

The Solanco School District New District Administrative Offices & Athletic Fields

VOLUME 2 DIVISIONS 2 through 14 DIVISIONS 31 through 33 TECHNICAL SPECIFICATIONS

CRA PROJECT NO. 3706

CONFORMED SET - July 8, 2026



CONFORMED SPECIFICATIONS

THE FOLLOWING SPECIFICATIONS HAVE BEEN REVISED TO INCLUDE ADDENDA ITEMS. SPECIFICATIONS SETS ARE BEING ISSUED AS A CONVENIENCE TO ALL PARTIES INVOLVED IN ORDER TO EXPEDITE THE COORDINATION AND CONSTRUCTION OF THIS PROJECT. THESE SPECIFICATIONS ARE NOT CONTRACT DOCUMENTS. IF ANY CONFLICTS OR DISCREPANCIES ARISE BETWEEN THESE DOCUMENTS AND THE ORIGINAL CONTRACT DOCUMENTS AND ADDENDA, THE ORIGINAL CONTRACT DOCUMENTS AND ADDENDA TAKE PRECEDENCE.

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VOLUME 2

TECHNICAL SPECIFICATIONS

FOR

**NEW DISTRICT ADMINISTRATIVE
OFFICES & ATHLETIC FIELDS**

FOR THE

THE SOLANCO SCHOOL DISTRICT

**121 South Hess Street
Quarryville, PA 17566**



**CRABTREE, ROHRBAUGH & ASSOCIATES
ARCHITECTS**

401 East Winding Hill Road
Mechanicsburg, Pennsylvania 17055

ARCHITECT'S PROJECT NO. 3706

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, vapor barriers, mix designs, placement procedures, other accessory materials and finishes.
- B. Cast-in Place concrete includes but is not limited to the following:
 - 1. Footings and foundation walls
 - 2. Interior slabs-on-grade
 - 3. Masonry infill
 - 4. Suspended slabs
 - 5. Equipment bases and foundations
 - 6. Fill for steel pan stair treads and landings.
- C. Related Sections include the following:
 - 1. Division 5 "Structural Steel Framing" for embedded items.
 - 2. Division 5 "Metal Fabrications" for embedded items.
 - 3. Division 9 Section "Wood Athletic Flooring" for required moisture, pH, and other required compatibility testing requirements.
 - 4. Division 9 Section "Resilient Tile Flooring" for required moisture, pH, and other required compatibility testing requirements.
 - 5. Division 9 Section "Resinous Flooring" for required moisture, pH, and other required compatibility testing requirements.
 - 6. Division 9 Section "Tile Carpeting" for required moisture, pH, and other required compatibility testing requirements.
 - 7. Division 31 Section "Earth Moving" for drainage fill under slabs-on grade.
 - 8. Division 32 Section "Concrete Pavement" for exterior concrete pavement and sidewalks.
 - 9. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants to be used in exterior concrete paving.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. If mix water is to be withheld at the plant and later added at the Project site to provide the water to cement ratio of the design mix, this must be clearly indicated on EVERY delivery ticket to the Project site.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement" and ACI MNL-66, "ACI Detailing Manual". Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement.
- D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Polypropylene Fiber Reinforcement
 - 4. Admixtures.
 - 5. Curing materials.
 - 6. Floor and slab treatments, when required by the Drawings.
 - 7. Vapor barriers.
 - 8. Semi-rigid joint filler.
 - 9. Premolded expansion joint-filler strips.
 - 10. Repair materials, when required for repair, and use of the repair is accepted by the Architect.
 - 11. Epoxy for drilling and placing dowels into hardened concrete.
 - 12. Waterstops
- E. Minutes of Pre-installation Conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must use Pennsylvania Department of Transportation certified materials.

- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Refer to "Field Quality Control" Paragraph below for testing requirements.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel".
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete".
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
 3. CRSI Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 4. ACI 306.1 "Standard Specification for Cold Weather Concreting"
 5. ACI 305 "Hot Weather Concreting"
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings".
1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.
 2. The Contractor's superintendent must conduct a Pre-installation meeting with a representative of the fiber manufacturer, listed in the "Polypropylene Fiber Reinforcement" Paragraph of this specification below, to obtain technical assistance, guidance, and recommendations for mix designs and finishing practices for a fiber free finished top surface prior to placing any building slab concrete. In addition to any recommendations given by the fiber manufacturer, the Contractor shall follow the requirements of the "Finishing Floors and Slabs" Paragraph of this specification below. Any conflict between the requirements noted and recommendations of the fiber manufacturer shall specifically be brought to the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage. Store reinforcement in a manner that prevents soil, mud, debris, or oil from adhering to the bars. If for any reason soil, mud, debris, oil or other deleterious material is on a bar, it shall be removed before the bar is installed.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials that produce a smooth, formed finish are acceptable.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved materials are acceptable. Provide lumber dressed on at least two edges and one side for a tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 inch by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
- F. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- B. Plain-Steel Welded Wire Fabric: ASTM A 1064, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Fly Ash: Fly ash may be part of the concrete mix as follows.
 - a. Fly ash to be in accordance with ASTM C 618, Class C or F. Use only in concrete mixes for foundation footings, CMU wall grout fills and slabs-on-grade.
 - 2. Ground Granulated Blast-Furnace Slag
 - a. Use one brand of cement throughout project unless approved otherwise by Architect.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Nominal Maximum Aggregate Size: One inch (3/4 inch where placement by pumping)
- C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
 - 1. Admixture shall be certified by manufacturer to be compatible with other admixtures.
- C. Water-Reducing Admixture: ASTM C 494, Type A.

1. Products: Subject to compliance with requirements, products include, but are not limited to, the following:
 - a. Eucon WR-75, Euclid Chemical Co.
 - b. Chemtard, ChemMasters Corp.
 - c. Plastocrete, 161, Sika Corp.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 1. Products: Subject to compliance with requirements, products include, but are not limited to, the following:
 - a. Super P, Anti-Hydro Co., Inc.
 - b. Eucon 37, Euclid Chemical Co.
 - c. Superslump, Metalcrete Industries
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 1. Products: Subject to compliance with requirements, products include, but are not limited to, the following:
 - a. Accelguard 80, Euclid Chemical Co.
 - b. Accel-Set, Metalcrete Industries
 - c. Daraset, W.R. Grace & Co.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 1. Products: Subject to compliance with requirements, products include, but are not limited to, the following:
 - a. Eucon Retarder 75, Euclid Chemical Co.
 - b. Daratard-17, W. R. Grace & Co.
 - c. Plastiment, Sika Corporation
- G. Moisture Vapor Reduction Admixture (MVRA): **For use only in concrete slabs-on-grade.** ASTM C 494, Type S. Non-toxic, liquid admixture that is specifically designed to have a natural chemical reaction with pre-existing elements inside the concrete to eliminate the route of moisture vapor emission through the slab by restricting the integral capillary system.
 1. Basis-of-Design Product: “Barrier One High Performance Concrete Admixture” manufactured by Barrier One, Inc. Subject to compliance with requirements, additional manufacturers of acceptable products include, but are not limited to the following:
 - a. ISE Logik MVRA 900.
 - b. AVECS Pro-Act.
 2. Warranty requirements: Product must be installed according to and in compliance with manufacturer’s published data to include, but not limited to, dosing instructions, the use

of an ASTM E1745 vapor retarder installed following ASTM E1643 and ASTM F710 guidelines. MVRA manufacturer's warranty shall include:

- a. Term: Life of the concrete.
- b. Repair and/or removal of failed flooring.
- c. Placement of a topical moisture remediation system.
- d. Replacement of flooring materials to include material and labor.
- e. MVRA Manufacturer shall provide an adhesion warranty to match the term of the adhesive manufacturer's warranty in accordance with the MVRA manufacturer's requirements for conveyance of such

2.6 VAPOR BARRIER AND GRANULAR MATERIALS

A. Vapor Barrier: ASTM E 1745, Class A, membrane that satisfies the following:

1. Membrane shall not be less than 15 mils thick.
2. Installation shall comply with the "Vapor Barrier and Granular Materials" Paragraph of this specification.
3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Stego Industries, LLC; Stego Wrap 15-mil Class A Vapor Barrier
 - b. Barrier-Bac, Inc.; VB-350 16 mil Class A Vapor Retarder
 - c. W. R. Meadows, Inc.; Sealtight Perminator 15 mil Class A Vapor Retarder
 - d. Insulation Solutions Inc.; Viper VaporCheck II 15 mil Class A Vapor Barrier

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- I. Products: Subject to compliance with requirements, products to include, but are not limited to, the following:
 - 1. Evaporation Retarder:
 - a. Cimfilm; Axim Concrete Technologies.
 - b. Finishing Aid Concentrate; Burke Group, LLC (The).
 - c. Spray-Film; ChemMasters.
 - d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
 - e. Sure Film; Dayton Superior Corporation.
 - f. Eucobar; Euclid Chemical Co.
 - g. Vapor Aid; Kaufman Products, Inc.
 - h. Lambco Skin; Lambert Corporation.
 - i. E-Con; L&M Construction Chemicals, Inc.
 - j. Confilm; Master Builders, Inc.
 - k. Waterhold; Metalcrete Industries.
 - l. Rich Film; Richmond Screw Anchor Co.
 - m. SikaFilm; Sika Corporation.
 - n. Finishing Aid; Symons Corporation.
 - o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
 - 2. Clear, Solvent-Borne, Membrane-Forming Curing Compound:
 - a. AH Clear Cure; Anti-Hydro International, Inc.
 - b. Spartan-Cote; Burke Group, LLC (The).
 - c. Spray-Cure & Seal 15; ChemMasters.
 - d. Conspec #1-15 percent solids; Conspec Marketing & Manufacturing Co., Inc.
 - e. Day-Chem Cure and Seal; Dayton Superior Corporation.
 - f. Diamond Clear; Euclid Chemical Co.
 - g. Nitocure S; Fosroc.
 - h. Lambco 120; Lambert Corporation.
 - i. L&M Dress & Seal 18; L&M Construction Chemicals, Inc.
 - j. CS-309; W. R. Meadows, Inc.
 - k. Seal N Kure; Metalcrete Industries.
 - l. Rich Seal 14 percent UV; Richmond Screw Anchor Co.
 - m. Kure-N-Seal; Sonneborn, Div. of ChemRex, Inc.
 - n. Flortec 14; Sternson Group.
 - o. Cure & Seal 14 percent; Symons Corporation.
 - p. Clear Seal 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
 - q. Acrylic Cure; Unitex.
 - r. Certi-Vex AC 309; Vexcon Chemicals, Inc.
 - 3. Clear, Waterborne, Membrane-Forming Curing Compound:
 - a. AH Clear Cure WB; Anti-Hydro International, Inc.

- b. Klear Kote WB II Regular; Burke Chemicals.
 - c. Safe-Cure & Seal 20; ChemMasters.
 - d. High Seal; Conspec Marketing & Manufacturing Co., Inc.
 - e. Safe Cure and Seal; Dayton Superior Corporation.
 - f. Aqua Cure VOX; Euclid Chemical Co.
 - g. Cure & Seal 309 Emulsion; Kaufman Products Inc.
 - h. Glazecote Sealer-20; Lambert Corporation.
 - i. Dress & Seal WB; L&M Construction Chemicals, Inc.
 - j. Vocomp-20; W. R. Meadows, Inc.
 - k. Metcure; Metalcrete Industries.
 - l. Cure & Seal 150E; Nox-Crete Products Group, Kinsman Corporation.
 - m. Rich Seal 14 percent E; Richmond Screw Anchor Co.
 - n. Kure-N-Seal WB; Sonneborn, Div. of ChemRex, Inc.
 - o. Florseal W.B.; Sternson Group.
 - p. Cure & Seal 14 percent E; Symons Corporation.
 - q. Seal Cure WB 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
 - r. Hydro Seal; Unitex.
 - s. Starseal 309; Vexcon Chemicals, Inc.
4. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound:
- a. Spray-Cure & Seal Plus; ChemMasters.
 - b. UV Super Seal; Lambert Corporation.
 - c. Lumiseal Plus; L&M Construction Chemicals, Inc.
 - d. CS-309/30; W. R. Meadows, Inc.
 - e. Seal N Kure 30; Metalcrete Industries.
 - f. Rich Seal 31 percent UV; Richmond Screw Anchor Co.
 - g. Cure & Seal 31 percent UV; Symons Corporation.
 - h. Certi-Vex AC 1315; Vexcon Chemicals, Inc.
5. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
- a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
 - b. Polyseal WB; ChemMasters.
 - c. UV Safe Seal; Lambert Corporation.
 - d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
 - e. Vocomp-30; W. R. Meadows, Inc.
 - f. Metcure 30; Metalcrete Industries.
 - g. Vexcon Starseal 1315; Vexcon Chemicals, Inc.

2.8 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid. 100 percent solids per ASTM D 2240.

- C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type: Class IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- F. Waterstops: Flexible PVC waterstops for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes. Use profile of ribbed surface with center bulb. The waterstop is to be embedded 3 inches into concrete unless noted otherwise on drawings.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4,100 psi at 28 days when tested according to ASTM C 109/C 109M.
 - 5. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.
 - a. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - b. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - c. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - d. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301 and ACI 318-02.
 - 2. Under circumstances where laboratory trial mix or field test data are not available, the required average compressive strength of concrete produced with materials similar to those specified shall be at least 1,200 psi greater than the specified compressive strength. This alternative shall not be permitted if the specified compressive strength is greater than 4,000 psi.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 18 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
- D. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
 - 1. Air Content: 6 percent for 3/4-inch nominal maximum aggregate size.
- E. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
- F. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- G. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation/Retaining Walls: Proportion normal-weight concrete mix as follows:
 - 1. Minimum Compressive Strength (28 Days): 4000 psi.
 - 2. Select slump limits from subparagraphs below or revise to suit Project.
 - 3. Maximum Slump: 4 inches.
 - 4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2 to 4 inch slump.

B. Interior Slabs-on-Grade: Proportion normal-weight concrete mix as follows:

1. Minimum Compressive Strength (28 Days): 3500 psi.
2. Select cementitious materials content from subparagraphs below or delete if ACI 301 default for floors is sufficient. ACI 302.1R recommends quantities in listed order below, for nominal maximum aggregate sizes 1-1/2, 1, and 3/4 inch (38, 25, and 19 mm). ACI 301 sets identical quantities, but for minimum cement rather than cementitious materials content.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8-inches after admixture is added to concrete .
5. Interior slab mix is to contain a high-range, water-reducing admixture with a water cement ratio equal to 0.47.
6. Produce a mix that has the minimum amount of water necessary to generate a 2 to 3 inch slump prior to the addition of any water reducing admixtures, as recommended in ACI 302.1R, "Concrete Floor and Slab Construction", Chapter 6, "Concrete Properties and Consistency".
7. Reinforce concrete with polypropylene fiber reinforcement at a dosage rate specified by fiber reinforcement manufacturer. Reinforcement to be placed in concrete at the mixing plant per fiber reinforcement manufacturer's recommendations.
8. Per ACI 544.3, mix designs for concrete containing fiber reinforcement shall include a maximum 55% by volume coarse aggregate content by total volume of aggregates (sand and stone).

C. Suspended Slabs: Proportion normal-weight concrete mix as follows:

1. Minimum Compressive Strength (28 Days): 3500 psi.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8-inches after admixture is added to concrete .
4. Interior slab mix is to contain a high-range, water-reducing admixture with a water cement ratio equal to 0.47.
5. Produce a mix that has the minimum amount of water necessary to generate a 2 to 3 inch slump prior to the addition of any water reducing admixtures, as recommended in ACI 302.1R, "Concrete Floor and Slab Construction", Chapter 6, "Concrete Properties and Consistency"
6. Reinforce concrete with welded wire fabric per contract documents and supported per Paragraph 3.5.E. The use of polypropylene fiber reinforcement is not allowed without the permission of the Engineer-Of-Record.

Exterior Slabs-on-Grade and Sidewalks: See Division 32 Section "Concrete Pavement."

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice".

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information for EACH delivery to the Project site.
 - 1. When air temperature is between 85 and 90 deg. F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for concrete exposed to view.
 - 2. Class B, 1/4 inch for all other concrete surfaces.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.
- E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that do not support the weight of concrete may be removed after cumulatively curing at not less than 50 deg. F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR BARRIER AND GRANULAR MATERIAL

- A. Vapor Barrier: Place, protect, and repair membrane according to ASTM E 1643, ASTM F 710 and manufacturer's written instructions. Contractor shall place the vapor barrier directly below the concrete slab and on top of granular fill. Lap joints 6 inches minimum and seal with manufacturer's recommended tape. Sheets to extend to interior face of foundation walls, turn up vertically and terminate flush with top of concrete floor slab. Adhere to foundation wall with manufacturer's recommended tape. Seal all penetrations with manufacturer's recommended methods of boots, mastic or tape.
- B. Granular Fill: Place a minimum of 4 inches compacted granular fill on top of subgrade to elevation tolerances of plus 0 inch or minus 1/2 inch.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced at 3'-0" maximum spacing to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts or inserts.
 - 1. Grooved Joints Using Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints to a depth of one-fourth

- the slab thickness. Cut into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
3. Clean all debris from joints.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may not be added at Project site, unless there is a specific written indication on the delivery slip of how much water has not been added to the mix at the mixing plant.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mix. The addition of fiber reinforcement to concrete for slab construction will reduce field tested concrete slumps. The lower slump values for concrete that contain fiber reinforcement will not reduce workability of the concrete. Per ACI 302, the workability of a concrete mixture is not directly proportional to the slump. The addition of water at the project site to increase slump will likely result in excessive bleed water during finishing operations and is not permitted. Contractor shall contact fiber reinforcement representative to address any concerns with concrete workability and field tested slumps.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to, or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg. F and not more than 80 deg. F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- F. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg. F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacture's written instructions.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Concrete placement conditions should satisfy the following requirements to reduce random slab cracking:
 - 1. The base shall be free of frost and should not contain standing water. If concrete is placed in hot, dry conditions, the base should be lightly damped with water in advance of concreting.
 - 2. When slabs are placed on grade, there should be no more than 30 deg. F difference between the temperature of the base and concrete at the time of placement.
 - 3. Ideally, concrete should be protected from sun and wind and be placed after floor or roof deck is installed.
- C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
 - 1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.
- D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 - 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.
 - b. Specified values of flatness shall be based on "10-ft straightedge method" for suspended slabs. Flatness shall be within 1/8-inch per 10-ft for four of five consecutive measurements. In addition, visually obvious faults in floor flatness shall be corrected at contractor's own expense.

- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods for unformed surfaces.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with Plastic Sheet cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches. Cure for not less than 24 hours.
 - a. Cure concrete surfaces to receive floor coverings with a Plastic Sheet cover for 24 hours or a curing compound that the manufacturer recommends for use with floor coverings.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Fill joint in a manner that provides a finish at the joint which is flush with the surrounding surface of the slab.
- D. Joint filling is not required for 1/8-inch wide control joints.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat

- holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks less than 0.01 inch wide and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks less than 0.01 inch wide and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar. All removal and repairs shall be at Contractor's own expense.

- F. Repair materials and installation not specified above may be used, subject to Architect's approval. All removal and repairs shall be at Contractor's own expense.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article. See above Paragraph 2.5.G.2 for performance requirements at the expense of the concrete moisture vapor reduction admixture (MVRA) manufacturer.

Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 30 cu. yd. or fraction thereof.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens:
 - a. ASTM C 31; cast and laboratory (standard) cure one set of three standard cylinder specimens for each composite sample. Transport the cylinders to laboratory within 24 hours for final curing and testing.
 - b. ASTM C 31; cast and field cure one standard cylinder specimens for each composite sample. Field cure the cylinders for the first five (5) days, minimum, in the field under the same conditions as the cast concrete. Transport the cylinders to the laboratory for continued curing and testing.
 6. Compressive-Strength Tests:
 - a. ASTM C 39; test one laboratory (standard) cured specimen at 7 days and 2 specimens at 28 days.
 - b. ASTM C 39; test field cured specimen at 7 days.
- C. When strength of field-cured cylinders is less than 85 percent of companion cylinders that have been totally cured in the laboratory (no field curing), Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - D. A 28 day compressive-strength test for concrete shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

- E. Strength of concrete will be satisfactory if every average of sets of three consecutive compressive-strength tests at 28 days (total of 6 cylinders) equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- F. If time of concrete strength gain is affected by materials in the mix, such as fly ash, provide correlation information between the 28-day compressive strength and the final compressive strength prior to performing compressive strength tests.
- G. Non-destructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- H. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. The Contractor will be notified of the tests and the tests will be paid for by the Contractor. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY (ASSEMBLIES)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units.
 - 2. Decorative concrete masonry units.
 - 3. Mortar and grout materials.
 - 4. Mortar and grout mixes.
 - 5. Reinforcing steel.
 - 6. Masonry joint reinforcement.
 - 7. Ties and anchors.
 - 8. Embedded flashing.
 - 9. Miscellaneous masonry accessories and auxiliary materials.
 - 10. Masonry cleaners.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete fill for unit masonry cells and bond beams.
 - 2. Division 4 Section "Adhered Stone Masonry Veneer" for adhered artificial stone veneer materials and accessories.
 - 3. Division 5 Section "Metal Fabrications" for loose steel lintels and bearing plates and for other miscellaneous steel items installed as part of unit masonry assemblies.
 - 4. Division 5 Sections "Steel Joist Framing" and "Structural Steel Framing" (and the Structural Drawings) for coordination, and for layout requirements for bearing plates and similar items.
 - 5. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal flashing and trim items that get built into unit masonry assemblies.
 - 6. Division 8 Section "Hollow Metal Doors and Frames" for hollow metal door frames that get built into unit masonry assemblies.

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1. For Concrete Unit Masonry: 2000 psi (MPa).

1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified, to comply with requirements in Division 1 Section "Submittals".
- B. Pre-installation Coordination Drawings: In accordance with Division 1 Section "Project Coordination", prepare Coordination Drawings to coordinate unit masonry assemblies with the Work of other trades. Coordination drawings shall be reviewed by all Prime Contractors at the Masonry Pre-Installation Conference. Coordination items include, but are not limited to the following:
1. Sizes and locations of all masonry openings, coordinated with items installed by other trades, both interior and exterior, i.e., louvers, grilles, doors and windows, scuppers, etc. **At a minimum, coordination drawings must show ALL required openings through the finished exterior building masonry.**
 2. Locations of all expansion and control joints. **Locations shall be supported by a method recommended by current, published technical standards. Refer to Paragraph 3.2.A below for additional information.**
 3. Locations of all in-wall rainwater conductors and outlets through the wall.
 4. Locations of all piped sleeves and other foundation penetrations.
- C. Shop Drawings: In accordance with Division 1 Section "Submittals", prepare and submit Shop Drawings including details of the following, at a scale of not less than 3" = 1'-0".
1. Locations and types of lintels.
 2. Indicate required horizontal and vertical reinforcing and horizontal masonry bond beams.
 3. Fabricated flashing details, sections and installation methods including, but not limited to, through-wall base flashings, sill flashings, head flashings, low roof/high wall flashings, cap flashings, corner flashings, end dam flashings, stepped flashings and 2-piece flashing assemblies.
 4. Locations and detailed methods of attachment to supporting structural items and systems.
 5. Submit details and installation methods incorporating special shape units.
 6. Submit documentation of constructability issues related to design, installation methods, applicable building codes, fire-ratings and/or compatibility conditions. Accompany documentation with the most recent technical standards published by the International Masonry Institute, National Concrete Masonry Association, Brick Industry Association and/or product manufacturer's printed recommendations.
- D. Samples for Initial Selection of the following:

1. Unit masonry samples for each different exposed masonry unit required. Submit face brick to show range of colors, texture and mortar types for matching existing brick. Submit concrete masonry samples to illustrate texture.
 2. Colored mortar samples showing the full range of colors available.
- E. Samples for Verification of the following:
1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction. Sufficient quantity of units shall be provided to construct the specified Sample Panel.
 2. Colored mortar samples for each color required, showing the full range of colors expected in the finished construction. **Make samples using the same sand and mortar ingredients to be used on Project.** Label samples to indicate types and amounts of pigments used.
 3. Weeps/vents in color to match mortar color.
 4. Accessories embedded in masonry assemblies.
- F. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from requirements of the Contract Documents, unless such deviations are specifically brought to the attention of Architect and approved in writing.
- G. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- H. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements specified:
1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units and gross-area compressive strength of clay bricks.
 2. Mortar complying with ASTM C270.
 3. Grout mixes complying with compressive strength requirements of ASTM C476. Include description of type and proportions of grout ingredients.
 4. Submit concrete mix design for filling masonry cells and bond beams. Use concrete mix having a 28-day compressive strength of 3000 psi.
 - a. Refer to Division 3 Section "Cast-in-Place Concrete".
- I. Material Certificates: Signed by manufacturers certifying that each of the following items complies with specified requirements:

1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 4. Each material and grade indicated for reinforcing bars.
 5. Each type and size of joint reinforcement.
 6. Each type and size of anchor, tie, and metal accessory.
- J. Hot and Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot and cold-weather requirements.

1.6 QUALITY ASSURANCE

- A. Testing and Inspections: Owner will engage an independent testing agency, acceptable to authorities having jurisdiction, and who is qualified according to ASTM C1093 to conduct all required testing and inspections, including IBC Special Inspections.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color through one source from a single manufacturer and manufacturing plant.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per Applicable Code by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- E. Sample Panels: Prior to installation of above grade unit masonry, build sample panels, using single wythe veneer materials preliminarily selected for the completed Work. Build sample panels for each type of veneer masonry **48 inches long by 48 inches high** by full unit thickness.
 1. Locate panels in locations indicated or, if not indicated, as directed by Architect.
 2. Clean exposed faces of panels with masonry cleaner indicated.
 3. Protect approved sample panels from the elements with weather-resistant membrane.
 4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints;

aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

- a. Being preliminary in nature, multiple sample panels may be required to finalize unit masonry selections to be used on Project.
- b. Approval of sample panels does not constitute approval of deviations from Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.
- c. Demolish and remove sample panels when directed by Architect.

F. Project Mockup: The intent of the Project Mockup is to evidence the quality of construction and the assembly requirements of all exterior building components and their interrelationship to each other. Prior to the installation of any above grade unit masonry, or other exterior building component, and allowing sufficient time for construction and approval, build a full-assembly project mockup using the materials and products indicated for the completed Work. Build full assembly mockup panel to include each type of unit masonry and each other specified building cladding material. The Project Mockup shall be **a minimum of 72-inches long by 72-inches high** or larger to accommodate all necessary components.

1. Notify Architect at least seven (7) days in advance of dates and times when mockups will be constructed.
2. Locate mockups in the location indicated or, if not indicated, as directed by Architect.
3. Provide typical masonry opening, steel lintel, sill and associated blocking, sill flashings, air-barrier and flashing as detailed on Drawings and as specified in this Section.
4. Include metal coping, roof edge fascia, gutter (if applicable), thru-wall overflow roof scupper, and associated blocking and fasteners as detailed on Drawings and as specified in Division 7 Section "Sheet Metal Flashing and Trim."
5. If an aluminum framed storefront assembly cannot be acquired in sufficient time without delaying approval of the Project Mockup, include a 4-1/2-inch-deep x 2-inch-wide wood framed representation of the window frame to verify the relationship of the face of the window frame to the face of the veneer masonry.
6. Omit portions of veneer, sill, coping, fascia, and aluminum frame to provide viewable "cut-away" areas and items of construction ordinarily hidden behind finished wall construction. Coordinate with Architect prior to Project Mockup construction.
7. Build Project Mockups to include the following construction assemblies by full assembly thickness, including face veneer, cavity, backup and accessories. Include a sealant-filled vertical joint at least 16-inches long in each assembly.
 - a. Each exposed unit masonry veneer with unit masonry backup assembly.
 - b. Each exposed unit masonry veneer with metal stud backup assembly.
 - c. Other assemblies incorporating unit masonry or metal stud backup and claddings as specified in Related Sections paragraph including but not limited to, metal panel assemblies and exterior insulation finish system.
 - d. Sealants as specified in Division 7 Section "Joint Sealants".
8. Clean exposed faces of Project Mockup with masonry or other appropriate cleaner.
9. Protect accepted Project Mockup from the elements with weather-resistant membrane.

10. Maintain Project Mockup during construction in an undisturbed condition as a standard for judging the completed Work.
11. Approval of Project Mockups is for color, texture, and blending of masonry units; the interrelationship of masonry units to other cladding products, the relationship of mortar and sealant colors to masonry unit colors; the tooling of joints; the aesthetic qualities of workmanship; the incorporation of specified and detailed products and accessories and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of Project Mockups does not constitute approval of deviations from the Contract Documents, unless such deviations are specifically approved by Architect in writing.
12. Demolish and remove Project Mockup only when directed by Architect.

- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting securely tied. If units become wet, do not install until they are dry.
 1. Protect concrete masonry units from moisture absorption so that at the time of installation the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mixes on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24-inches down both sides and hold cover securely in place.

2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24-inches down face next to unconstructed wythe and secure cover in place.
- B. Do not apply uniform floor or roof loads for at least 12-hours and concentrated loads for at least 3 days after building masonry walls or columns.
 - C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come into contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surfaces.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
 - D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 50 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning. Follow manufacturer's recommendations for minimum temperature.
 - E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 1. When ambient temperature exceeds 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48-inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for ALL INTERIOR outside corners unless otherwise noted.
- B. Concrete Masonry Units: ASTM C90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi (MPa).
 2. Weight Classification: Normal weight.
 3. Size (Width): Manufactured to the following dimensions:
 - a. 4 inches nominal; 3-5/8 inches actual.
 - b. 6 inches nominal; 5-5/8 inches actual.
 - c. 8 inches nominal; 7-5/8 inches actual.
 - d. 10 inches nominal; 9-5/8 inches actual.
 - e. 12 inches nominal; 11-5/8 inches actual.
 - f. 14 inches nominal; 13-5/8 inches actual.
 - g. 16 inches nominal; 15-5/8 inches actual.
 4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
- C. Decorative Concrete Masonry Units: ASTM C90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi (MPa).
 2. Weight Classification: Normal weight.
 3. Size: Manufactured to dimensions indicated.
 4. Finish: Exposed faces matching color, pattern, and texture of Architect's samples.
 - a. Normal-weight aggregate, ground finish.
 - b. Normal-weight aggregate, textured finish.
 - 1) Provide units made with aggregate matching Architect's sample.
 5. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent mortar additive according to ASTM E514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen. Provide test results to Architect.
 - a. Available Products: Subject to compliance with specified requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) SikaMix W-10; Sika Corporation.
 - 2) Dry-Block; GCP.
 - 3) MasterPel 240; Master Builders Solutions.
 6. ~~Field Applied Water Repellent: Provide field applied silane/siloxane based liquid water repellent to existing exterior decorative concrete masonry units as noted on Drawings. Water repellent products shall not impair the breathing characteristic of the treated surfaces.~~

~~a. Available Products: subject to compliance with specified requirements, products that may be incorporated into the work include, but are not limited to, the following:~~

~~1) Siloxane PD; Prosoco, Inc.~~

~~2) Sikagard 701W; Sika Corporation.~~

~~3) MasterProtect H 1000; Master Builders Solutions. (ADDENDUM 5)~~

7. Color and Texture: This specification is based on the products indicated below:

- a. Ground Face CMU: Beavertown Block Company – Monroe Black
- b. Split Face CMU: Beavertown Block Company – Monroe Black (TYPE A)
Beavertown Block Company – Honey (TYPE B)

- 1) For all decorative concrete masonry units, Architect reserves the right to custom blend the final coloration of exposed aggregates.

8. Manufacturers:

a. Available Manufacturers: Subject to compliance with specified requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) York Building Products, Inc.
- 2) Nitterhouse Masonry Products, LLC
- 3) Beavertown Block Co., Inc.
- 4) Oldcastle APG (formerly Trenwyth Industries, Inc.)
- 5) Fizzano Bros. Concrete Products, Inc.

~~2.2 FACE BRICK~~

A. ~~General: Provide shapes indicated and as follows for each form of brick required:~~

- 1. ~~Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.~~

B. ~~Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.~~

- 1. ~~Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.~~
- 2. ~~Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.~~

C. ~~Face Brick: ASTM C216, Grade SW, Type FBS, and as follows:~~

1. ~~Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.~~
2. ~~Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C67.~~
3. ~~Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced".~~
4. ~~Surface Coloring: Brick with surface coloring, other than flashed or sand finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C67 with no observable difference in the applied finish when viewed from 10 feet.~~
5. ~~Size: Manufactured to the following actual dimensions:~~
 - a. ~~Utility Sized (New Additions): Nominally 3-5/8 inches by 3-5/8 inches by 11-5/8 inches long.~~
 - b. ~~Modular Sized (Existing Infills): Nominally 3-5/8 inches by 2-1/4 inches by 7-5/8 inches long.~~
6. ~~Color and Texture: This specification is based on the products indicated below. Architect reserves the right to revise and finalize all brick and mortar colors through the sample panel process.~~
7. ~~Manufacturers: Subject to compliance with specified requirements, additional manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:~~
 - a. ~~Glen-Gery Corp.~~
 - b. ~~Belden Brick.~~
 - c. ~~Watson town Brick.~~
 - d. ~~Redland Brick, Inc.~~
 - e. ~~Endicott, Inc.~~
 - f. ~~General Shale, Inc.~~
 - g. **US Brick. (ADDENDUM 4)**

2.3 MORTAR AND GROUT MATERIALS

- A. Available Products: Subject to compliance with specified requirements and suitability with specified materials as reviewed by Architect, products that may be incorporated into the Work include, but are not limited to, the following:
 1. Colored Portland Cement-Lime Mix:
 - a. Color Mortar Blend; Glen-Gery Corporation.
 - b. Rainbow Mortamix Custom Color Cement/Lime; Holcim, Inc.
 - c. Centurion Colorbond PL; Lafarge Corporation.
 - d. Heidelberg Materials (formerly Lehigh Hanson, Inc.)
 2. Mortar Pigments:
 - a. True Tone Mortar Colors; Davis Colors.
 - b. Centurion Pigments; Lafarge Corporation.

- c. SGS Mortar Colors; Solomon Colors, Inc.
 - B. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - C. Hydrated Lime: ASTM C207, Type S.
 - D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.
 - E. Aggregate for Mortar: ASTM C144; except for joints less than 1/4-inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - F. Aggregate for Grout: ASTM C404.
 - G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
 - H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units containing integral water repellent by the same manufacturer as that used in the concrete masonry units (Section 2.1.C.5 above).
 - 1. Provide integral water repellent admixture in mortar used for exposed decorative concrete masonry unit construction, including cavity wall construction.
 - I. Water: Potable.
- 2.4 MORTAR AND GROUT MIXES
- A. General: Do not use calcium chloride. The use of admixtures will not be considered unless their suitability is reviewed and approved by Architect and demonstrated by laboratory test results simulating the conditions that warrant the desired use of the admixture.
 - B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions and thoroughly blend ingredients before delivering to Project site.
 - C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification.
 - 1. Limit cementitious materials in mortar to portland cement and hydrated lime.
 - 2. For masonry below grade, foundation walls, retaining walls in contact with earth, and where indicated, use Type M or Type S mortar, 1 part portland cement, 1/4 part Type S hydrated lime and 3-3/4 parts sand, with a minimum 28-day compressive strength of 2500 psi.

3. For above grade exterior brick and non-load bearing partitions use Type N mortar, 1 part portland cement, 1 part hydrated lime Type S and 6 parts sand.
 4. For exterior above grade and load bearing clay brick and manufactured stone use Type S mortar.
 5. For interior and exterior tuck pointing, use Type N mortar.
 6. For restoration work, Contractor is required to review the existing mortar properties, including hardness, and the existing masonry properties and submit the appropriate type of mortar for approval by Architect.
 7. For new brick veneer above grade use Type N mortar.
 8. For natural stone masonry use Type M mortar.
- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
 2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
 3. For mineral-oxide pigments and mortar cement mortar, not more than 5 percent.
 4. For carbon-black pigment and mortar cement mortar, not more than 1 percent.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
1. Mix to match Architect's sample.
- F. Grout for Unit Masonry:
1. Use either pea gravel cement concrete or grout conforming with ASTM C476 with a minimum 28-day compressive strength of 3000 psi.
 2. Provide grout with a slump of 8 to 11-inches as measured according to ASTM C143.

2.5 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A615; Grade 60.

2.6 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A951 and as follows:
1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter unless otherwise noted.
 3. Wire Size for Cross Rods: W1.7 or 0.148-diameter unless otherwise noted.
 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide either ladder or truss type with a single pair of side rods and cross rods spaced not more than 16-inches o.c. Truss type shall not be used in vertically reinforced unit masonry walls.

C. For multi-wythe masonry, provide types as follows:

1. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16-inches o.c., and with separate adjustable veneer ties engaging the cross ties. Crossties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face. Unless otherwise indicated, install in first and second courses above finished floor and in alternating back-up masonry courses thereafter.
 - a. Use where indicated and where horizontal joints of facing wythe do not align (1-1/4-inches or less) with those of backup wythe.
 - b. Use where facing wythe is of different material than backup wythe.
 - c. Basis of Design Product: Hohmann & Barnard #270 Adjustable Ladder Eye-Wire Anchor System. Equal products are also acceptable.
 - 1) Coordinate the length of the projecting eye or hook with the thickness of the cavity wall insulation and use the appropriate product.
2. Adjustable (3-piece) type with ladder type reinforcement at back-up wythe which includes an extended cross rod. A vertical rod is hooked onto the extended cross rod and extends down to and behind the cross rod of the next lower truss type unit. An adjustable vee tie is hooked around the vertical rod for placement into the mortar joint of the face veneer.
 - a. Use where indicated and where horizontal joints of facing wythe do not align (greater than 1-1/4-inches) with those of the back-up wythe.
 - b. Basis of Design Product: Hohmann & Barnard Tie-HVR Anchor System. Equal products are also acceptable.
 - 1) Coordinate the length of the projecting eye or hook with the thickness of the cavity wall insulation and use the appropriate product.

2.7 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, and as required by Building Code Requirements and Specification for Masonry Structures; use of hot-dipped galvanized ties and anchors in exterior wall construction.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A82; with ASTM A153, Class B-2 coating.
- C. Galvanized Steel Sheet: ASTM A653, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
- D. Steel Sheet, Galvanized after Fabrication: ASTM A366 cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A153.
- E. Steel Plates, Shapes, and Bars: ASTM A36. Plates, shapes, and bars exposed to weather shall be hot-dipped galvanized after fabrication.

2.8 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME OR LINTELS

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section: Crimped 3/16-inch diameter, hot-dip galvanized steel wire anchor section for welding to steel.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1-inch of masonry face, made from 0.1875-inch (3/16-inch) diameter, hot-dip galvanized steel wire.

2.9 ANCHORS FOR CONNECTING TO SUBSTRATES

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to the plane of the wall.
 - 1. Structural Performance Characteristics: Capable of withstanding a 200-lbf load in both tension and compression without deforming or developing play more than 0.05-inch.
 - 2. Metal Stud Assemblies Basis of Design Product: Hohmann & Barnard HB-213-2X Adjustable Veneer Anchor. Equal products are also acceptable.
 - a. HB-213-2X anchor shall be coordinated with details on Drawings and/or actual field conditions for appropriate length, gauge and offset to accommodate cavity width from face of rigid insulation to masonry veneer and to include the appropriate connection interface to anchor to substrate. Anchor has 3/16-inch round wire hooks (2x mortar bed thickness) which hook into a bent backplate. Backplate is predrilled with two 9/32-inch fastener holes. Provide appropriate stainless steel self-drilling, self-tapping screws and gasketed seal tape by Hohmann & Barnard, Inc., or equal product.
 - 3. Sill and Jamb Blocking Basis of Design Product: Hohmann & Barnard Veneer Anchors #345-SV and #345-BT. Equal products are also acceptable.
 - a. At sill blocking provide #345-SV and at jamb blocking provide #345-BT spaced and secured at 16-inches o.c. horizontally and vertically. Coordinate with details on Drawings and/or actual field conditions for the appropriate length to accommodate cavity width from face of rigid insulation and/or wood blocking and/or concrete masonry back-up face to masonry veneer and to include the appropriate connection interface to the anchor substrate. Provide appropriate stainless steel self-drilling, self-tapping screws.

2.10 JOINT STABILIZATION ANCHORS

- A. General: Provide stabilization anchors in horizontal joints of masonry units across the joint between walls at all T-shaped wall intersections as follows:
 - 1. Use either a manufactured steel joint stabilizing anchor consisting of two steel rods connected together by sliding plate assemblies (Basis-of-Design product, Hohmann & Barnard, Inc. Slip-Set Stabilizer Control Joint Anchor) or a 1-1/2-inch x 1/8-inch x 8-inch

steel strap anchor with 2-inch (90 degree) right-angle bent ends (Basis-of-Design product, Wire-Bond Rigid Steel Tie Z-Straps at masonry shear walls.

- a. Anchors to be embedded in grout-filled cores of hollow concrete masonry units.
- b. 16-inches o.c. vertical spacing.
- c. Finish: Mill galvanized or hot-dip galvanized to comply with ASTM A153.

2.11 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Anchor Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153, Class C; of diameter and length indicated and in the following configurations:
 1. Headed bolts.
 2. Non-headed bolts, bent in manner indicated.
- C. Post-installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
 1. Type: Chemical anchors.
 2. Type: Expansion anchors.
 3. Type: Undercut anchors.
 4. For Post-installed Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
 5. For Post-installed Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.12 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabrications and materials listed in this Paragraph take precedent over materials specified in Division 7 Section "Sheet Metal Flashing and Trim". Fabricate from the following materials:
 1. Fabricate metal two-piece roof flashings and expansion-joint water-stops from Type 304, 26 gauge (.018-inches thick) stainless steel formed to shape indicated.
 2. Fabricate stainless steel drip plates from Type 304, 26 gauge (.018-inches thick) stainless steel furnished with a smooth, factory-formed hemmed edge. Width: 3-inches.
 - a. Basis of Design Product: Cheney Prefabricated Metal Flashing, the Cheney Flashing Co., Inc. Subject to compliance with all specified requirements, equal products by other manufacturers are also acceptable.
- B. Concealed Flashing: For through-wall flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Laminated Stainless-Steel Flashing: Flexible, stainless steel with a polymer fabric laminated to the underside face with a non-asphaltic adhesive.
 - a. Basis of Design Product: York Manufacturing, Inc. Multi-Flash SS. Use in conjunction with manufacturer's standard pre-formed 26 GA inside and outside corners. Subject to compliance with specified requirements, available products by other manufacturers include, but are not limited to, the following:
 - 1) Prosoco Inc. Wall Guardian Stainless Steel TWF.
 - 2) TK Products, Inc. TK TWF.
 - b. Stainless-steel Type 304, ASTM A240.
 - c. Thickness: Minimum 2 mils.
 - d. Puncture Resistance: Minimum 2,500 psi per ASTM E154.
 - e. Width: As required to comply with details on Drawings and with Flashing, Weeps and Vents Paragraph below.
 - f. Warranty: Life of wall.
Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Mastics, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.13 MISCELLANEOUS MASONRY ACCESSORIES AND AUXILIARY MATERIALS

- A. Non-Combustible Semi-Rigid Expansion Material: Moisture resistant semi-rigid, mono-density stone wool insulation board for use as a fire stop for compliance with NFPA 285.
 1. Products: Provide one of the following as a Basis-of-Design:
 - a. RockWool Cavityrock.
 - b. Owens Corning Thermafiber Rain Barrier Dark.
- B. Compressible Exterior Expansion Joint Filler: Silicone faced acrylic-impregnated expanding foam sealant and closed-cell foam sealant system. ASTM E283-04, compressible up to 50 percent; of width and thickness indicated. Color as selected by Architect, from full range of standard and special colors.
 1. Products: Provide the following as a Basis-of-Design:
 - a. Colorseal, Emseal Joint Systems, Ltd.
- C. Preformed Control-Joint Gaskets: Styrene-Butadiene-Rubber Compound designed to fit standard sash block and to maintain lateral stability in masonry wall. ASTM D2000, Designation M2AA-805.
 1. Products: Provide products by one of the following manufacturers:

- a. Hohmann & Barnard, Inc.
 - b. Sandell Mfg. Co., Inc.
- D. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).
- E. Sill Weep: Weeps shall be installed as detailed at 16-inches o.c. on top of the metal drip plate along the length of the sill. Install per manufacturer's written instructions. Lay vents flat on top of stainless-steel drip plate.
 - 1. Products: Basis of Design product, Hohmann & Barnard, Inc., QV-Quadro-Vent.
 - a. Polypropylene tested in conformance with ASTM D2240, D790B, D638 and D1238B.
 - b. Honeycomb design.
 - c. Color as selected by Architect from full range of standard and special colors, and to match the associated mortar color.
 - d. Size according to associated masonry veneer units.
- F. Cavity Drainage Material: Free-draining mesh made from polyethylene strands and shaped to avoid being clogged by mortar droppings. Use standard thickness products in compliance with manufacturer's gap tolerance between cavity substrate surfaces.
 - 1. Basis of Design Products: Mortar Net USA, Mortar Net or Hohmann & Barnard, Inc. Mortar Trap, base of wall cavity drainage material.
 - a. The use of a full height cavity drainage material in insulated cavity walls is an acceptable alternative to a base-of-wall cavity drainage product. Basis of Design Product: CavClear, CavClear Masonry Mat, a division of Archovations, Inc.
- G. Cavity Weeps and Vents: As a Basis of Design, provide one of the following products:
 - 1. Mortar Net Weep Vents, Mortar Net USA, Ltd.
 - 2. Mortar Trap, Hohmann & Barnard, Inc.
 - a. Free-draining mesh inserts made from polyester.
 - b. Height of weep shall match height of specified masonry veneer (up to 4-inches nominal). Use the 4-inch nominal height weep at 8-inches or higher masonry veneer units.
 - c. Color as selected by Architect from full range of standard and special colors, and to match the associated mortar color.
 - 3. Hohmann & Barnard, Inc., QV-Quadro-Vent.
 - a. Polypropylene tested in conformance with ASTM D2240, D790B, D638 and D1238B.
 - b. Honeycomb design.
 - c. Color as selected by Architect from full range of standard and special colors, and to match the associated mortar color.
 - d. Size according to associated masonry veneer units.

- H. Termination Bars: Stainless steel, Type 304, 1-1/2-inches x 8-foot-long x 26 ga. bar with Foam-Tite Seal and 3/8-inch caulking flange; bar punched to accept fasteners at 8-inches o.c.
1. Basis of Design Product: Hohmann & Barnard, Inc. T2 termination bar or equal product.
- I. Cavity Air Barrier (Installed over C.M.U. above exterior grade): Continuous, single component, asphalt free, fluid applied, vapor permeable self-sealing elastomeric air barrier membrane that permits moisture vapor to escape through the membrane while remaining resistant to water and air penetration per ASTM E2178, ASTM E96 and ASTM E2357. Apply over C.M.U. at 60 square foot (25-mils wet) per gallon. Air barrier must be compatible with contacted surfaces and materials including cavity insulation.
1. Basis of Design Product: Enviro-Barrier VP™, Sandell Moisture Protection Systems; Hohmann & Barnard, Inc. Subject to compliance with specified requirements, the following products are also acceptable.
 - a. Air Bloc 17MR, Henry, a Carlisle Company.
 - b. Perm-A-Barrier VPL, GCP Applied Technologies.
 - c. Fire Resist Barritech VP, Henry, a Carlisle Company.
- J. Vapor Retarder (Installed over C.M.U. below exterior grade, at interior floor slab elevation changes, and where noted or detailed): Continuous, fluid applied, asphalt based non-fibred emulsion-type damp proofing which permits moisture vapor to escape through the membrane while remaining resistant to water and air penetration per ASTM D1187, ASTM D1227, E2178, ASTM E96, and ASTM E2357. Damp proofing must be compatible with contacted surfaces and materials including cavity insulation.
1. Products: Type based on application method. Subject to compliance with specified requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Karnak, 100AF Non-filtered Emulsion Damp proofing, Karnak Corporation.
 - b. Sealmastic Emulsion, Non-fibred Emulsion Damp proofing, W.R. Meadows.
- K. Cavity Air Barrier (Installed over gypsum or plywood sheathing): Continuous, single component, asphalt free, fluid applied, vapor-permeable self-sealing elastomeric air barrier membrane that permits moisture vapor to escape through the membrane while remaining resistant to water and air penetration per ASTM E2178, ASTM E96 and ASTM E2357. Apply over exterior gypsum sheathing at 75 square foot (20-mils wet) per gallon. Must be compatible with contacted surfaces and materials including cavity insulation.
1. Basis of Design Product: Enviro-Barrier VP™, Sandell Moisture Protection Systems; Hohmann & Barnard, Inc. Subject to compliance with specified requirements, the following products are also acceptable.
 - a. Air Bloc 31MR, Henry Company.
 - b. Perm-A-Barrier VPL, GCP Applied Technologies.
 - c. Fire Resist Barritech VP, Carlisle Coatings & Waterproofing.

- L. Cavity Air Barrier Accessories (Installed with C.M.U. and gypsum sheathing): For use in detailing transitions between dissimilar materials, cracks and voids, window and door openings, etc.
1. Products: Basis of Design products by Hohmann & Barnard include the following:
 - a. Enviro-Barrier™ Mastic, gun grade mastic; Sandell Moisture Protection Systems by Hohmann & Barnard, Inc.
 - b. Stretch-X-Seal Membrane, a flexible self-sealing adhesive backed with release liner, transition membrane flashing and sill tape; Sandell Moisture Protection Systems, by Hohmann & Barnard, Inc.
 - c. Spray-Tape™, a water based single component self-sealing spray or brush-applied detail flashing for air barriers applied at 100 square feet (60-mils wet) per gallon, a minimum of 3-inches around the opening and a minimum of 3-inches into the opening; Sandell Moisture Protection Systems, by Hohmann & Barnard, Inc.
 2. Subject to compliance with specified requirements, equal products by the following manufacturers are also acceptable.
 - a. Accessories manufactured by Henry Company.
 - b. Accessories manufactured by GCP Applied Technologies.
 - c. Accessories manufactured by Carlisle Coatings & Waterproofing.
- M. Cavity Insulation (Installed over C.M.U.): Square edge extruded polystyrene insulation board, 16-inches x 96-inches, complying with ASTM C578, Type IV with a compressive strength of 25 psi. Install with manufacturer's standard board joint sealing system.
1. Products: Provide one of the following:
 - a. Foamular 250, Owens-Corning Co.
 - b. Styrofoam Cavitymate or Scoreboard, DuPont (formerly DOW Chemical Co.).
- N. Cavity Insulation (Installed over gypsum sheathing): Shiplap or tongue and groove edged extruded-polystyrene board, 48-inches x 96-inches, complying with ASTM C578, Type IV with a compressive strength 25 psi. Install with manufacturer's standard board joint sealing system.
1. Products: Provide one of the following:
 - a. Foamular 250, Owens-Corning Co.
 - b. Cavitymate SC, Dow Chemical Co.
- O. Insulation Inserts (Installed in cores of C.M.U. for single wythe masonry installations): Individually molded, expanded polystyrene inserts with a minimum density of 1.05 lbs./cf, a thermal resistance of 5.0 per inch of thickness at 75° F, and complying with ASTM C578 Standard Type X. Insert into each C.M.U. core.
1. ICON Universal Inserts, as produced by Concrete Block Insulating Systems, Inc./Korfil or equal product.

- P. Gypsum Sheathing: Unless specifically specified or required otherwise on the Structural drawings for structural reasons such as sheer properties, the below specified exterior gypsum sheathing for wall cavity assemblies takes precedence over any Divisions 6 or 9 specified products . Gypsum sheathing complying with ASTM C1177 and ASTM E84 with glass mats both sides and long edges, water-resistant treated core.

1. Dens-Glass Gold Sheathing, Georgia-Pacific.

2.14 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Follow brick manufacturer's recommendations for cleaning solution for each brick type.

1. Available Products: Subject to compliance with specified requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
 - a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar and Not Subject to Bleaching:
 - 1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 600 Detergent; PROSOCO, Inc.
 - b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
 - 1) 200 Lime Solv; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 101 Lime Solvent; PROSOCO., Inc.
 - c. Cleaners for Brick Subject to Metallic Staining:
 - 1) 202V Vana-Stop; Diedrich Technologies, Inc.
 - 2) Sure Klean Vana Trol; PROSOCO, Inc.

2.15 SOURCE QUALITY CONTROL

- A. Brick Tests: For each type and grade of brick indicated, meet the requirements in the "Face Brick" Paragraph of this Section. Units will be tested according to ASTM C67.
- B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, meet the requirements in the "Concrete Masonry Units" Paragraph of this Section. Units will be tested according to ASTM C140.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions with Installer present for compliance with all specified requirements for installation tolerances and other conditions affecting performance of the Work. Proceeding with installation of the Work of this Section acknowledges acceptance of conditions.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that all specified and detailed structural requirements that precede the work of this section are properly satisfied.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction of preceding work to verify compliance with Project requirements.
- C. Coordinate with the simultaneous work of others to assure all required built in piping, conduit and other items specified to be installed in a concealed manner are properly concealed.

3.2 INSTALLATION, GENERAL

- A. Unit Masonry Assemblies shall be installed in accordance with the Contract Documents, and the most recent technical standards published by the International Masonry Institute, the National Concrete Masonry Association, the Brick Industry Association and the product manufacturer's printed recommendations.
- B. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single wythe walls to the actual widths of masonry units, using units of widths indicated.
- C. Build chases and recesses into the Work to accommodate items specified in this Section and in other Sections of the Specifications.
- D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- E. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- G. Wetting of Clay Brick: Wet clay brick 3 to 24 hours before laying if the initial rate of absorption exceeds 20 g/30 sq. in. per minute when tested per ASTM C67. Allow units to absorb water so they are damp but not wet at the time of laying.

- H. **NO CONDUIT OR PIPING SHALL BE INSTALLED VERTICALLY OR HORIZONTALLY IN MASONRY CAVITIES.** Penetrations through the cavity are permitted for items such as wall hydrants, electrical fixtures and devices, etc. but they shall be horizontal, perpendicular through the cavity, and located directly at the intended item.
- I. In new construction, unless specifically specified otherwise or approved in writing in advance by Architect, NO exposed conduit will be acceptable in finished spaces.
- J. Install air barrier systems per manufacturer's printed instructions.
- K. Install insulation board systems per manufacturer's printed instructions.
- L. In lieu of field-formed flashing corners and end dams, preformed stainless steel corners and end dams may be used at Contractor's option. All products shall be compatible with the flashing system and shall be installed per the manufacturer's recommended printed instructions in addition to the sealing requirements described in the specification.
- M. Install single wythe masonry flashing per manufacturer's printed instructions.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances specified in ACI 530.1/ASCE 6/TMS 602 and the following:
 - 1. For conspicuous vertical lines such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4-inch in 20 feet, or 1/2-inch maximum.
 - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4-inch in 10 feet, or 1/2-inch maximum.
 - 3. For conspicuous horizontal lines such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4-inch in 20 feet, or 1/2-inch maximum.
 - 4. For exposed bed joints, do not vary from thickness indicated by more than 1/8-inch with a maximum thickness limited to 1/2-inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8-inch.
 - 5. For exposed head joints, do not vary from thickness indicated by more than 1/8-inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8-inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joints in each course centered on units in courses above and below.

- a. One-half running bond pattern applies to all standard and painted CMU, to decorative CMU installations, and to modular brick infills where matching adjacent existing patterns.
 - 2. One-third running bond with vertical joints in each third course aligning vertically.
 - a. One-third running bond pattern applies to all utility sized brick installations.
 - C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required and remove loose masonry units and mortar before laying fresh masonry.
 - E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
 - F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
 - G. Fill cores in hollow concrete masonry units with grout a minimum of 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated on the Structural drawings.
 - H. Entire courses and/or individual units of irregular surface faced masonry (i.e., split-face masonry units) shall be turned smooth side out in locations as directed by Architect during Preinstallation Conference.
 - I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof deck above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of deck above.
 - 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of deck above to comply with Division 7 Section "Through Penetration Firestop Systems."
- 3.5 MORTAR BEDDING AND JOINTING
- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and compress into place. Do not deeply furrow bed joints or slush head joints.
 - 1. At cavity walls, bevel beds away from cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
- C. Set stone trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone joint surface thoroughly before setting; for soiled stone surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- D. Site Wall Copings (including cast stone and concrete): Set copings on canted stainless-steel flashing (drip plate flashing) with continuous hemmed drip edge at all faces of wall (length and ends). Install drip plate flashing on sloped mortar bed. Seal laps between lengths of drip plate flashing with lap sealant overlapped a minimum of 4-inches. Secure copings to wall with a kerfed split tail anchor mechanically attached to top of wall. Set anchors on a membrane patch and fill anchor kerfs between coping pieces with sealant. Shim copings as required for level and alignment. Tool a 3/8-inch sealant joint between coping and the top of drip plate flashing below providing for weeps every 4-feet. Seal all skyward facing and vertical joints in coping material with joint sealant.
- E. Sill Units (including cast stone, concrete and masonry): Tool skyward facing and vertical joints to a point 3/8-inches below the top face of the sill material. Apply a continuous sealant bead in the tooled joints. Sealant to match mortar color. At brick sills, tool exposed joints to match adjacent joints. Tool joints between weeps.
- F. Unless otherwise indicated, tool exposed joints slightly concave when thumbprint hard using a jointer larger than the joint thickness.
- G. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with grout at exterior walls, except cavity walls, and solidly with mortar at interior walls and partitions.

3.6 BONDING OF MULTI-WYTHER MASONRY

- A. General: Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.
- B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints of back-up wall wythes flush where facing cavities.
- B. Installing Cavity-Wall Insulation: Apply rectangular grid adhesive on inside face of insulation boards. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Install boards with manufacturer approved sealant in all board joints. Press units firmly against inside wythe of masonry or other construction as shown.
 1. Seal all cracks and gaps, piping and conduit penetrations with manufacturer approved materials compatible with insulation and masonry.
 2. All insulation board joints and penetrations shall be sealed with manufacturer's approved joint sealant systems to meet the air barrier requirements of ASTM E2357 Assembly Test and the International Code Council (ICC-ES) Evaluation Report ESR-2142.
- C. Wall assembly for ASTM C578 polystyrene foam plastic insulation board shall meet the requirements of NFPA 285 Wall Assembly.

3.8 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8-inch on exterior side of walls and 1/2-inch elsewhere. Lap reinforcement a minimum of 6-inches.
 1. Space reinforcement not more than 16-inches o.c.
 2. Space reinforcement not more than 8-inches o.c. at foundation walls and parapet walls.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.
- D. At all flashing locations, reinforcement shall not interrupt the flashing.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members. Comply with the following:
 1. Anchor masonry to structural members with flexible channel slot anchors embedded in masonry joints and attached to the structure. Provide a 1-inch space in width between

masonry and structural member unless otherwise indicated. Keep open space free of mortar or other rigid materials.

2. Space anchors at location of slotted channel anchor assembly on the structural member.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated, or if not indicated, in accordance with acceptable best practice procedures. Build-in related items as masonry work progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as detailed on Drawings or by one of the following approved methods:
 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces. **Maximum distance between C.M.U. control joints shall not exceed 25 feet or distances as indicated on Structural drawings.**
 2. Install preformed control-joint gaskets designed to fit sash block.
 3. **Submit for approval a method as recommended by current technical standards published by Industry standards as noted in Section 3.2.A above.**
- C. Form building expansion joints in exterior masonry veneer as follows:
 1. Form open joint of width indicated; install compressible exterior expansion joint filler per manufacturers' recommendations. Keep joint free and clear of mortar. Install at locations indicated on Drawings.
- D. Build in pressure-relieving expansion joints where indicated; construct joints by installing compressible expansion material.

3.11 LINTELS

- A. Install lintels where indicated.
- B. Provide lintels at all masonry wall openings greater than 12 inches wide. Refer to Structural drawings and Lintel Schedule.
 1. Not all required lintels are shown on Drawings. Prior to submitting a Bid, Contractor shall be responsible to review the entire set of Contract Documents for required openings, i.e., for ductwork, louvers, etc. and shall refer to the requirements for opening widths found in the Lintel Schedule.

3.12 AIR BARRIER SYSTEM

- A. Composite Masonry Walls and Cavity Walls: Apply cavity air barrier system on the entire exterior face of the inner wythe of masonry (behind the insulation board) to form a monolithic

membrane on the cavity wall. Air barrier accessories and transition membranes shall be installed as detailed and/or required by system manufacturer over all dissimilar material transitions such as wood blocking, structural framing, cracks and voids, door and window openings and any other construction elements that will prevent a continuous monolithic membrane. Follow manufacturers recommended installation procedures. System shall meet the requirements of the International Energy Conservation Code (IECC) ASTM E2357 Air Assembly Test.

- B. Metal Stud Masonry Veneer Walls: Apply cavity air barrier system on the entire exterior face of the metal stud wall sheathing (behind the insulation board). Air-barrier accessories and transition membranes shall be installed as detailed and/or required by system manufacturer over all dissimilar material transitions such as wood blocking, structural framing, cracks and voids, door and window openings and any other construction elements that will prevent a continuous monolithic membrane. Follow manufacturers recommended installation procedures. System shall meet the requirements of the International Energy Conservation Code (IECC) ASTM E2357 Air Assembly Test.

3.13 FLASHING, WEEPS, AND VENTS

- A. General: In addition to base-of-wall flashing, install continuous thru-wall flashing and weeps in composite masonry walls at all shelf angles, lintels, sills, ledges, and other obstructions to downward flow of water in wall. All flashing applications shall be installed in accordance with details on Drawings and using all manufacturer's standard accessory products.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar. Seal overlaps and transitions in flashing with adhesive, sealant or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
 - 1a. Insulated Composite Masonry Wall Base Flashing Conditions: Adhere the specified stainless steel drip plate to the bedding joint of the veneer masonry with manufacturer's approved moisture cure sealant creating a 1/4-inch drip flange, as detailed. Seal all laps between lengths of drip plate with lap sealant overlapped a minimum of 4-inches. The drip flange of one of the overlapping pieces shall be cut back so that only the concealed portion of the drip plate overlaps. The drip flange portions of adjacent drip plates shall be neatly abutted to eliminate sharp edges. At outside corners, miter the drip flange portion of the drip plate to form a neatly abutted corner. Beginning at a point 1-inch in from the exterior face of the veneer masonry, adhere the specified laminated stainless-steel flashing to the top of the drip plate with manufacturer's approved non-asphaltic adhesive, mastic or bonding tape. All inside and outside corners shall be flashed with manufacturer's preformed stainless-steel corners. Seal all laps between lengths of the flashing material, and all transitions to the preformed corners with manufacturer's approved lap sealant, overlapped a minimum of 4-inches. Extend the flashing material back working from the drip plate back to the outer face of the inner wythe of masonry then fold and turn the flashing material up a minimum of 8-inches (behind the insulation and over the specified air barrier system) and secure it at 8-inches o.c. to the outer face

of the inner wythe of masonry with the specified stainless-steel termination bar. Install a continuous bead of elastomeric sealant in the angled sealant flange. Within the cavity, angle the flashing material downward toward the veneer masonry to provide for positive drainage to the weeps. Install transition membranes as required at all corners, obstructions, and other interferences in the cavity to assure a continuous and watertight flashing installation. Install all accessory components including, but not limited to, weeps, vents, cavity drainage material, etc. in accordance with details on Drawings and with subparagraph D below.

- 1b. Insulated Metal Stud with Masonry Veneer Base Flashing Conditions: Adhere the specified stainless steel drip plate to the bedding joint of the veneer masonry with manufacturer's approved moisture cure sealant creating a 1/4-inch drip flange, as detailed. Seal all laps between lengths of drip plate with lap sealant overlapped a minimum of 4-inches. The drip flange of one of the overlapping pieces shall be cut back so that only the concealed portion of the drip plate overlaps. The drip flange portions of adjacent drip plates shall be neatly abutted to eliminate sharp edges. At outside corners, miter the drip flange portion of the drip plate to form a neatly abutted corner. Beginning at a point 1-inch in from the exterior face of the veneer masonry, adhere the specified laminated stainless-steel flashing to the top of the drip plate with manufacturer's approved non-asphaltic adhesive, mastic or bonding tape. All inside and outside corners shall be flashed with manufacturer's preformed stainless-steel corners. Seal all laps between lengths of the flashing material, and all transitions to the preformed corners with manufacturer's approved lap sealant, overlapped a minimum of 4-inches. Extend the flashing material back working from the drip plate back to the face of the wall sheathing. Fold and turn the flashing up a minimum of 8-inches (behind the insulation and over the specified air barrier system) and secure it to the metal wall framing at each stud with the specified stainless-steel termination bar. Install a continuous bead of elastomeric sealant in the angled sealant flange. Within the cavity, angle the flashing material downward toward the veneer masonry to provide for positive drainage to the weeps. Install transition membranes as required at all corners, obstructions, and other interferences in the cavity to assure a continuous and watertight flashing installation. Install all accessory components including, but not limited to, weeps, vents, cavity drainage material, etc. in accordance with details on Drawings and with subparagraph D below.
- 1c. Masonry Relieving Angles in Insulated Composite Walls: Follow the installation methods prescribed above for either insulated composite masonry walls (method 1a) or insulated metal stud walls with masonry veneer (method 1b) but in addition, at masonry relieving angles, install backer rod and sealant under the metal drip plate drip flange.
- 1d. Masonry Opening Sill Flashing Conditions: Adhere the specified stainless steel drip plate to the bedding joint of the veneer masonry located directly below the exterior sill with manufacturer's approved moisture cure sealant creating a 1/4-inch drip flange, as detailed. Seal all laps between lengths of drip plate (if any) with lap sealant overlapped a minimum of 4-inches. The drip flange of one of the overlapping pieces shall be cut back so that only the concealed portion of the drip plate overlaps. The drip flange portions of adjacent drip plates shall be neatly abutted to eliminate sharp edges. Beginning at a point 1-inch in from the exterior face of the veneer masonry, adhere the specified laminated stainless-steel flashing to the top of the drip plate with manufacturer's approved non-asphaltic adhesive, mastic or bonding tape. Seal all laps between lengths of the flashing material (if any) with manufacturer's approved lap sealant, overlapped a minimum of 4-

inches. Extend the flashing material working back from the drip plate and turn it up vertically behind the sill, then continue it horizontally below the window frame sill to a point 1-inch from the inside face of the window frame. Extend the flashing material at the sill ends and turn the ends up not less than 2-inches to form a pan. Install the specified air barrier behind the flashing. Provide positive drainage to weeps where the bottom of the flashing turns out to the veneer masonry. At precast concrete or stone sills, install the specified weeps horizontally laid flat on top of the flashing material at 16-inches o.c. At brick sills, install sill weeps vertically at 16-inches o.c. Equally space the weeps along the length of the sill and tool the joints. At sill blocking, provide Hohmann & Barnard, Inc. #345 SV and at jamb blocking provide Hohmann & Barnard, Inc. #345-BT veneer anchors as specified and as detailed on Drawings. Space and secure anchors horizontally and vertically at 16-inches o.c. Install transition membranes as required at all jambs and sills and at any obstructions and other interferences in the cavity to assure a continuous and watertight flashing installation.

2. Lintels and Shelf Angles in Insulated Composite Walls: Adhere the specified stainless steel drip plate to the top of the lintel plate of the veneer masonry with manufacturer's approved moisture cure sealant creating a 1/4-inch drip flange, as detailed. Seal all laps between lengths of drip plate (if any) with lap sealant overlapped a minimum of 4-inches. The drip flange of one of the overlapping pieces shall be cut back so that only the concealed portion of the drip plate overlaps. The drip flange portions of adjacent drip plates shall be neatly abutted to eliminate sharp edges. At outside corners, miter the drip flange portion of the drip plate to form a neatly abutted corner. Beginning at a point 1-inch in from the exterior face of the veneer masonry, adhere the specified laminated stainless-steel flashing to the top of the drip plate with manufacturer's approved non-asphaltic adhesive, mastic or bonding tape. All inside and outside corners shall be flashed with manufacturer's preformed stainless-steel corners. Seal all laps between lengths of the flashing material (if any), and all transitions to the preformed corners (if any) with manufacturer's approved lap sealant, overlapped a minimum of 4-inches. Extend the flashing material back working from the drip plate back to the outer face of the inner wythe of masonry then fold and turn the flashing material up a minimum of 8-inches (behind the insulation and over the specified air barrier system) and secure it at 8-inches o.c. to the outer face of the inner wythe of masonry with the specified stainless-steel termination bar. Install a continuous bead of elastomeric sealant in the angled sealant flange. Extend the flashing a minimum of 4-inches into the masonry at each end or to cover the full length of the lintel, whichever is greater. At heads and sills, extend the flashing at the ends and turn the flashing up not less than 2-inches to form a pan. Seal all laps between lengths of the membrane flashing with manufacturer's approved lap sealant overlapped a minimum of 4-inches. Within the cavity, provide positive drainage to the weeps. where the bottom of the flashing turns out to the outer wythe of the masonry. Install backer rod and sealant under the metal drip plate. Install transition membranes as required at all corners, obstructions, and other interferences in the cavity to assure a continuous and watertight flashing installation. Install all accessory components including, but not limited to, weeps, vents, cavity drainage material, etc. in accordance with details on Drawings and with subparagraph D below.
- 3a. Low Roof to High Wall Conditions at Insulated Composite Masonry Walls: Adhere a two-piece interlocking type, 26-gauge stainless-steel sheet flashing to the bedding joint of the veneer masonry with manufacturer's approved moisture cure sealant, as detailed. Extend

the embedded sheet metal flashing back to the outer face of the inner wythe of masonry and turn it up a minimum of 2-inches to form a pan (behind the insulation). Seal all laps between lengths of sheet flashing with lap sealant overlapped a minimum of 6-inches. The extended portion of one of the overlapping pieces of sheet flashing shall be cut back so that only the concealed portion of the flashing overlaps. The extended portions of adjacent sheet flashings shall be neatly abutted to eliminate sharp edges. Beginning at a point 1-inch in from the exterior face of the veneer masonry, adhere the specified laminated stainless-steel flashing to the top of the embedded flashing with manufacturer's approved non-asphaltic adhesive, mastic or bonding tape. All inside and outside corners shall be flashed with manufacturer's preformed stainless-steel corners. Seal all laps between lengths of the flashing material, and all transitions to the preformed corners with manufacturer's approved lap sealant, overlapped a minimum of 4-inches. Extend the flashing material back working from the veneer masonry back to the outer face of the inner wythe of masonry then fold and turn the flashing material up a minimum of 8-inches (behind the insulation and over the specified air barrier system) and secure it at 8-inches o.c. to the outer face of the inner wythe of masonry with the specified stainless-steel termination bar. Install a continuous bead of elastomeric sealant in the angled sealant flange. Within the cavity, angle the flashing material downward toward the veneer masonry to provide for positive drainage to the weeps. Install transition membranes as required at all corners, obstructions, and other interferences in the cavity to assure a continuous and watertight flashing installation. Install all accessory components including, but not limited to, weeps, vents, cavity drainage material, etc. in accordance with details on Drawings and with subparagraph D below. Install the interlocking piece of flashing over the roof termination as detailed on Drawings. The seams of the interlocking flashing and the embedded portion of the two-piece sheet metal flashing shall be offset a minimum of 18-inches.

- 3b. Low Roof to High Wall Conditions at Insulated Metal Stud/Masonry Veneer Walls: Adhere a two-piece interlocking type, 26-gauge stainless-steel sheet flashing to the bedding joint of the veneer masonry with manufacturer's approved moisture cure sealant, as detailed. Extend the embedded sheet metal flashing back to the outside face of the cavity sheathing and turn it up a minimum of 2-inches to form a pan (behind the insulation). Seal all laps between lengths of sheet flashing with lap sealant overlapped a minimum of 6-inches. The extended portion of one of the overlapping pieces of sheet flashing shall be cut back so that only the concealed portion of the flashing overlaps. The extended portions of adjacent sheet flashings shall be neatly abutted to eliminate sharp edges. Beginning at a point 1-inch in from the exterior face of the veneer masonry, adhere the specified laminated stainless-steel flashing to the top of the embedded flashing with manufacturer's approved non-asphaltic adhesive, mastic or bonding tape. All inside and outside corners shall be flashed with manufacturer's preformed stainless-steel corners. Seal all laps between lengths of the flashing material, and all transitions to the preformed corners with manufacturer's approved lap sealant, overlapped a minimum of 4-inches. Extend the flashing material back working from the veneer masonry back to the outside face of the cavity sheathing then fold and turn the flashing material up a minimum of 8-inches (behind the insulation and over the specified air barrier system) and secure it to the metal wall framing at each stud with the specified stainless-steel termination bar. Install a continuous bead of elastomeric sealant in the angled sealant flange. Within the cavity, angle the flashing material downward toward the veneer masonry to provide for

positive drainage to the weeps. Install transition membranes as required at all corners, obstructions, and other interferences in the cavity to assure a continuous and watertight flashing installation. Install all accessory components including, but not limited to, weeps, vents, cavity drainage material, etc. in accordance with details on Drawings and with subparagraph D below. Install the interlocking piece of flashing over the roof termination as detailed on Drawings. The seams of the interlocking flashing and the embedded portion of the two-piece sheet metal flashing shall be offset a minimum of 18-inches.

- D. Install cavity weeps, cavity vents, sill sweeps and cavity drainage material in the head joints in exterior wythes of masonry as indicated on Drawings and as follows:
 - 1. Space cavity weeps at 24-inches o.c. for both modular and utility sized brick veneer units and at 32-inches o.c. for decorative concrete masonry veneer units.
 - 2. Space cavity vents at minimum 48-inches o.c.
 - 3. Install weep material horizontally on top of flashing at all sills.
 - 4. Place continuous cavity drainage material immediately above flashing in cavities.
 - 5. Test weep with water poured into cavity to insure draining water freely comes out of each weep hole.
- E. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.14 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 - 1. Construct formwork to conform to shape, line, and dimensions shown. Make the formwork sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 - 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.15 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform all required field quality-control testing services, including IBC Special Inspections.

1. Contractor shall coordinate with and provide all support services required by Owner's testing agency including, but not limited to, collecting mortar and grout samples, providing samples of other materials for testing, and providing access to the Work.

3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.17 MASONRY WASTE DISPOSAL

- A. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cast-stone trim.
- B. Related Sections:
 - 1. Section 042000 "Unit Masonry".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
 - 1. Include building elevations showing layout of units and locations of joints and anchors.
- C. Samples for Initial Selection:
 - 1. For color and texture of cast stone.
 - 2. For Mortar
- D. Samples for Verification:
 - 1. For each color and texture of cast stone required, 10 inches square in size.
 - 2. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
 - 1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.
 - 1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute, the Architectural Precast Association, or the Precast/Prestressed Concrete Institute for Group A, Category AT.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
 - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
 - 2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.
- E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
 - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.

2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
 3. Air-Entraining Admixture: ASTM C 260/C 260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
 6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast-stone material.
1. Epoxy Coating: ASTM A 775/A 775M.
 2. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

2.3 CAST-STONE UNITS

- A. Cast-Stone Units: Comply with ASTM C 1364.
1. Units shall be manufactured using the vibrant dry tamp or wet-cast method.
 2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 3. Provide drips on projecting elements unless otherwise indicated.
- C. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.
- D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
 2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five days at mean daily temperature of 70 deg F or above.
 - b. No fewer than six days at mean daily temperature of 60 deg F or above.
 - c. No fewer than seven days at mean daily temperature of 50 deg F or above.
 - d. No fewer than eight days at mean daily temperature of 45 deg F or above.
- E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- F. Color: Dark Grey to match Face Brick color 'B'
- G. Textures: As selected by Architect from manufacturer's full range.

2.4 MORTAR MATERIALS

- A. Provide mortar materials that comply with Section 042000 "Unit Masonry."
1. Color: Match cast stone color.

2.5 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.6 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- D. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Build anchors and ties into mortar joints as units are set.
 - 2. Fill dowel holes and anchor slots with mortar.
 - 3. Fill collar joints solid as units are set.
 - 4. Build concealed flashing into mortar joints as units are set.
 - 5. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 - 6. Keep joints at shelf angles open to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- H. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.
- I. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."
 - 1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- J. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
4. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 1. Remove mortar fins and smears before tooling joints.
 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.
- 2. Shrinkage-resistant grout.

- B. Related Requirements:

- 1. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
- 2. Section 055000 "Metal Fabrications" for [steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.
- 3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting"

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand-critical welds.
- D. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the appropriate state.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural-steel materials, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Nonshrink grout.
 - 6. Structural steel including chemical and physical properties.

- F. Source quality-control reports.
- G. Field quality-control reports and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant OR has 5 or more years of experience in similar sized projects.
- B. Installer Qualifications: A qualified installer that participates in the AISC Quality Program OR has 5 or more years of experience in similar sized projects.
- C. Shop-Painting Applicators: Qualified in accordance with AISC's Sophisticated Paint or to SSPC-QP 3.
- D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store materials out of direct sunlight or insulate to ensure that beams and other members do not expand in the heat prior to be welded to bearing walls. Expanded beams that contract after installation can cause damage to the masonry walls local to the bearing plates. Such damage will require repair at no additional cost to the owner.
- C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
 - 2. ANSI/AISC 341.
 - 3. ANSI/AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - 1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use Allowable Stress Design; data are given at service-load level.
- C. Moment Connections Type FR, fully restrained.
- D. Construction: Combined system of moment frame and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M].
- B. Channels, Angles: ASTM A36/A36M..
- C. Plate and Bar: ASTM A36/A36M or ASTM A572/A572M, Grade 50 (345) as required for connection design.
- D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A563M, Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1 (Type 8.8-1), compressible-washer type with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round head assemblies, consisting of steel structural bolts with splined

ends; ASTM A563, Grade DH (ASTM A563M, Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain.

- C. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36

1. Configuration: Straight.
2. Nuts: ASTM A563 (ASTM A563M) heavy hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436 (ASTM F436M), Type 1, hardened carbon steel.
5. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M, Class C for exterior exposed columns.

- B. Threaded Rods: ASTM A36/A36M

1. Nuts: ASTM A 63 (ASTM A563M) hex carbon steel.
2. Washers: ASTM F436 (ASTM F436M), Type 1, hardened
3. Finish: Plain

2.5 PRIMER

- A. Steel Primer:

1. Comply with [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

- B. Galvanized-Steel Primer: MPI#26

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: ASTM A780/A780M.

2.6 SHRINKAGE-RESISTANT GROUT

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

2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with **SSPC-SP 2**.
- F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened

- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.
 - 2. All visually exposed HSS beam to HSS column connections shall be welded all around and ground smooth.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.
 - 3. Galvanize all exterior columns including all base connection material and anchor rods.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces unless indicated to be painted.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 - 2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94/E94M.
4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.
 1. Do not remove temporary shoring supporting structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. **Snug-tighten** anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Snug tightened or Pretensioned
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated or exposed to view, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.

3.6 PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting."

- D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. Joist accessories.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
 - 3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists requiring modification by manufacturer to support non-uniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- F. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications." and "Standard Specification for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications." and "Standard Specification for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Camber joists according to SJI's "Specifications."
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.3 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Section 099123 "Interior Painting." where exposed to view.

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications. Furnish additional erection or uplift bridging if required for stability.
- C. Fabricate steel bearing plates from ASTM A36/A36M steel with integral anchorages of sizes and thicknesses indicated.
- D. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.
 - 1. Finish: Plain, uncoated.
- E. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Plain.
- F. Welding Electrodes: Comply with AWS standards.
- G. Galvanizing Repair Paint: ASTM A780/A780M.
- H. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.
- D. Shop priming of joists and joist accessories is specified in and Section 099123 "Interior Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications joist manufacturer's written instructions, and requirements in this Section."
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied. See drawings for joists to be used in moment frames.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework only as required using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709.
 - c. Ultrasonic Testing: ASTM E164.
 - d. Radiographic Testing: ASTM E94.
- C. Visually inspect bolted connections.
- D. Prepare test and inspection reports.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, abutting structural steel and accessories.
 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Composite floor deck.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Section 035216 "Lightweight Insulating Concrete" for lightweight insulating concrete fill over steel deck.
 - 3. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 4. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 5. Section 099113 "Exterior Painting" for repair painting of primed deck and finish painting of deck.
 - 6. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- D. Evaluation Reports: For steel deck, from ICC-ES.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.
- D. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180)] zinc coating.

2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

a. Color: Manufacturer's standard Gray

3. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A792/A792M, Structural Steel (SS), Grade 33 (230) minimum, AZ50 (AZ150) aluminum-zinc-alloy coating.

4. Deck Profile: As indicated Retain one option in "Profile Depth" Subparagraph below or revise to suit Project. Indicate locations on Drawings if various depths are required. FM Global approval, if required, is limited to roof deck 1-1/2 inches (38 mm) deep.

5. Profile Depth: As indicated

6. Design Uncoated-Steel Thickness: As indicated

7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated

8. Span Condition: As indicated

9. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade ~~5033~~ (350230) minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray baked-on, rust-inhibitive primer.

2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade ~~5033~~ (350230), G60 (Z180) zinc coating.

3. Profile Depth: As indicated.

4. Design Uncoated-Steel Thickness: As indicated.

5. Span Condition: As indicated

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile [indicated] [recommended by SDI Publication No. 31 for overhang and slab depth].
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: ASTM A780/A780M.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck with Architect's approval. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 1. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.
 1. Install reinforcing channels or zees in ribs to span between supports and weld.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- G. Sound-Absorbing Insulation: Installation into topside ribs of deck per manufacturer's recommendations.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 1. Weld Diameter: As Indicated.
 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
 3. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
1. End Joints: Lapped or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.
- F. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on **both surfaces** of prime-painted deck immediately after installation, and apply repair paint.
1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Soffit framing.
 - 3. **Roof trusses (ADDENDUM 5)**
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
 - 2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing to comply with the design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the appropriate state.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs tracks and truss chord members.
- D. Product Test Reports: For each listed product, for tests performed by **manufacturer and witnessed by a qualified testing agency a qualified testing agency**.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, **or in-house testing with calibrated test equipment**, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. 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."
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ClarkDietrich Building Systems
 - 2. Marino\WARE
 - 3. Nuconsteel, A Nucor Company

4. Steel Network, Inc. (The)
5. Steel Structural Systems
6. United Steel Deck, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 1. Design Loads: **As indicated on Drawings or as calculated per code.**
 2. Deflection Limits: Design framing systems to withstand **design loads** without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of **1/360 typical of the wall height and 1/600** of the wall height where supporting adhered veneer.
 - b. Interior Non-Load-Bearing Framing: Horizontal deflection of **1/240** of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
 - c. Roof Truss Framing: Vertical deflection of **1/360** for live loads and 1/240 for total loads of the span.
 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of **1 inch (25 mm) unless noted otherwise on structural drawings.**
 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. **Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S202, and the following: (ADDENDUM 5)**
 1. Floor and Roof Systems: ~~AISI S210~~ **AISI 240. (ADDENDUM 5)**
 2. Wall Studs: ~~AISI S211~~. **AISI 240. (ADDENDUM 5)**
 3. Headers: ~~AISI S212~~. **AISI 240. (ADDENDUM 5)**
 4. **Nonstructural Members: S220 (ADDENDUM 5)**
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 1. Grade: **As required by structural performance.**
 2. Coating: **G60 (Z180).**
- B. Steel Sheet for **Vertical Deflection** and Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: **As required by structural performance.**
 2. Coating: **G90 (Z275).**

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. 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: **0.0538 inch (1.37 mm).**
 2. Flange Width: **1-3/8 inches (35 mm) minimum.**
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: **0.0538 inch (1.37 mm).**
 2. Flange Width: **1-1/4 inches (32 mm).**
- C. Vertical Deflection Clips: Manufacturer's standard [bypass] [head] clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 1. Minimum Base-Metal Thickness: **0.0538 inch (1.37 mm).**
 2. Flange Width: Minimum of 2½" inch or **1 inch (25 mm) plus the design deflection given on the drawings.**
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness **0.0538 inch (1.37 mm)**.
 - b. Flange Width: Minimum of 2½" inch or **1 inch (25 mm) plus the design deflection given on the drawings.**
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: **0.0538 inch (1.37 mm)**.
 - b. Flange Width: dimension **equal to sum of outer deflection track flange width plus 1 inch,** minimum.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- G. Vertical Deflection Clips: Manufacturer's standard **bypass** clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

2.5 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: **0.0428 inch (1.09 mm)**.
 2. Flange Width: **1-5/8 inches (41 mm)**, minimum.

2.6 ROOF TRUSS FRAMING (ADDENDUM 5)

- A. Chords: Manufacturer's standard symmetrical steel sections in profile and loading orientation, of web depths indicated, punched, and as follows:
1. Minimum Base-Metal Thickness: **As required by design.**
 2. Flange Width: **As required by design.**
 3. Profile Depth: **4 Inches.**
- B. Webs: Manufacturer's standard symmetrical steel sections in profile and loading orientation, of web depths indicated, punched, and as follows:
1. Minimum Base-Metal Thickness: **As required by design.**
 2. Flange Width: **As required by design.**
 3. Profiles Depth: **As required by design.**

2.7 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Gusset plates.
 - 7. Stud kickers and knee braces.
 - 8. Hole-reinforcing plates.
 - 9. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, and as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: **Torque-controlled expansion anchor or adhesive anchor.**
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: **SSPC-Paint 20**.
- B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to **top and** bottom track unless otherwise indicated or at a defelection track that should not be fasted to top track. Space studs as follows:
 - 1. Stud Spacing: **[16 inches (406 mm)]** maximum.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg defelection tracks and anchor to building structure.
 - 2. Install double deep-leg defelection tracks and anchor outer track to building structure.
 - 3. Connect vertical defelection clips to **bypassing** studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated **on Shop Drawings** but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within **12 inches (305 mm)** of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 1. Install solid blocking at **96-inch (2440-mm) centers**.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ROOF TRUSS INSTALLATION (ADDENDUM 5)

- A. Install trusses in accordance with Structural Component Manufacturer's guidelines and Truss Manufacturer's Truss Design Drawings and Truss Placement Diagram. Use correct fasteners as previously described.
- B. Place trusses at spacings indicated on the Truss Design Drawings.
- C. Install all erection (temporary installation) bracing and permanent bracing and bridging before application of any loads; follow recommendations of the CFSBCSI - Cold-Formed Steel Building Components Safety Information.
- D. Provide bracing that holds trusses straight and plumb and in safe condition until decking and permanent truss bracing has been fastened to form a structurally sound framing system.
- E. All sub-contractors shall employ proper construction procedures to insure adequate distribution of temporary construction loads so that the carrying capacity of any single truss or group of trusses is not exceeded.
- F. Install permanent bracing and bridging as developed in accordance with ANSI/AISI/S202-15 Section I1.6 and in the locations shown on the Truss Manufacturer's Truss Design Drawings.
- G. Removal, cutting, or alteration of any truss chord, web or bracing member in the field is prohibited, unless approved in advance in writing by the Architect/Building Designer and the Truss Design Engineer.
- H. Repair or replace damaged chords, webs, and complete trusses as directed and approved in writing in advance by the Architect/Structural Engineer, Delegated Designer and the Structural Component Manufacturer.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes, but is not limited to the following items. Contractor shall thoroughly review and use both the Architectural and Structural drawings for details requiring miscellaneous metal fabrications that may be detailed throughout.
 - 1. Loose bearing plates.
 - 2. Loose steel lintels.
 - 3. Steel angle framing for support of mechanical rooftop equipment.
 - 4. Steel angle framing for support of roof openings at mechanical penetrations and roof hatches.
 - 5. Miscellaneous steel angles and clip angles for support of lite-gauge metal framing.
 - 6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 7. Steel and other metal shapes, plates and bars for applications not specifically noted herein.
 - 8. Metal fabrications detailed in the drawings and not specifically noted herein.
 - 9. Shelf angles.
 - 10. Metal ladders.
 - 11. Metal bollards
 - 12. Abrasive metal nosings
 - 13. Fasteners
 - 14. Miscellaneous materials
 - 15. Metal ships ladder (ADDENDUM 5)**
- B. Products furnished, but not installed under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

2. Division 4 Section "Unit Masonry (Assemblies)" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 5 Section "Structural Steel Framing."
4. Division 9 Section "Painting" for primers and paint products.
5. Division 9 Section "High Performance Coatings" for primers.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 SUBMITTALS

- A. Product Data: For the following:
 1. Abrasive metal nosings.
 2. Paint products. Also provide a copy to painter who will be applying paint topcoat.
 3. Non-slip aggregates and non-slip aggregate surface finishes.
 4. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 1. Provide setting diagrams or templates for anchors and bolts which are to be embedded in concrete or masonry.
- C. Samples for Verification: For each type and finish of abrasive metal nosing.
- D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For professional engineer.
- F. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- G. Welding certificates: Copies of certificates for field welding personnel must be available at Project site for review by Architect.
- H. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- I. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding Qualifications: Qualify procedures and personnel according to the following. Certify that welder has satisfactorily passed AWS qualification tests for welding processes involved.
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. AWS D1.2, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.7 DELIVERY AND COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Deliver fabrications to the Project site and store to avoid damage.
- C. Identify pieces with suitable mark for easy location.
- D. Deliver products in their original wrappings or carton clearly marked for identification and bearing manufacturer's name, and model or part number, if applicable. Store to avoid damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 1 Section "Quality Requirements," to design ladders and custom banner posts.
- B. Structural Performance of Ladders: Ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36, except all wide flange shapes shall conform to ASTM A992/A572, Grade 50.
- C. Steel Plates to be Bent or Cold Formed: ASTM A203.
- D. Cold-finished Steel Bars: ASTM A108.
- E. Checkered Plate: ASTM A786, rolled from plate complying with ASTM A500, or hot-rolled ASTM A283, Grade C or D.
- F. Steel Tubing: Cold-form steel tubing complying with ASTM A500, or hot-rolled ASTM A501.
- G. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads; welded or seamless; uncoated or hot-dipped galvanized as indicated on Contract Drawings.
- H. Stainless-Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type304.
- I. Stainless-Steel Bars and Shapes: ASTM A276, Type304.
- J. Cast Iron: Either gray iron, ASTM A48 or malleable iron, ASTM A47, unless otherwise indicated.
- K. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

- M. Aluminum Castings: ASTM B26, Alloy 443.0-F.

2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D1187.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Metal: Factory-formulated galvanized metal primer for exterior application.
1. ICI Dulux Paints; 4160-XXXX Devguard Multi-purpose Tank and Structural Primer.
 2. Kelly-Moore: 1722 Kel-Guard Acrylic Galvanized Iron Primer.
 3. MAB Paints: Rust-O-Lastic Hydro-Prime II Acrylic (DTM) Maintenance Primer 073-189.
 4. Pittsburgh Paints: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
 5. Sherwin Williams: Galvite HS Paint B50WZ3.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3; with hex nuts, ASTM A563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Machine Screws: ASME B18.6.3.
- G. Lag Bolts: ASME B18.2.1.
- H. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- I. Plain Washers: Round, carbon steel, ASME B18.22.1.
- J. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
- K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
- L. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
- M. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Concrete: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Furnish inserts for units installed after concrete is placed.

- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with primer specified in Division 9 Sections "Painting" and "High-Performance Coatings" where indicated.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, when members will be embedded in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with primer specified in Division 9 Section "Painting".

2.9 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3, except for elevator pit ladders.
 - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders: Engage a qualified professional engineer to design metal ladders, including connections to structure. Include effects of thermal movements.
 - 1. Space siderails 18 inches apart unless otherwise indicated.
 - 2. Siderails: Continuous, 3/8-by-3-inch steel flat bars, with eased edges.
 - 3. Rungs: 1-inch diameter steel bars.
 - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 - 6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
 - 7. Galvanize and prime exterior ladders, including brackets.

2.10 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe 1/4-inch wall-thickness round steel tubing. Galvanize exterior bollards.
 - 1. Provide bollards as detailed on Drawings.

2. Bollards shall be concrete filled with mounted tops.

B. Prime bollards with primer specified in Division 9 Section "Painting".

2.11 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Nosings: Cross-hatched units, 4 inches wide with 1/4-inch lip, for casting into concrete.

B. Manufacturers: Subject to requirements, provide one of the following:

1. American Safety Tread
2. Balco, Inc.
3. Barry Pattern & Foundry
4. Safe-T-Metal Company

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Apply bituminous paint to concealed surfaces of cast-metal units.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with primer specified in Division 9 Section "Painting".

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Division 9 Section "Painting".

2.14 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die

2.16 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standards listed below:
 - 1. ASTM A123 for galvanizing steel and iron products.
 - 2. ASTM A153 for galvanizing steel and iron hardware.
 - 3. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Division 9 Sections "Painting" and "High-Performance Coatings".
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Division 9 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.17 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

2.18 METAL SHIPS LADDERS AND PIPE CROSSOVERS (ADDENDUM 5)

- A. **Verify that use of ships' ladders is acceptable to authorities having jurisdiction before retaining this article. ANSI/ASC A14.3 and OSHA regulations discourage use of ships' ladders 60 degrees or steeper. See the Evaluations.**
 - 1. **Provide metal ships' ladder and pip crossovers where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.**
 - 2. **Threads are not to be less than 5 inches exclusive of nosing or less than 8.5 inches including the nosing and riser height is not to be more than 9.5 inches.**
 - 3. **Fabricate ships' ladders and pipe crossovers, including railings from stainless steel.**
 - 4. **Fabricate treads and platforms from welded or pressure-locked stainless steel bar grating.**
 - 5. **Limit openings in gratings to no more than 1/2 inch in least dimension.**
 - 6. **Fabricate treads and platforms from abrasive-surface floor plate.**
 - 7. **Comply with applicable railing requirements in Section 055213 "Pipe and Tube Railings.**

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to, and rigidly brace from, building structure.

3.3 INSTALLING METAL BOLLARD

- A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- B. Anchor internal sleeves for removable bollards in concrete by inserting in pipe sleeves preset into concrete. Fill annular space around internal sleeves solidly with non-shrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward internal sleeve.
- C. Place removable bollards over internal sleeves and secure with 3/4-inch machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.
- D. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 1. Do not fill removable bollards with concrete.

3.4 INSTALLING NOSINGS

- A. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

3.5 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting".
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055000

SECTION 055100 - METAL STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes preassembled steel stairs with concrete-filled and precast material treads.
- B. Related Sections:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 2. Division 5 Section "Metal Fabrications" for metal nosings installed at locations other than in metal stairs and alternating tread devices.
 - 3. Division 5 Section "Pipe and Tube Railings" for pipe and tube railings, including those that are attached to metal stairs and to walls adjacent to metal stairs, as well as other items and conditions.
 - 4. Division 9 Section "Portland Cement Terrazzo Flooring" for terrazzo treads and landings.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/sq. ft.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to $L/360$ or $1/4$ inch, whichever is less.
- C. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor is 1.5.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:

1. Nonslip aggregates and nonslip-aggregate finishes.
2. Paint products.
3. Grout.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer who is legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal stairs and railing systems similar to this Project in material, design, and extent and that have a record of successful in-service performance.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing steel stairs similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.
- B. Installer Qualifications: Fabricator of products.
- C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for classes of stairs designated, unless more stringent requirements are indicated.
 1. Preassembled Stairs: Commercial class.
 2. Industrial-Type Stairs: Industrial class.
 3. Ornamental Stairs: Architectural class.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts, if indicated or required, with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Steel Tubing: ASTM A 500 (cold-formed) or ASTM A 513.
- D. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
- G. Galvanized-Steel Sheet: ASTM A 653, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.
- H. Steel Bars and Wire Rods for Grating Treads and Crossbars: As indicated in Division 5 Section "Metal Fabrications."

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be galvanized.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Screws: ASME B18.2.1.
- F. Plain Washers: Round, ASME B18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Primers: Provide primers that comply with Division 9 Sections for Painting and High-Performance Coatings.
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3,000 psi unless otherwise indicated.
- J. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
 - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

- G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

- A. Manufacturing: Steel-framed stairs may be produced by local or regional entity who specializes in structural steel or metal fabrications and who meets the quality assurance criteria indicated in this Section, or by a nationally-recognized manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alfab, Inc.
 - b. American Stair, Inc.
 - c. Sharon Companies Ltd. (The).
- B. Stair Framing:
 - 1. Fabricate stringers of steel channels or tubes, as indicated.
 - a. Provide closures for exposed ends of stringers.
 - 2. Construct platforms of steel channel or tube headers as indicated and miscellaneous framing members as needed to comply with performance requirements or as indicated.
 - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 - 4. If stairs are enclosed by gypsum board or shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
 - 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
 - a. Where gaps between stringers and masonry walls exceed 1/4 inch, provide minimum 1/8-inch-thick steel plate to conceal entire top edge of stringer, from end of radius to within 1/8 inch of wall, scribed to wall as necessary.
- C. Metal-Pan Stairs: Form risers, subreads pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
 - 1. Steel Sheet: Uncoated cold- or hot-rolled steel sheet, unless otherwise indicated. Provide perforated steel sheet where perforated risers are indicated on drawings.
 - 2. Directly weld metal pans to stringers; locate welds on top of subreads where they will be concealed by concrete fill. Do not weld risers to stringers.
 - 3. Attach risers and subreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting. Provide perforated steel risers where indicated on drawings.
 - 4. Shape metal pans to include nosing integral with riser.
 - 5. Attach abrasive nosings to risers, if indicated.

6. At Contractor's option, provide stair assemblies with metal-pan subreads filled with reinforced concrete during fabrication.
 7. Provide subplatforms of configuration indicated or, if not indicated, the same as subreads. Weld subplatforms to platform framing.
- D. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.097 inch.
1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
 2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
 3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
 4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.
- E. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from rolled-steel floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch. Surface shall be compatible to accommodate precast finish assemblies as indicated.
1. Form treads in profiles indicated, with back edge stiffener. Form risers from steel sheet not less than 0.097 inch thick, welded to tread nosings and stiffeners and to platforms.
 2. Where unexposed, weld steel supporting brackets to stringers and weld treads to brackets.
 3. Fabricate platforms in profiles indicated and weld to platform framing.
- F. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from steel grating with indicated in Division 5 Section "Metal Fabrications."
 2. Surface: Plain, unless otherwise indicated.
 3. Finish: Galvanized.
 4. Fabricate grating treads with rolled-steel floor plate nosing, unless abrasive nosing is indicated, and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
 5. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Weld grating to platform framing.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Or SSPC-SP 3, "Power Tool Cleaning," as applicable.
- E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete."
1. Where indicated for cast-in-place concrete steps, install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.
- H. Install precast treads with adhesive or mortar supplied by manufacturer.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonmetallic, nonshrink grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Painting and High-Performance Coatings Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055100

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Architectural grade, shop finished aluminum pipe railings
- B. Related Sections include the following:
 - 1. Division 9 Section "High Performance Coatings" for field finishing requirements.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint and coating products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples: For pipe, tubing, handrails, fittings and brackets. Samples need not be full height.

1. Provide samples of each exposed finish required.

- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For qualified professional engineer who is legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal stairs and railing systems similar to this Project in material, design, and extent and that have a record of successful in-service performance.
- F. Welding certificates.
- G. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- H. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- I. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.
- J. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing railings similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.
- B. Installer Qualifications: Fabricator of products.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. Welds shall be architectural quality, ground smooth for a finished appearance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect shop finishes on exposed surfaces from damage by applying a temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings: Provide railings and accessories based on the various standard-of-quality products indicated herein.
- ~~B. Aluminum Pipe Railings:~~
 - ~~1. Manufacturer: Basis of Design product, Superior Aluminum Products, Style 5P tubular railing system with vertical pickets. Subject to compliance with specified requirements, other manufacturers offering equal products are also acceptable.~~
 - ~~a. Posts: 1.9-inch O.D. Schedule 40 pipe.~~
 - ~~b. Pickets: 3/4-inch schedule 40 pipe.~~
 - ~~c. Brackets, flanges, and accessories: Manufacturer's standard mechanically fastened system components, concealed fastening. (ADDENDUM 5)~~
- C. Source Limitations: Obtain each type of railing from a single source, and from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 1 Section "Quality Requirements," to design railings, including attachment to building construction and construction of the items specified in the Related Sections Article.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.4 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B429, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B210, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- G. Castings: ASTM B26, Alloy A356.0-T6.

2.5 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5 for zinc coating.
 - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153 or ASTM F2329 for zinc coating.
 - 3. Conceal all fasteners to the greatest extent possible. Where fasteners must be exposed, match finish appearance, including color and texture, of railings.
 - 4. Aluminum Railings: Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils per applied coat, to surfaces that are exposed after assembly and installation, and to concealed surfaces.
- G. Finish Coats: All steel railing assembly components shall consist of a shop-applied primer and field-applied topcoats. Refer to Division 9 Section "Painting".
- H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- I. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- J. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop-assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form Changes in Direction as Follows:
 - 1. As detailed on Drawings.
 - 2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
 - 3. For aluminum railings use prefabricated flush elbow fittings.

- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than 6-inches long with inside dimensions not less than 1/2-inch greater than outside dimensions of post, with metal plate forming bottom closure.
- P. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe, or other material as indicated, whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
- Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 ALUMINUM FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done. Examine masonry assemblies for suitability of attaching pipe and tube handrails.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16-inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4-inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
 - 1. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Unless specifically indicated to be non-welded connection, use fully-welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated or required, but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Securing Posts to Metal Surfaces: Anchor posts to structural steel components, including steel tube stair stringers, by welding to brackets, flanges, angles, and similar components, or by welding bottom of post directly to structural steel. Provide bolted connections or other fastening means only where specifically detailed on Drawings.

1. Provide slip-fit metal sleeves with threaded set screws to secure sections of removable railings.
- B. Securing Posts to Concrete Slabs: Provide one of the following recessed post methods, as indicated:
1. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
 2. Form or core-drill holes not less than 5-inches deep and 3/4-inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
 3. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material; if welding connections are not required or feasible, attach to post with set screws. If cover flanges are not shown, leave anchorage joint exposed with 1/8-inch buildup, sloped away slightly from post.

3.5 ATTACHING RAILINGS

- A. Anchor steel railing ends to posts by welding, unless otherwise indicated. Weld infill panel assemblies to posts and horizontal rails. Weld balusters to horizontal rails.
- B. Install handrails in maximum practical lengths.
1. Handrails: Neatly join ends of handrails of the same run together using sleeves set into each end of handrail a minimum of 2-inches. Weld seams and grind smooth.
- C. Attach handrails to walls or posts as indicated. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Where indicated or required, return handrails perpendicularly to walls, within 1/4-inch of finished wall surface.
1. For concrete and solid or grouted masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For steel-framed partitions, use the following attachment methods:
 - a. Between Studs: Use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 - b. Stud Centers: Use self-tapping screws fastened to steel framing or to concealed steel reinforcements, or use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

- 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking, cants, and nailers.
 - 4. Wood furring and grounds.
 - 5. Wood sleepers.
 - 6. Plywood backing panels.
- B. Related Requirements:
 - 1. Division 7 Section "Composite Wall Panels".
 - 2. Division 7 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing".
 - 3. Division 7 Section "Sheet Metal Flashing and Trim".

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.
 6. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat all rough carpentry unless otherwise indicated:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. Where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on drawings, and the following:
 1. Framing for raised platforms.
 2. Framing for stages.
 3. Concealed blocking.
 4. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Joists, Rafters, and Other Framing: Select Structural No. 1 grade.

1. Species:

- a. Hem-fir (north); NLGA.
- b. Southern pine; SPIB.
- c. Douglas fir-larch; WCLIB or WWPA.
- d. Mixed southern pine; SPIB.
- e. Spruce-pine-fir; NLGA.
- f. Douglas fir-south; WWPA.
- g. Hem-fir; WCLIB or WWPA.
- h. Douglas fir-larch (north); NLGA.
- i. Spruce-pine-fir (south); NLGA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking
2. Nailers
3. Rooftop equipment bases and support curbs
4. Cants
5. Furring
6. Grounds

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

C. For concealed boards, provide lumber with 15 percent maximum moisture content.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.8 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Install plywood backing panels by fastening to masonry; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill below partitions.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.

- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with approved indicated fastener patterns where applicable.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
- H. Provide solid blocking between joists under jamb studs for openings.
- I. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
 - 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal-size lumber, double-crossed and nailed at both ends to joists.
 - 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes exterior gypsum-based wall sheathing.
- B. Related Requirements:
 - 1. Division 5 Section "Cold-Formed Metal Framing" and Division 9 Section "Non-Structural Metal Framing," for metal framing designed to accommodate exterior gypsum sheathing.
 - 2. Division 6 Section "Rough Carpentry," for other types of sheathing not specified in this Section.
 - 3. Division 7 Section "Weather Barriers," for water-resistive barriers applied over wall sheathing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Georgia-Pacific Building Products "DensGlass Sheathing," or comparable product by one of the following:
 - a. CertainTeed Corporation.
 - b. National Gypsum Company.
 - c. Temple-Inland Building Products, a Georgia-Pacific company.
 - d. United States Gypsum Co.
 - 2. Type and Thickness: Type X, 5/8 inch thick.
 - 3. Size: 48 by 96, 108 or 120 inches for vertical installation.
- B. Plywood Sheathing Concealed from View but Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 1. Fire retardant treated at all locations.
 - 2. Preservative treatment at exterior locations where unprotected by air and moisture barrier.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153 of Type 304 stainless steel.
- B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads per inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.5 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWP A standards.
- B. Fire Retardant Treatment:
1. Manufacturers:
 - a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
 - b. Hoover Treated Wood Products, Inc: www.frtw.com.
 - c. J.H. Baxter & Co.: www.jhbaxter.com.
 2. Exterior Type: AWP A U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. All fire retardant treated wood materials shall bear a UL "FR-S" label, or a label from an approved inspection agency.
 - c. Treat all concealed exterior rough carpentry panels, and other wood blocking as required.
 - d. Do not use treated wood in direct contact with the ground.
 3. Interior Type A: AWP A U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

- a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat all concealed interior rough carpentry panels, and other wood blocking as required.
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 - 1. Manufacturers:
 - a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
 - b. Viance, LLC: www.treatedwood.com.
 - c. Osmose, Inc: www.osmose.com.
 - 2. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - 1) Treat lumber exposed to weather.
 - b. Treated lumber locations:
 - 1) Exterior locations where unprotected by air and moisture barrier.
 - 3. Preservative Pressure Treatment of Plywood Above Grade: AWP A U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treated lumber locations.
 - c. Exterior locations where unprotected by air and moisture barrier.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install board vertical edges centered over studs or furring. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- D. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running wood trim.
 - 2. Custom plastic laminate cabinets and millwork.
 - 3. Custom plastic laminate countertops.
 - 4. Hardware and accessories for custom cabinets.
- B. Related Requirements:
 - 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 2. Division 8 Section "Flush Wood Doors" and "Sound Control Door Assemblies" for wood species and finishes related to interior architectural woodwork.
 - 3. Division 9 Section "Painting" for shop-finishing requirements of interior architectural woodwork, including stains and transparent finishes.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each product indicated, including high-pressure decorative laminate and accessories, cabinet and millwork hardware and accessories, and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for grommets and other wire management components installed in architectural woodwork.
 - 4. Show laminate panels with dimensions, seams, grain direction and exposed face.
- C. Samples for Verification:
 - 1. Miter joints for standing and running trim.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of product, signed by product manufacturer.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Installer who is either employed or approved by the Fabricator.
- C. Quality Standard: AWI labeling and certification for fabrication is not required; however, as a standard of quality the Fabricator and Installer shall comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.11 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Species and Cut for Transparent Finish: Unless otherwise noted, all interior architectural woodwork components for this Project shall consist of White Maple, plain sliced.
- B. Wood Products: Comply with the following:
 - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 20 percent.
 - 2. Low-Emitting Materials: Composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice

for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 4. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- C. Thermoset Decorative Overlay: Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Panolam Industries International Incorporated.
 - d. Wilsonart International; Div. of Premark International, Inc.
 2. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - a. As selected by Architect from manufacturer's full range of colors including standard and premium laminates of solid colors, patterns and wood grains. Provide a minimum of (125) laminates.
- E. Edges: PVC edge banding, matching laminate in color, pattern and finish.
1. Thickness: 1 mm/3mm.
 2. Manufacturers:
 - a. Doellken – Woodtape, Inc.
 - b. Charter Industries, LLC.
 3. Color: As selected by Architect from manufacturer's full range of colors to match countertop laminate.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom
- B. Hardwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
2. Species: White Maple.
3. Cut: Plain sliced/plain sawn.
4. Wood Moisture Content: 5 to 10 percent.
5. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
6. For trim items, other than base wider than available lumber, use veneered construction. Do not glue for width.
7. For veneered base, use hardwood lumber core, glued for width.
8. For base wider than available lumber, glue for width. Do not use veneered construction.
9. Back-out or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
10. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
11. Profiles and Locations: Refer to drawings.

2.3 PLASTIC LAMINATE CABINETS AND MILLWORK

- A. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 2. Vertical Surfaces: Grade VGS.
 3. Edges: PVC edge banding, matching laminate in color, pattern and finish.
 - a. Cabinet Body Edges: 1mm thick.
 - b. Door/Drawer Fronts: 3mm thick.
- B. Materials for Semiexposed Surfaces:
 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 1mm thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 2. Drawer Sides and Backs: Hardwood plywood.
 3. Drawer Bottoms: Hardwood plywood.
- C. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

- D. Door and Drawer Edging: Provide 3mm PVC edging for all doors and drawers on laminate custom cabinets/millwork.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces.

2.2 PLASTIC LAMINATE COUNTERTOPS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces.
- D. Grain Direction: Parallel to cabinet fronts.
- E. Edges: 3 mm PVC edge banding, matching laminate in color, pattern and finish.
- F. Core Material: Particleboard.
- G. Core Thickness: Build up countertop thickness at front, back, and ends with additional layers of core material laminated to top.
 - 1. Plastic Laminate Cabinets: 1-1/4 inch thickness.
- H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware".
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch thick metal, and as follows:
 - 1. Semiconcealed Hinges for Overlay Doors: ANSI/BHMA A156.9, B01521.
- D. Wire Pulls: Back mounted, satin stainless steel, 4 inches long, 5/16 inch in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

- G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 - 3. File Drawer Slides: Grade 1HD-100 and Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MILLWORK ACCESSORIES

- L. Accessories:
 - 1. Countertop Support Bracket: For Surface-Mounted Heavy-Duty Aluminum Bracket.
 - a. Manufacturer: A&M Hardware.
 - b. Series: Work Station Bracket.
 - c. Size: As required for countertop depth.
 - d. Finish: As selected by Architect from manufacturer's full range.
 - 2. Grommets: For cable passage through countertops; 2-1/2-inch outside diameter EDP grommets with flip-top with slot for wire passage.
 - a. Manufacturer: Doug Mockett & Company, Inc.
 - b. Model: EDP3-2-1/2-Set.
 - c. Color: As selected from manufacturer's full range.
 - 3. Wire Management Hangers: 1 Piece J-Shape Cable Manager.
 - a. Manufacturer: Doug Mockett & Company, Inc.
 - b. Model: WM2.
 - c. Color: As selected from manufacturer's full range.
 - 4. Label Holders @ Mailboxes: For card inserts at mailboxes, aluminum with open ends, angled corners, nails/nail holes and clear plastic card protector.
 - a. Manufacturer: Chicago Card Holder, LLC or equal. Confirm
 - b. Dimension: 5/8-inch by 4-inches.

2.6 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Adhesives shall not contain urea formaldehyde.
- D. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. VOC Limits for Installation Adhesives: Installation adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Contact Adhesive: 250 g/L.
- F. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FASTENERS AND ANCHORS

- A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements. For metal framing supports, provide screws as recommended by metal framing manufacturer.
- B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements. Provide any type of non-corrosive nail for exterior woodwork.
- C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.8 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
 - 4. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, grommets, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- F. Where indicated, and whenever possible, install glass, plastic or metal panels, stand-offs, inlays, and similar decorative elements in the shop.
- G. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets.

2.9 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Refer to Division 9 Section "Painting" for finish application requirements. Defer only final touchup, cleaning, and polishing until after installation.

- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative panels. If referencing WI standards and retaining Laboratory grade for casework, insert special finishes required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation.
 - 1. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.

2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
- H. Millworks: Install without distortion so cabinet doors and drawers (by others) fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install millwork with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
- I. Countertops Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
 2. Secure backsplashes to walls with adhesive.
 3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
- J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- K. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 071110 - COMPOSITE SHEET WATERPROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Below-grade wall waterproofing.
 - 2. Protection / Drainage course
 - 3. Perforated drain pipe
 - 4. Geotextile fabric
 - 5. Below-grade rigid insulation board
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete placement, curing, and finishing.
 - 2. Division 4 Section "Unit Masonry Assemblies".

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet membrane.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data including manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
- C. Shop Drawings showing locations and extent of waterproofing, including details for substrate joints and cracks, sheet flashings, penetrations, tie-ins with adjoining construction, and other termination conditions. Also, drawing showing drain pipe layout plan and elevations indicating discharge methods and outlet locations.
- D. Samples: For the following products:
 - 1. 12 by 12 inch square of waterproofing sheet material.

2. 12 by 12 inch square of insulation board material.
 3. 12 by 12 inch square of drainage course material.
 4. 12 by 12 inch square of geotextile fabric material.
- E. Product test reports from a qualified independent testing agency evidencing compliance of waterproofing with requirements and other physical properties reported by manufacturer based on comprehensive testing of products according to current standard test methods within previous 5 years.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who has completed waterproofing similar to that indicated for this Project. Installer to submit certificate signed by waterproofing manufacturer.
- B. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.
- C. Mockups: Apply waterproofing to 100 sq. ft. of wall to demonstrate quality of materials and execution of work.
1. If architect determines mockup does not comply with requirements, reapply materials until mockup is approved.
 2. Approved mockup may become part of the completed WORK.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
1. Before installing waterproofing, conduct a combined meeting with Owner, Architect, Manufacturers Representative and other concerned entities.
 2. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.
 3. Notify participants at least 7 days before conference.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Manufacturers Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.
 1. Warranty Period: Five years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Rubberized-Asphalt Composite Sheet:
 - a. CCW MiraDRI 860/861; Carlisle Corporation, Carlisle Coatings & Waterproofing Inc.
 - b. Bituthene 3000; GCP Applied Technologies/GCP Saint Gobain.
 - c. Sealtight MEL-ROL; W.R. Meadows Inc.

2.2 SELF-ADHERING COMPOSITE SHEET

- A. Rubberized-Asphalt Composite Sheet: 60-mil- thick self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner on adhesive side.
 1. Sheet Type: Composite sheet formulated for use with primer or surface conditioner meeting VOC limits of authorities having jurisdiction.
 2. Physical Properties: Provide waterproofing complying with the following:
 - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Pliability: No cracks when bent 180 degrees over a 1-inch mandrel at minus 25 deg F; ASTM D 146.
 - d. Puncture Resistance: 40 lbf minimum; ASTM E 154.
 - e. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane.
- B. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.
- C. Sheet Flashing: Self-adhering, rubberized-asphalt composite sheet of same material, construction, and thickness as waterproofing sheet membrane.
- D. Protection / Drainage Course: As follows:
 - 1. High-performance, high-strength, three dimensional high-impact polystyrene drainage core, bonded to a non-woven filter fabric on the drainage face and a polymeric sheet adhered to the back side of the core.
 - a. Core: thickness; Nominal .40 inch; ASTM D 1777
 - b. Fabric: grab tensile strength; 100 lb.; ASTM D 4632.
 - c. Core: compressive strength; 15,000 lbs. per sq. ft.; ASTM D 1621.
 - d. Core: flow rate installed vertically; 12.5 gpm per sq. ft.; ASTM D 4716.
- E. Geotextile Fabric: As follows:
 - 1. Woven monofilament filtration fabric.
 - a. Flow rate: 18 gpm per sq. ft.; ASTM D 4491.
 - b. Tensile strength: 370 x 250; ASTM D 4632.
- F. Termination Bar: As recommended by Waterproofing manufacturer.
- G. Drain Pipe: Perforated (PVC) Poly Vinyl Chloride sewer and drain pipe and fittings. Complies with ASTM D 2729.
- H. Cap Flashing: Embedded flashing extending outbound concealing top termination of waterproofing assembly. Buried and covered by controlled earth backfill.
 - 1. EPDM: Ethylene Propylene Diene Terpolymer synthetic rubber. Flexible 40 mil elastomeric rubber membrane.
 - a. EPDM Flashing, flexible membrane:
 - 1) Carlisle Pre-Kleened EPDM; Carlisle Coatings & Waterproofing, Incorporated.
 - 2) Firestone Flashgard Thru-Wall Flashing; Firestone Building Products Co.
 - 2. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates. Some rubberized-asphalt flashing products are

0.040 inch (0.8 mm); others are 0.030 inch (0.6 mm). BIA recommends 0.030 inch (0.6 mm) as a minimum.

- I. Extruded-Polystyrene Insulation Board: Rigid, square-edged, cellular extruded polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for Type IV, compressive strength minimum 25 lbs. psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with Manufacturers requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.
 - 2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Notify Architect in writing of anticipated problems using waterproofing over substrate.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete.
- C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- D. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Install membrane strip and center over construction and control joints and cracks exceeding a width of 1/16 inch.
- E. Inside Corners: Prepare, prime, and treat inside corners according to waterproofing manufacturer's written instructions.
 - 1. Install membrane strip centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
 - a. At footing-to-wall intersections, install membrane strip centered over corner.

- F. Outside Corners: Prepare and treat outside corners according to waterproofing manufacturer's written instructions.
 - 1. Install strip of membrane 12 inches wide, centered over corner.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.
 - 1. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge and cover with sheet membrane strips.

3.3 SELF-ADHERING COMPOSITE SHEET APPLICATION

- A. Install self-adhering composite sheet according to waterproofing manufacturer's written instructions.
- B. Apply primer to substrate at required rate and allow to dry. Limit priming to areas that will be covered by waterproofing membrane in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheet membrane over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures exceed 40 deg F, install manufacturer's standard rubberized-asphalt composite sheet.
- D. Apply continuous sheet membrane over membrane strips bridging each type of joint to dimensions indicated or required by manufacturer.
- E. Seal exposed edges of membrane terminations not concealed by counterflashings or ending in reglets with mastic or sealant. Top edges, vertically and horizontally, to be sealed by installation of Waterproofing manufacturers mechanically fastened termination bar and concealed by cap flashing membrane.
- F. Install sheet membrane and auxiliary materials to tie in adjacent waterproofing.
- G. Repair tears, voids, and lapped seams in waterproofing not meeting requirements. Slit and flatten fishmouths and blisters. Patch with sheet membrane extending 6 inches beyond repaired areas in all directions.

3.4 PROTECTION / DRAINAGE COURSE INSTALLATION

- A. Install protection / drainage course over waterproofing membrane according to waterproofing manufacturer's written instructions.

3.5 CAP FLASHING INSTALLATION

- A. Extend EPDM flexible flashing from a point a minimum of 12-inches below the top edge of the waterproofing membrane, extending vertically up the outboard face of the drainage/protection course, continuing horizontally a minimum of 1¼" into the bottom masonry veneer mortar joint. Provide a minimum 1¼" overlap and adhere to wall cavity vapor retarder material using flashing manufacturer's approved tape. Cap flashing material to conceal top exposed edge of Waterproofing assembly. Adhere flashing material to outboard face of drainage/protection course using flashing manufacturer's approved adhesive or tape. Seal laps between lengths of flashing with lap sealant, over lap min. 4".

3.6 DRAIN PIPE INSTALLATION

- A. Install drain pipe with perforations on top according to pipe manufacturer's written instructions. Top of pipe to align with top of concrete footing, setting on a minimum of 2" deep clean approved granular backfill. Cover perforated top half of pipe with geotextile fabric. Install clean approved granular backfill covering pipe a minimum of 12" on top and outboard side. Granular backfill to be wrapped with geotextile fabric.
- B. Pipe to drain to finished grade by means of sloped pipe discharges at specific site locations or pumping.

3.7 EXTRUDED-POLYSTYRENE INSULATION BOARD INSTALLATION

- A. Install insulation board over waterproofing membrane according to insulation manufacturer's written instructions. Insulation board to be covered with protection/drainage course.

3.8 PROTECTING AND CLEANING

- A. Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.
- B. Where insulation board is being used in conjunction with waterproofing assembly, protect installed insulation from damage due to ultraviolet light exposure, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071110

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Extruded polystyrene foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.
 - 3. Nail-base polyisocyanurate board insulation.
 - 4. Mineral-wool blanket.
 - 5. Spray polyurethane foam insulation for use in miscellaneous voids.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for insulation installed in cavity walls.
 - 2. Division 7 Section "Thermoplastic Polyolefin (TPO) Roofing", for insulation specified as part of roofing construction.
 - 3. Division 7 Section "Through-Penetration Firestop Systems" for fire safing insulation.
 - 4. Division 9 Section "Gypsum Board" for sound attenuation blankets.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- C. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E84.
 - 2. Fire-Resistance Ratings: ASTM E119.

3. Combustion Characteristics: ASTM E136.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Foam-Plastic Board Insulation: ASTM C578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
 1. Thermal Properties: Minimum continuous R-Value of 5.0 per inch; 2-inch-thick shall be the equivalent of R-10.
 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The).
 - b. DiversiFoam Products.
 - c. Owens Corning.
 - d. Pactiv Corporation.
 3. Foundation Insulation: Type IV, 25 psi; equal to Dow "Styrofoam SquareEdge."
 4. Cavity Wall Insulation: Refer to Division 4 Section "Unit Masonry (Assemblies)".
 5. Roofing Insulation: Refer to Division 7 Section "Thermoplastic Polyolefin (TPO) Roofing" for polyisocyanurate board insulation.
 6. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CertainTeed Corporation.
 2. Guardian Building Products, Inc.
 3. Johns Manville.
 4. Owens Corning.
- B. Unfaced Glass-Fiber Blanket Insulation: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
- C. Thermal Properties: Minimum continuous R-Value of 3.2 per inch; 6-inch-thick shall be the equivalent of R-19.

2.3 NAIL BASE POLYISOCYANURATE BOARD INSULATION

- A. Nail-Base Polyisocyanurate Board Insulation: Class A thermal rigid insulation composed of closed cell polyisocyanurate foam bonded to 5/8" fire-retardant treated plywood. ASTM C1289, Type V made with Type II, Class 2 foam, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 250, respectively, per ASTM E84.
1. Compressive Strength: 25 psi minimum, complying with ASTM D1621.
 2. Resistant to Mold: Passes (10), complying with ASTM D3273.
 3. Water Absorption: Less than 0.1% volume; complying with ASTM C209.
 4. Moisture Vapor Permeance: Less than 1.2 perms; complying with ASTM E96.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Basis of Design: Hunter Panels Xci
 2. Carlisle Coatings and Waterproofing: R2+Base
- C. Radius Installations: Contractor to score and cut panels as required to fit radius applications indicated. Boards shall be neatly fitted and butted together with small gaps sealed with spray-foam insulation.
- D. Thermal Properties: Continuous R-Value of 6.44 per inch (average); 2-1/2-inch thick foam (3.1-inches overall with 5/8" plywood) for the equivalent of R-16.1.

2.4 MINERAL-WOOL BLANKETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Roxul, Inc.
 2. Industrial Insulation Group, LLC (IIG-LLC).
 3. Thermafiber, Inc.; an Owens Corning company.

- B. Mineral-Wool Blanket, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

- 1. For use in firestopping assemblies, as indicated.

2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Gemco; Spindle Type.
 - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

2.6 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit. Prepare panels for one of the following attachment methods.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, including at composite sheet waterproofing assemblies, set insulation units using manufacturer's recommended adhesive or loosely laid according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, as detailed on Drawings, and complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install where indicated on Drawings and in all voids and cavities in the building's thermal envelope formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the voids and cavities formed by framing members. If more than one length is required to fill the void or cavity, provide lengths that will produce a snug fit between ends.
 - 2. Where indicated on Drawings, place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Set units in exterior walls with facing placed toward interior of construction.
 - b. Set units in interior walls with facing placed toward areas of high humidity, unless otherwise indicated.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

- A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Building paper.
 - 2. Building wrap.
 - 3. Flexible flashing.
 - 4. Air/Vapor Barrier
- B. Related Requirements: Division 6 Section "Sheathing" for glass mat exterior gypsum board substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated, or water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D.
- B. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont "Tyvek CommercialWrap" or comparable products by one of the following:
 - a. Dow Building Solutions; Dow Chemical Company (The).
 - b. GreenGuard Commercial Building Wrap; Pactiv Building Products.

- c. Raven Industries, Inc.
- 2. Water-Vapor Permeance: Not less than 75 perms per ASTM E 96, Desiccant Method (Procedure A).
- 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
- 4. Allowable UV Exposure Time: Not less than three months.
- 5. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended or manufactured by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 0.030 inch.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- C. Nails and Staples: ASTM F 1667.

2.3 AIR/VAPOR BARRIER

- A. Air/Vapor Barrier (installed over Gypsum Sheathing): Continuous single component, asphalt free, fluid applied vapor permeable self-sealing elastomeric air barrier membrane which permit moisture vapor to escape through the membrane while remaining resistant to water and air penetration ASTM E2178, ASTM E96 and ASTM E2357. Apply over exterior gypsum sheathing at 75 square foot (20 mils wet) per gallon. Must be compatible with contacted surfaces and materials including cavity insulation.
- B. Available Products: Subject to compliance with requirements:
 - 1. Basis of Design: Enviro-Barrier VP, Sandell Moisture Protection Systems by Hohmann & Barnard, Inc.
- C. Materials that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Air Block 31MR – Manufactured by Henry Company
 - 2. Perm-A-Barrier VP – Manufactured by WR Grace
 - 3. Fire Resist Barritech VP – Manufactured by Carlisle Coatings and Waterproofing.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.
- D. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.3 AIR/VAPOR BARRIER

- A. Install air barrier system on the entire exterior face of the metal stud wall sheathing (behind insulation board). Air-barrier accessories shall be installed as detailed and/or required by system manufacturer over all dissimilar material transitions such as wood cladding, structural framing, cracks and voids, door and window openings and any other construction element that will prevent a continuous monolithic membrane. Follow manufacturers recommended installation procedures. System shall meet the requirements of the International Energy Conservation Code (IECC) ASTM E2357 Air Assembly Test.

END OF SECTION 072500

SECTION 074113 – STANDING SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Factory-formed and field-assembled, standing-seam metal roof panels and accessories.
 - 2. Composite nailbase insulation.
 - 3. Self-adhering underlayment.
 - 4. Vapor retarders.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood blocking.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for fasciae, flashings, metal soffit, gutters and downspouts, snow guards and other sheet metal work not part of metal roof panel assemblies.
 - 3. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.
- B. Solar Flux: Direct and diffuse radiation from the sun received at ground level over the solar spectrum, expressed in watts per square meter.
- C. Solar Reflectance: Fraction of solar flux reflected by a surface, expressed as a percent or within the range of 0.00 and 1.00.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft.
 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
 3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- C. Water Penetration: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft.
 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
 3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- D. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift resistance class indicated.
1. Construction Method: Class UL-90.
 2. Hail Resistance: UL-2218.
- F. Engineering Responsibility: Roofing panel system manufacturer shall be responsible to engineer the metal panel roof system, including clip spacing, to conform to local jurisdictional code requirements
1. Roof shall be designed to meet requirements of 2009 IBC, 2009 NFPA 101 and other applicable codes.
- G. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Drawings.
 2. Deflection Limits: Engineer metal roof panel assemblies to withstand design loads with vertical deflections no greater than 1/180 of the span.

- H. Thermal Movements: Provide **documented** metal roof panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Roofing panel system manufacturer shall provide written documentation that the panel attachment clips have been designed to accommodate thermal movement for the noted temperature change range

1. Temperature Change (Range): 120 deg F, ambient; 220 deg F, material surfaces.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Shop drawings and calculations shall be signed and sealed by a registered professional engineer in the Commonwealth of Pennsylvania.
- C. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
1. Roof panels and attachments.
 2. Roof-mounted items, including penetrations.
- D. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Roof Panels: 12 inches long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.

2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
 3. Nailbase Insulation: 12-inch-square samples, including fasteners.
 4. Underlayment: 6-inch square Samples.
 5. Accessories: 12-inch long samples for each type of accessory.
- F. Qualification Data: For Installer.
- G. Material Certificates: For thermal insulation and vapor retarders, signed by manufacturers.
- H. Field quality-control inspection reports.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
1. Metal Roof Panels: Include reports for air infiltration, water penetration, thermal performance, solar reflectance, and structural performance.
 - a. Provide Professional Engineer's certification indicating that the roofing system incorporates sufficient allowance for stress and movement.
 2. Insulation and Vapor Retarders: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.
- J. Maintenance Data: For metal roof panels to include in maintenance manuals.
- K. Warranties: Warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
1. Installer's responsibilities include fabricating and installing metal roof panel assemblies and providing professional engineering services needed to assume engineering responsibility. Installer shall be documented as an approved installer of the roofing system being submitted.
 2. Engineering Responsibility: Preparation of data for metal roof panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer's Inspections: During progress of roofing installation, the roofing manufacturer shall inspect the Work for a duration of not less than 3 days per week.
1. Manufacturer shall inform the Architect and Owner's Representative of the progress and quality of the Work, as observed.
 2. A total of three inspections shall be required by the panel manufacturers field technical representative.
 3. Upon completion of the Work, Manufacturer shall report to the Architect, in writing, that all deficiencies have been addressed and corrected.

- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain metal roof panels and accessories through one source from a single manufacturer.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal roof panels and are based on the specific system indicated.
 - 1. Do not modify intended aesthetic effects, as judged solely by the Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to the Architect for review.
- F. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Combustion Characteristics: ASTM E 136.
 - 2. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - 3. Metal roof panels shall be identified with appropriate markings of applicable testing and inspecting agency.
- G. Surface-Burning Characteristics: Provide insulated metal roof panels having insulation core material with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less, unless otherwise indicated.
 - 2. Smoke-Developed Index: 450 or less, unless otherwise indicated.
- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for metal roof panels including related roofing materials.
 - a. Size: 72 inches wide by 48 inches long, with 12-inch overhang; mockup shall be constructed as part of the masonry and fiber cement siding mockup panel and shall include all related sheet metal flashing and trim.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- I. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative,

subcontractor(s), Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
4. Examine decking conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and conditions of other construction that will affect metal roof panels.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for metal roof panel assembly during and after installation.
8. Review roof observation and repair procedures after metal roof panel installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements before metal roof panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal roof panels without field measurements, or allow for field-trimming of panels. Coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate installation of roof-mounted items, including penetrations.
- B. Coordinate metal panel roof assemblies with rain drainage work, flashing, trim, and installation of insulated deck panels, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. The contractor shall warrant the standing seam roofing and related work to be free of faults and defects in accordance with the General Conditions, except the warranty shall be extended by the manufacturer's and installer's standard and multi-year warranties.
- B. Warranty on Base Material and Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish and Base Material Warranty Period: ~~20~~ 25 years from date of Substantial Completion, non-prorated.
- C. Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period. WARRANTY SHALL BE A No-Dollar-Limit Warranty.
 1. Weathertight Warranty Period: 10 years from date of Substantial Completion.
- D. All warranties shall be in writing and signed by the manufacturer and panel installer.
- E. Installer's Warranty: The installer shall further warrant the installation to be weather-tight for a period of five (5) years and agree to repair or replace metal roof panel assemblies that fail to remain weather-tight.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to **performance** compliance with requirements, provide products by one of the following:

1. IMETCO Architectural Systems Zip-Rib - Burlington, NJ - 412.670.9277
2. Centria Architectural Systems SRS-3 1.5 - Pittsburgh, PA - 412.299.8000
3. Fabral Architectural Systems 2-1/2" SSR – Lancaster, PA - 717.475.1927
4. Englert Manufacturing Series 3000 - Perth Amboy, NJ – 412. 1.800.ENGLERT

2.2 PANEL MATERIALS

- A. Aluminum-Zinc Alloy-coated Steel sheet: ASTM A792/A792M, Class AZ50 coating designation, Grade 50 pre-painted by the coil-coating process to comply with ASTM A 755/A 755M; structural quality.

1. Thickness: ~~22-gauge~~. **24 Gauge (Addendum 5)**
2. Surface: Smooth, flat finish with striations to prevent oil-canning.
3. Exposed Coil-Coated Finish: Metallic Coat Fluoropolymer.
4. Exposed Finish: Exposed Metallic Coating
5. Color: Platinum Silver
6. Clips: Low-movement, floating clips to accommodate thermal movement; fixed clips where design permits; intermittent or continuous clips as required to meet performance requirements; and with clip bearing plate wear required. Clips shall be specifically designed to accommodate the performance of panels fabricated in a continuous length in excess of 100'-0", or per the longer lengths require for this project.

- a. Material: 0.064-inch-nominal thickness, aluminum-zinc alloy-coated steel sheet.

7. Joint Type: Field mechanically seamed.
8. Panel Pan Configuration: Planked or Beaded
9. Panel Seam Height: 2.5 inches
10. Panel Coverage: 18 inches
11. Panel Lengths: Panel lengths on all roof runs SHALL BE CONTINUOUS. Splicing is NOT ACCEPTABLE in continuous spans of roof.

- B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.3 THERMAL INSULATION FOR STEEP-SLOPED ROOFING

- A. Insulation: Composite, insulation, consisting of psi polyisocyanurate board insulation.
 - 1. Basis-of-design product: subject to compliance with requirements, provide Atlas Roofing Corporation "AC Foam Nailbase" or comparable product by one of the following:
 - a. Johns Manville.
 - b. R-Max.
 - c. Cornell Corporation.
 - 2. Size: 48 inches by 96 inches.
 - 3. Thickness: 4" Polyisocyanurate Board Insulation.
 - 4. Fasteners: engineered, low-profile screws with large-diameter heads, manufactured or approved by nailbase insulation manufacturer.
 - 5. Blocking: perimeter wood blocking, equal in thickness to nailbase insulation.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering Sheet Underlayment, Granular Surfaced (Ice and Water Shield): ASTM D 1970, minimum of 55-mil-thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. IMETCO Aqua-Block 50
 - b. ALCO-NVC Inc.
 - c. Atlas Roofing Corporation.
 - d. Carlisle Coatings & Waterproofing, Inc.
 - e. CertainTeed Corporation.
 - f. GAF Materials Corporation.
 - g. Henry Company.
 - h. IKO.
 - i. Johns Manville.
 - j. Owens Corning.
- B. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, minimum.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.

1. UL-rated clip: 18-gage galvanized steel, 3-1/2 inches long, double fastener type.
 2. Nailable substrate fasteners: A-point fastener, pancake head Phillips drive screws for nailbase structural fiber roof deck or OSB non-corrosive base material, length as required to penetrate through nail base and one inch into structural deck, complying with UL requirements.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Provide color-matched touch-up paint for roof panels.

2.6 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
- B. Integral Standing Seam Metal Roof Panels: Formed with integral ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and lapping and interconnecting side edges of adjacent panels.
1. Roof Slope: Panel system shall be able to accommodate minimum roof slope of 1 ½:12.

2.7 ACCESSORIES

- A. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including trim, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
1. Metal Snow Guards shall be provided at locations indicated on Roof Plan, spacing, pattern and quantity as recommended by Standing Seam Roof manufacturer.
 2. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 3. Clips: Minimum 0.0625-inch-thick, stainless-steel panel clips designed to withstand negative-load requirements.
 4. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch-thick, stainless-steel or nylon-coated aluminum sheet.
 5. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 6. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or

premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

2.8 FABRICATION

- A. General: Field fabricated by the manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements. Panels shall be fabricated using panel manufacturer field forming equipment with no less rolling stations as utilized in the factory forming process.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs for full length of panel. Panel lengths shall be continuous, with no splices in between high and low points of roof span. Form flashing components from full, single-width sheet in minimum 10-foot lengths. Provide shop-fabricated, mitered corners, joined using closed-end pop rivets and joint sealant.
- C. Where indicated, fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with manufacturer's recommendations that apply to the design, dimensions, metal, and other characteristics of items indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal roof panel manufacturer.
 - a. Size: As recommended by metal roof panel manufacturer for application but not less than thickness of metal being secured.

2.9 FINISHES, GENERAL

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations

in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer and Manufacturer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
 - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 - 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Vapor Retarder: prior to installation of nailbase insulation, install layer of polyethylene vapor retarder over metal decking, lapped in direction to shed water. Lap sides not less than 4 inches between courses. Tape all seams.

3.3 NAILBASE INSULATION AND ACCESSORY INSTALLATION

- A. Nailbase Insulation: Install composite nailbase insulation panels over vapor retarder and roof deck over entire roof surface. Attach with specified fasteners.
 - 1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate panels together. Install fasteners at a rate recommended by the insulation manufacturer, but not less than 15 fasteners per full size insulation panel, in pattern jointly recommended by the fastener and insulation manufacturer to meet manufacturer's recommendations and applicable code requirements.

- a. Attachment method must satisfy minimum wind uplift requirements.
 - b. Upon completion of installation of nail base insulation panels, use spray foam insulation at all transitions between panels which are not flush panel-to-panel factory edge joints to insure a complete, insulation barrier for the roof assembly.
2. Comply with UL requirements for fire-rated construction.
- B. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Provide and install sheet metal crickets to shed water from curbs and other projections where indicated.
- D. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written recommendations.

3.4 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on nailbase insulation panels under metal roof panels. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply at locations indicated below, in shingle fashion to shed water, with end laps of not less than 6 inches. Overlap side edges not less than 4 inches. Roll laps with roller. Cover underlayment within 14 days.
 1. Apply from eave to ridge over entire surface of sloping roofs where metal roof panels are scheduled.
- B. Apply slip sheet over underlayment before installing metal roof panels.

3.5 METAL ROOF PANEL INSTALLATION, GENERAL

- A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement. Comply with all details, manufacturer's standards and other requirements in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
 1. Field cutting of metal roof panels by torch is not permitted.
 2. Install panels in directions indicated on drawings.
 3. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.
 4. Provide metal closures at peaks, rake edges, rake walls, and each side of ridge and hip caps.

5. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
6. Locate and space fastenings in uniform vertical and horizontal alignment.
7. Install ridge and hip caps as metal roof panel work proceeds.
8. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.

B. Fasteners:

1. Aluminum Roof Panels: Use stainless-steel or aluminum fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.6 FIELD-ASSEMBLED METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Fasten standing seams with manufacturer-approved methods.

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, closures, seam covers, flashings, sealants, gaskets, and similar items.

- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal roof panel installation, including accessories. Report results in writing. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
 - 1. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 074214 - METAL SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes linear metal soffit panels, fascia and related trims and accessories for exterior applications.
- B. Related Sections:
 - 1. Division 6 Sections "Rough Carpentry" and "Sheathing," for blocking and sheathing needed to support metal soffit panels.
 - 2. Division 7 Section "Insulated Metal Wall Panels" for wall panels to be installed adjacent to metal soffit panels.
 - 3. Division 7 Section "Joint Sealants," for elastomeric sealants to be installed with metal soffit panels.
 - 4. Division 7 Section "Sheet Metal Flashing and Trim," for related break metal flashings, fascia and trims.
 - 5. Division 9 Section "Non-Structural Metal Framing," for primary and secondary framing required to support metal soffit panels.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, fascia, trim, flashings, closures, and accessories; and special details.
 - 1. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

- C. Samples: For each type of metal panel indicated with factory-applied finishes. Provide two (2) 12-inch-long metal panels of actual panel width in finishes indicated. Include fasteners, channels, closures, and other metal panel accessories indicated in matching finishes.
 - 1. Include similar Samples of fascia and other break metal trim in 12-inch lengths, in depths and profiles indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METAL SOFFIT PANELS

- A. General: Provide manufactured metal soffit panels, for exterior applications, designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically

attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

- B. Flush-Profile Metal Soffit Panels: Concealed-fastener, solid panels with linear design, formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges, which form shallow V-groove joints.

1. Manufacturers:

- a. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS International "Design Wall - DWF" or comparable product by one of the following:

- 1) Fabral, a Euramax company "Décor-Flush."
- 2) Berridge Manufacturing Company "FW-12 Panel."
- 3) Petersen Aluminum Company "Flush Soffit Panels."
- 4) Firestone Metal Products "Una-Clad – UC-500 Flush Panel System."
- 5) AEP Span "Flush Panel."
- 6) Centria "IW Series."
- 7) Morin, a Kingspan Group company "CF-Series – F-12."
- 8) MBCI; Div. of NCI Building Systems "FW-120."

2. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

- a. Thickness: 0.032 inch.
- b. Surface: Smooth, flat finish.
- c. Exterior Finish: One of the following, as indicated on Drawings:
 - 1) Clear anodized.
 - 2) Specialty laminate.
- d. Panel Coverage: 12 inches, with stiffening ribs at midpoint, or 18 inches, with stiffening ribs at 1/3-points; stiffening ribs and panel edges shall be located on 6-inch centers.
- e. Panel Height: 1 inch to 1-1/2 inches.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653, G90 coating designation or ASTM A 792, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, channels, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or cross-linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- C. Flashing and Trim: Provide site- or shop-formed break metal flashing and trim, formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels. Install with concealed fasteners whenever possible; if fasteners must be exposed, install in an inconspicuous and watertight manner.
 - 1. Fascia: For concealing ends of soffit and face boards at eaves and similar construction. Form to dimensions and profiles indicated.
 - a. Thickness: 0.050 inch.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Clear anodized.
 - 2. Drip Edges and Miscellaneous Flashing and Trim: Fabricate in profiles and dimensions indicated or necessary for watertight construction and for consistent, uniform finished appearance in conjunction with metal fascia and soffit panels.
 - a. Thickness: 0.032 inch for overall widths less than 6 inches; 0.050 inch for overall widths of 6 inches or more.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Clear anodized.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads for concealed fastening of panels.
 - 1. Provide exposed fasteners only where necessary, with heads matching color of metal panels by means of factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners, or other means approved by the Architect.
 - 2. Wind Compression Struts: Manufacturer's standard compression post assembly, including moveable, telescopic couplings, inverted metal tee shapes, and fasteners in combination with light-gauge metal furring channels, to prevent excessive movement or wind uplift of suspended linear soffit systems; provide where indicated or where soffit systems are not directly attached to rigid framing members.
- E. Panel Sealants: Provide any of the following sealant types, as recommended by manufacturer, that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

- B. Provide panel profile, including stiffening ribs, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. On-Site Fabrication: For fascia and similar break metal trim and flashing, fabricate on-site or in shop using UL-certified roll-forming equipment. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 5. Ensure that dissimilar metals coming into contact with metal soffit panels are protected from galvanic action, using manufacturer's standard coatings or sealants.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 - 1. Exposed Anodized Finish: Provide at all locations except where otherwise indicated on Drawings.
 - a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2. Biaxially-oriented polyethylene (boPET) specialty laminate film, with UV stabilizer to absorb ultraviolet radiation, protecting chemical structure of polyester finish.
 - a. Laminate Manufacturer: Equal to "Texcover" film, as manufactured by Sublitex, a Miroglio company.
 - b. Color and Texture: As selected by Architect from laminate manufacturer's full range of standard wood grain patterns and colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine framing to verify that angles, channels, furring, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
 1. Soffit Framing: Wire tie, screw or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes, if provided.

4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Installation Pattern: As indicated on Drawings.
- C. Fasteners for Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum fasteners for surfaces exposed to the interior, if any.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
- F. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074214

SECTION 074223 - METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

- A. Section includes concealed-fastener, lap-seam, perforated metal wall panels, primarily for HVAC rooftop equipment screen walls.
- B. Related Sections:
 - 1. Division 5 Section "Metal Fabrications" for pipe columns, channels and other miscellaneous steel shapes for supporting assemblies clad with metal wall panels.
 - 2. Division 5 Section "Cold-Formed Metal Framing" for support framing, including girts, studs, and bracing.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for fascia and other trim required to be installed with metal wall panels.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 20 lbf/sq. ft., acting inward or outward.
 - b. Uniform pressure as indicated on Drawings.
 - 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/240 of the span.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings,

closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

- a. Flashing and trim.
- b. Anchorage systems.

C. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.

- 1. Include similar Samples of trim and accessories involving color selection.
- 2. Include Samples showing full range of standard perforation patterns.
- 3. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners and other metal wall panel accessories in profile indicated.

D. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and professional engineer.

B. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal wall panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.

D. Preinstallation Conference: Conduct conference at Project site.

- 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels.
- 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review temporary protection requirements for metal wall panel assembly during and after installation.
6. Review wall panel observation and repair procedures after metal wall panel installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 2. Warranty Period: Two years from date of Substantial Completion.

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using concealed fasteners in side laps.
- B. Corrugated-Profile (Vertical): Concealed-Fastener Metal Wall Panels for Exterior Walls: Formed with alternating curved ribs spaced at 2.67 inches o.c. across width of panel.
1. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS "MPW 160" or "MFN160" where indicated on drawings, or comparable product by one of the following:
 - a. Fabral.
 - b. Kingspan Group Company
 - c. Alcoa Architectural Products (USA).
 - d. CENTRIA Architectural Systems.
 - e. UNA-CLAD; Firestone Metal Products.
 - f. Berridge Manufacturing Company.
 - g. Industrial Building Panels.
 - h. MBCI; Div. of NCI Building Systems.
 - i. McElroy Metal, Inc.
 - j. Metal Sales Manufacturing Corporation.
 - k. Petersen Aluminum Corporation.
 2. Material: Aluminum sheet, 0.040 inch thick.
 - a. Exterior Finish: 70% PVDF.
 3. Panel Coverage: 16 inches.
 4. Panel Height: 15/16 inch to 1 1/4" inch.
 5. Panel Length: Wherever possible, provide panels in continuous, corner-to-corner lengths to avoid nesting panel splices with visible seams. Panel lengths shall be of lengths indicated on Drawings; where required lengths of screen walls exceed the manufacturer's

maximum panel length due to fabrication or transportation limitations, provide maximum lengths permitted without warranting cost increases.

6. Perforations: Reverse pattern. Final hole size and spacing to be determined by Architect upon review of submittal; the following shall be considered:
 - a. Hole Shape: Round.
 - b. Approximate Hole Size: 3/16 inch diameter or smaller.
 - c. Approximate Hole Spacing: 5/16 inch o.c., staggered; approximately 33-percent open area.

2.2 ACCESSORIES

- A. Flashing and Trim: Formed from 0.040-inch minimum thickness, clear-anodized aluminum sheet. Provide flashing and trim as required to provide finished appearance. Locations include, but are not limited to, bases, drips, corners, and fascia. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.3 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 1. Form concealed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with concealed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
 - 1. Examine wall framing to verify that angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 - 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels so that corrugations are oriented horizontally, parallel to the roof surface, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
 - 2. Shim or otherwise plumb substrates receiving metal wall panels.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal wall panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition. Unless otherwise indicated, open

ends of splices shall face away from the primary building entrances to minimize the visibility of splices from primary views.

7. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

B. Fasteners: Use aluminum or stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap corrugated sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Provide metal-backed washers under heads of concealed fasteners bearing on weather side of metal wall panels.
3. Locate and space concealed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Provide sealant tape at lapped joints of metal wall panels.
6. Where panel splices are required, nest panels with minimum 6-inch end lap, and fasten together.
 - a. Pattern: Arrange splices in random fashion to avoid "stepping" effect. Ends of panels between adjacent courses shall be offset a minimum of 4 feet in either direction.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, corners, flashings, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams to prevent water from penetrating to backup structure side of panels.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074223

SECTION 074243 - COMPOSITE METAL PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum-faced composite metal panels with mitered [tight-fit flat] [tight-fit reveal] moldings.
 - 2. Miscellaneous materials and accessories.
 - a. Metal sub-framing and furring.
 - b. Composite nail-base polyisocyanurate insulation board.
 - c. Weather barriers.
 - d. Weather barrier tape.
 - e. Fasteners.
 - f. Sealants.
 - g. Flashing.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry Assemblies" for cavity air barrier as a component of composite metal panel assemblies.
 - 2. Division 7 Section "Sheet Metal, Flashing and Trim" for flashing and trim components that are not a part of the composite metal panel system's standard assembly.
 - 3. Division 7 Section "Joint Sealants" for sealants and caulking installed as a component of composite metal panel assemblies.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Design system to accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to temperature and humidity ranges reasonably anticipated.
 - 2. Design system to accommodate tolerances of structure.
- B. Performance Requirements: Submit test data witnessed by an independent testing agency for the following:

1. Fire Propagation Characteristics: Standard test method showing compliance with NFPA 285 for exterior wall assemblies containing combustible components.
2. Structural tests for wind load by "Chamber Method" in compliance with ASTM E72.
 - a. Standard test design loading: 20 psf (960 Pa) positive and negative wind load.
 - b. Design panel system to withstand code-imposed design loads, and a deflection limit of L/180 shall apply to positive load pressures only.
3. Air Infiltration: 0.06 cfm/sq. ft. (0.3L/s per sq. m) air leakage under a static pressure of 1.57 lbf/sq. ft. (75 Pa) when tested in accordance with ASTM E283.
4. Water Penetration: No uncontrolled water penetration through the standard vertical panel and sealed joints at a static pressure of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with ASTM E331.
5. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - a. Temperature Change (Range): 120° F (67° C), ambient; 180° F (100° C), material surfaces.
6. Fire Performance: Tested in accordance with ASTM E84, Class A material with a Flame Spread Index of 25 or less and a Smoke Developed Index of 450 or less.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 Section – Submittals.
- B. Product Data: Manufacturer's data sheets on each product used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Performance Requirements Submittal: Submit certified test reports and product certificates signed by Manufacturer certifying materials comply with all Performance Requirements Specified above.
 1. Manufacturer's product certificates must specifically show compliance with NFPA 285.
- D. Shop Drawings: Submit shop drawings showing the complete assembly including all substrate components (regardless of provided and installed by others), panel layout, flashings, sub-framing, air and weather barriers, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- E. Initial Samples: For each finish product specified, provide one complete set of color chips representing Manufacturer's full range of available PVDF Solid colors.

1. Color to be selected by Architect from manufacturer's full range of PVDF Solid colors.

F. Verification Samples: For each finish product selected through Initial Samples, provide two verification samples, minimum size 12-inches x 12-inches, representing the actual product, color, and pattern selected.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

B. Installer Qualifications:

1. Installer experienced in performing Work of this Section who has specialized in installation of Work similar to that required for Project.

2. Panel Installer shall assume responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

a. Proceeding with installation of panel system signifies acceptance of all preceding Work whether performed by Panel Installer or by others.

C. Pre-installation Meetings: Conduct pre-installation meeting at Project site to verify project requirements, substrate conditions, Manufacturer's installation instructions, compliance with specified Performance Requirements, and Manufacturer's warranty requirements.

D. Mock-up: Install mock-up at Project site using specified products. Mock-up shall comply with details on Drawings and with Manufacturer's approved details. Mock-up shall be of the full system assembly including all substrate components, air and weather barriers, sub-framing, full composite metal panel assembly, flashing, and sealants.

1. Mock-up shall be a minimum of 4-foot x 4-foot and shall include each type of required trim condition. Both vertical and horizontal trim conditions shall be included.

2. Maintain mock-up for duration of construction to be used for workmanship comparison.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store panels horizontally, off the ground, in Manufacturer's unopened packaging until ready for installation.

B. Examine materials upon receipt to ensure that no damage has occurred during shipment. Store composite metal panels horizontally, covered with a suitable weather tight and ventilated covering. Store composite metal panels to ensure dryness, with a positive slope for drainage of water. Do not store composite metal panels in contact with other materials that might cause staining, denting, or other surface damage. DO NOT allow storage space to exceed 120 deg. F.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by Manufacturer for optimum results. Do not install products under environmental conditions outside Manufacturer's absolute limits.

1.8 WARRANTY

- A. Finish Warranty: Warranty shall commence on Date of Substantial Completion.
 - 1. Provide minimum twenty (20) year written Warranty with PVDF fluoropolymer finish color coated metal finish covering color fading, chalking, and film integrity.
 - 2. Finish coating shall not peel, blister, chip, crack or check.
 - 3. Chalking, fading or erosion of finish measured by the following tests:
 - a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
 - b. Finish coating shall not change color or fade in excess of 8 NBS units as determined by ASTM D2244.
- B. Material and Installation Warranty: Warranty shall commence on Date of Substantial Completion.
 - 1. Panels shall be warranted not to delaminate (separate) for a period of five (5) years.
 - a. Installer's Warranty: Panel System Installer shall warrant the complete installed composite metal panel assembly for all specified installation tolerances, against specified air and water infiltration values, and against expansion, contraction and visible buckling for a period of two (2) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AVAILABLE PRODUCTS, COMPOSITE METAL PANELS

- A. Basis of Design Manufacturer: Citadel Architectural Products, Inc., Indianapolis, IN 46226 T: (800) 446-8828; www.citadelap.com. Subject to compliance with all specified requirements, equal products by other manufacturers are also acceptable.
- B. Basis of Design Product: 4mm Envelope 2000 Reveal (RV) System Aluminum-Faced Composite Metal Panels.
 - 1. Panel Construction: Prefinished aluminum sheet over a thermoset phenolic resin core with backer sheet.
 - 2. Panel Facing: Minimum 0.024-inch thick, smooth aluminum sheet complying with ASTM B209.
 - 3. Panel Backing: Primed smooth aluminum sheet, minimum 0.010-inch thick, aluminum sheet complying with ASTM B209.

4. Panel Thickness: 4 mm (5/32 inch).
5. Weight: 1.25 lbs/ft²
6. Fire Test Performance: ASTM E84, Class A.
7. Bond Test Performance: Passes ASTM C481-A Cyclic Aging.
8. Finish: Kynar 500 - PVDF fluoropolymer paint system meeting AAMA 2605.
9. Finish Colors: As selected by Architect from Manufacturer's full line of PVDF Solid colors.
10. Aluminum Composite Metal Panel Installation System: One-Piece Tight-Fit Extrusion.

- C. Miscellaneous Assembly Components: Provide Manufacturer's standard assembly components including, but not limited to, tracks, channels, foam tapes, adhesives, J-moldings and trims for each assembly condition, expansion shims, and drainage vents required for a complete panel system assembly.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Metal Sub-framing and Furring: ASTM C645, cold-formed metallic-coated steel sheet, ASTM A653, G90 hot-dip galvanized coating. Provide manufacturers standard sections as required for support and alignment of composite metal panel assemblies.

1. Hat-Shaped, Rigid Furring Channels: subject to compliance with specified requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. ClarkDietrich Building Systems.
- b. Jaimes Industries.
- c. MarinoWARE.
- d. MRI Steel Framing, LLC.
- e. SCAFCO Steel Stud Company.

2. Minimum Base-Metal Thickness: .064-inch (16 gauge).

3. Depth: As indicated on Drawings.

- a. For compliance with NFPA 285, sub-framing when installed behind composite metal panels shall not create an air cavity of more than 2-inches maximum.

- B. Composite Nail-Base Polyisocyanurate Insulation Board: Class A thermal rigid insulation composed of closed cell polyisocyanurate foam bonded to 5/8-inch-thick fire-retardant treated plywood. ASTM C1289, Type V made with Type II, Class 2 foam of type and minimum compressive strength indicated below, with maximum flame spread and smoke developed indices of 75 and 450, respectively, per ASTM E84.

1. Manufacturers: Subject to compliance with specified requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Basis of Design: Hunter Panels Xci.
- b. Carlisle Coatings and Waterproofing: R2+base.

2. Thickness: 4.10-inches (overall).

3. R-Value: 22.5.
 4. Panel Size: 4-foot x 8-foot.
 5. Compressive Strength: 20 psi minimum, complying with ASTM D1621.
 6. Resistance to Mold: Passes (10), complying with ASTM D3273.
 7. Water Absorption: Less than 0.1% volume; complying with ASTM C209.
 8. Moisture Vapor Permeance: Less than 1 perm; complying with ASTM E96.
 9. Contains no CFC's, HCFC's or HCF's.
- C. Weather Barrier: ASTM E1677, Type I weather barrier; with flame-spread and smoke-developed indexes of less than 15 and 25, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
1. Basis-of-Design Manufacturer: Subject to compliance with specified requirements, provide weather barrier as manufactured by DuPont Corporation; Tyvek Commercial Wrap, or equal product by one of the following:
 - a. Dow Building Solutions; Dow Chemical Company (The).
 - b. Green Guard Commercial Building Wrap; Pactiv Building Products.
 - c. Raven Industries, Inc.
 2. For application over composite nail-base insulation and behind composite metal wall panels.
 3. Water-Vapor Permeance: 23 perms per ASTM E96, Desiccant Method (Method A).
 4. Air Permeance: Not more than 0.001 cfm/sq. ft. at 1.57 psf when tested according to ASTM E2178.
 5. Allowable UV Exposure Time: Not less than 9 months.
 6. Basis Weight: 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 7. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882.
 8. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
- D. Weather Barrier Tape: Pressure-sensitive plastic tape recommended by weather barrier manufacturer for sealing joints and penetrations in weather barrier.
- E. Fasteners: Self tapping screws and washers and other suitable fasteners designed to withstand design loads. Provide type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members and trim moldings to substrates.
1. Conceal fasteners. Exposed fasteners are not permitted on faces of panels or accessories, or any components exposed to view.
- F. Sealants: Provide Manufacturer's recommended sealants for product installation complying with ASTM C920.
1. Comply with requirements of Division 7 Section "Joint Sealants".
- G. Flashing and Closure Trims: In accordance with NFPA 285 requirements, fabricate flashings and concealed closure trims as detailed on Drawings. Concealed closure trims shall be fabricated from 0.032-inch (20 gauge) minimum thickness galvanized steel sheet. Exposed face trims shall

be fabricated from 0.050 (16 gauge), coil-coated aluminum sheet to match color of composite metal panel system.

1. Comply with requirements of Division 7 Section "Sheet Metal Flashing and Trim".
2. Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" then apply to design, dimensions, metal, and other characteristics indicated.
3. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks, and that are true to line and levels indicated, with exposed edges folded back to form hems.
4. Provide a 12-inch-wide lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
5. Provide a lapped strip of tape at the top of base flashings for positive drainage over flashing.

2.3 FABRICATION

- A. General: Fabricate and finish composite metal wall panels and accessories at the factory, by manufacturers standard procedures and processes, as required to fulfill all specified performance requirements evidenced by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
 1. Tolerances: Length and Width plus or minus 1/16-inch; squareness (diagonals) equal within 1/8-inch.
- B. Fabricate composite metal wall panel joints with manufacturer's standard gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

2.4 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with substrate installer present for compliance with details on Drawings, requirements for structural soundness, installation tolerances, metal panel supports and sub-framing, compliance with the requirements of NFPA 285 and other specified Performance Requirements, and other conditions affecting performance of the Work.
 - 1. Verify that weather barriers have been properly installed over substrates to protect substrate and prevent water penetration into the building.
 - 2. Notify Architect in writing of any unsuitable conditions or deviations from Project requirements found.
 - 3. Installation tolerances shall not exceed the following:
 - a. 1/4-inch in any 20 feet length vertically or horizontally.
 - b. 1/2-inch in any building elevation.
- B. Examine roughing-in conditions for components and systems penetrating composite metal panels to verify actual locations of penetrations relative to seam locations before composite metal panel installation.
- C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports and Sub-Framing: Install sub-framing, miscellaneous supports and anchorages as specified and in the proper orientation and locations required to receive composite metal panel assemblies. Comply with all requirements of Manufacturer's installation instructions and details, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation type selected.
 - 1. At a minimum, provide sub-framing members at each horizontal and vertical joint in the composite metal panel assembly.
 - 2. Ensure that vertical drainage paths are provided in any horizontally oriented sub-framing to allow weeping of moisture that may enter through the composite metal panel assembly.
 - 3. Shim or otherwise plumb sub-framing as required to comply with specified tolerances.

3.3 INSTALLATION

- A. General: Comply with all requirements of manufacturer's installation instructions and details on Drawings. Work shall be completed in a workmanlike and weathertight manner by skilled mechanics.
- B. Install composite metal panels assemblies according to orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor composite metal panel assemblies and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Flash and seal composite metal panel assemblies at perimeter of all openings. Do not begin installation until flashings that will be concealed by panels are installed. Set units

true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight. All exposed edges shall be folded back to form hems.

- a. Install closure trims as detailed on Drawings to close off the perimeter of all openings and to comply with the requirements of NFPA 285.
 - C. Install composite metal panel assemblies using manufacturer's standard assembly components including, but not limited to, tracks, channels, foam tapes, adhesives, J-moldings and trims for each assembly condition, expansion shims, and drainage vents.
 - D. Fasteners: Use aluminum or stainless-steel fasteners. Fasteners shall be concealed to the greatest extent possible. Comply with all manufacturer's written instructions.
 - E. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.
 - F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.
 - G. Sealant Installation: Use only approved sealants as described in manufacturer's published guidelines. Provide sealants as required by manufacturer's standard and warranted details.
- 3.4 FIELD QUALITY CONTROL
- A. Manufacturer's Field Service: Provide Manufacturer's field service consisting of periodic and final site visits for inspection of composite metal panel assembly installation for compliance with manufacturer's installation instructions.
- 3.5 CLEANING AND PROTECTION
- A. Protection: Protect installed product and finish surfaces from damage during construction.
 - B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
 - C. Touch-up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION 074243

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
 - 2. Roof insulation.
 - 3. Roof underlayment mat.
 - 4. Walkways.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof flashings and counter-flashings.
 - 3. Division 7 Section "Roof Specialties" for roof hatches and other roof specialties.
 - 4. Division 7 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
 - 5. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Before starting roof deck construction, conduct conference at Project site in accordance with Division 1 Section "Project Meetings".
 - 1. Meet with Owner, Architect, Owner's Roof Consultant, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's representative, deck Installer and other installers whose work interfaces with or affects roofing, including installers of roof drains, roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize the construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review deck substrate requirements for conditions and finishes, including flatness and fastening. At areas of new decking, examine decking surfaces prior to system installation for conformance to specified requirements.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review warranty and manufacturer assembly letters.

1.5 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 1. Layout and thickness of insulation.
 2. Details for base flashings and membrane terminations.
 3. Installation details and terminations of specified vapor retarders.
 4. Flashing details at all roof penetrations.
 5. Tapered insulation, thickness, and slopes including crickets and drain sumps.
 6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 7. Tie-in with air barrier.
- C. Samples for Verification: For the following products:
 1. Roof membrane and flashings of color required.
 2. Roof insulation.
- D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.
- E. Qualification Data: For Installer and manufacturer.
- F. Manufacturer Certificates:
 1. Assembly Letter: Submit an "Assembly Letter" from the roofing manufacturer stating that their system, including all materials and components, meets the requirements of these specifications, including the specified Warranty.
 2. Special Warranty Certificate: Signed by roof membrane manufacturer certifying that all materials supplied under this Section are acceptable for special warranty.
- G. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

- H. Evaluation Reports: For components of roofing system, from ICC-ES.
 - 1. Provide fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- I. Field Quality Control Reports.
- J. Sample Warranties: For manufacturer's special warranties.
 - 1. Refer to Warranty Form attached to the end of this Section.
- K. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that specified for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty, with a minimum of five (5) years of experience installing the specified system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, cover boards, and other components of roofing system.
 - 2. Warranty Period: 20-years from date of Substantial Completion.
 - a. Provide "No Dollar Limit" total system watertight Warranty.
 - b. Provide seventy-two (72) mile per hour windspeed Warranty.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarders, and walkway products for the following warranty period:
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.
 - 1. Accelerated Weathering: As tested by the manufacturer, roof membrane shall withstand a minimum of 2,000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- D. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency. ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING
 - A. EPDM Sheet: ASTM D4637, Type I, non-reinforced, EPDM sheet with factory-applied seam tape.
 - B. EPDM Roofing System Basis of Design: Carlisle Syntec Sure-Seal fully-adhered roofing system.

1. Subject to compliance with all specified requirements, other manufacturers offering products acceptable to the Work include, but are not limited to the following:
 - a. Holcim Elevate RubberGard EPDM (formerly Firestone Building Systems).
 - b. Versico Roofing Systems.
 - c. Johns Manville.
2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Black.
4. Source Limitations: Obtain components for roofing system from roof membrane manufacturer.
5. Provide 54-inch perimeter of ECO-CO sacrificial sheet around perimeter of kitchen exhaust fan. Refer to Roof Plan.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.
- C. Protection Sheet: Epichlorohydrin (ECO-CO) or neoprene nonreinforced flexible sheet, 55 to 60 mils thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
- D. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- E. Bonding Adhesive: Manufacturer's standard, aerosol-based spray adhesive.
- F. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch-wide, butyl splice tape with release film or factory-applied seam tape, width as recommended by manufacturer.
- G. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- I. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8-inch-thick; with anchors.
- J. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.

- K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, termination reglets, cover strips, and other accessories.

2.4 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm (6 ng/Pa x s x sq. m); cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM roof membrane manufacturer.

- B. Polyisocyanurate Board Insulation:

- 1. Basis of Design: Carlisle Syntec Systems; Carlisle Corp., SecurShield (coated glass facers)
- 2. Thermal Requirements: To obtain the required thermal envelope properties, the minimum long-term thermal resistance (LTTR) values shall be achieved, based on insulation board thickness.

- a. Minimum LTTR Values for Polyisocyanurate Board Insulation:

- 1) 30.0 continuous or 30.0 average depending upon specific roof areas.
- 2) Provide two (2) layers of 2.6-inch-thick polyisocyanurate insulation, utilizing staggered boards, for a total base thickness of 5.2 inches, not including tapered insulation. The specified 5.2-inch thickness is based upon Carlisle Syntec Systems SecurShield. Overall thickness may vary based upon manufacturer.

- 3. Compressive Strength: 20 psi and 25 psi.
- 4. Size: 48 by 96 inches or 48 by 48 inches.

- C. Tapered Insulation: Provide factory-tapered insulation boards.

- 1. Material: Match roof insulation.
- 2. Minimum Thickness: 1/4 inch.
- 3. Slope:
 - a. Roof Field: 1/4-inch per foot unless otherwise indicated on Drawings.
 - b. Saddles, Sumps and Crickets: 1/2-inch per foot unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: ASTM C117, glass- mat, water-resistant gypsum substrate or ASTM C1278 fiber-reinforced gypsum board.
 - 1. Basis-of-Design Product: Georgia Pacific DensDeck. Subject to compliance with requirements equal products by other manufacturers are also acceptable.
 - 2. Thickness: 5/8-inch.
- D. Roof Underlayment Mat: Three (3)-dimensional reinforcement mat made of continuous nylon monofilaments fused at their intersections. The filament structure acts as a thermal break between the roof surface and the sheathing substrate and it reduces impact noise from rain or sleet greater than 13.5 dB.
 - 1. Basis-of-Design Product: Colbond, Enkamat 7020. Subject to compliance with specified requirements, equal products but other manufacturers are also acceptable.
 - a. Tensile Strength: ASTM D6818, 240 lbs./ft.
 - b. Thickness: ASTM D6525; 3/4-inches.
 - c. Flame Spread: ASTM E84; 25.
 - d. Smoke Density: ASTM E84; 30.
- E. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or two other insulation layer as follows:
 - 1. Bead applied, low- rise, one-component or multi component urethane adhesive.

2.7 PAVERS

- A. Concrete Pavers: Hanover Products or approved equal; 23-1/2-inches x 23-1/2-inches x 1-1/4-inches; 15 pounds per square foot, diamond finish, and natural color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.

2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 1. Submit test result within 24 hours of performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Do not install insulation or roofing over damp, wet, frost covered or otherwise unsatisfactory deck conditions. Decking shall be clean and dry prior to proceeding with Work.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie into existing roofing to maintain weathertightness of transition and not void warranty for existing roofing system.

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 1. Install base layer of insulation with joints staggered not less than 6-inches in all directions.

- a. Ensure that decking is dry and frost free prior to proceeding with Work.
 - b. Locate end joints over crests of decking.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4-inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump.
- 1) Trim insulation so that water flow is unrestricted.
- f. Fill gaps exceeding 1/4-inch with foam insulation.
 - g. Cut and fit insulation within 1/4-inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation over substrate.
2. Install upper layer of insulation and tapered insulation with joints of each layer offset not less than 6-inches from previous layer of insulation.
- a. Install with long joints continuous and with end joints staggered not less than 6-inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4-inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump.
 - e. Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4-inch with foam insulation.
 - g. Cut and fit insulation within 1/4-inch of nailers, projections, and penetrations.
 - h. Mechanically attach upper layer of insulation, through base layer and down to substrate as required to meet specified wind speed warranty.

3.5 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's roofing consultant.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply aerosol adhesive spray to substrate and underside of roof membrane at rate required by manufacturer, and allow to 'flash-off' before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters as required to meet specified windspeed warranty.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

- H. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
- I. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread water cut-off mastic bed over deck-drain flange at roof drains at a rate of one (1) tube per drain, and securely seal roof membrane in place with clamping ring.
- K. Adhere ECO-CO protection sheet over roof membrane at locations indicated.

3.6 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply aerosol spray adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply low-VOC EPDM primer, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars at a rate of 6-inches on-center or every pre-punched hole.

3.7 INSTALLATION OF WALKWAYS

- A. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified, IIBEC member (International Institute of Building Enclosure Consultants) testing agency to inspect roofing work in progress, including substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect. IIBEC member consultant shall conduct a minimum of one inspections for every ____ SF of installed roofing.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075323

ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: Mechanicsburg Area School District
 2. Street Address: 500 South Broad Street, Mechanicsburg, PA 17055
 3. Building Name/Type: Mechanicsburg Area Senior High School
 4. City/State: Mechanicsburg, Pennsylvania
 5. Area of Work: Addition Roofs
 6. Acceptance Date: _____
 7. Warranty Period: Two (2) years from the date of Substantial Completion.
 8. Expiration Date: _____
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Fire;
 - c. Failure of roofing system substrate, including cracking, settlement, excessive Deflection, deterioration, and decomposition;
 - d. Faulty construction of parapet walls, copings, chimneys, skylights, vents, Equipment supports, and other edge conditions and penetrations of the work;
 - e. Vapor condensation on bottom of roofing; and
 - f. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations,

attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

SECTION 075416 - KETONE ETHYLENE ESTER (KEE) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Adhered thermoplastic KEE roofing system on metal deck, including:
 - 2. Roof insulation.
 - 3. Roof insulation cover board.
 - 4. Walkways.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof flashings and counter-flashings.
 - 3. Division 7 Section "Roof Specialties" for roof hatches and other roof specialties.
 - 4. Division 7 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
 - 5. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" and NRCA's Glossary for definition of terms related to roofing work in this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review warranty and manufacturer assembly letters.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
 1. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastener spacings and patterns for mechanically fastened components.
 2. Base flashings and membrane terminations.
 - a. Indicate details meet requirements of NRCA and FM required by this Section.
 3. Layout and thickness of insulation.
 4. Tapered insulation layout, including slopes.
 5. Crickets, saddles, and tapered edge strips, including slopes.
 6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 7. Membrane securement, fastening or adhesion requirements.
- C. Samples for Verification: For the following products:
 1. Sheet roofing materials and base flashing, of type and color specified, including T-shaped side and end lap seam.
 2. Roof insulation and cover board.
 3. Walkway materials.
- D. Qualification Statements: For Installer, Manufacturer and Roofing Inspector.
 1. Letter written for this Project indicating manufacturer approval of Installer.
- E. Contractor's Product Certificate: Submit signed certification, on company letterhead, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.
- F. Manufacturer Certificates:
 1. Submit evidence of compliance with specified requirements in "Performance Requirements" Article.
 - a. Include: External fire resistance submittal and Wind uplift resistance submittal.

2. Product Compatibility: Indicate manufacturer has verified compatibility of roofing system components, including but not limited to: Roofing membrane, flashing sheets, adhesives, and sealants.
- G. Warranties: Unexecuted sample copies of special warranties.
- H. Field Quality Control Reports:
 1. Field Test Reports:
 - a. Fastener pullout test results and manufacturer's revised requirements for fastener patterns.
 - b. Test results and recommendations for fastening wood nailers according to ANSI/SPRI/FM 4435 ES-1.
 2. Inspection Reports: Reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.
 - a. Submit reports within 48 hours after inspection.
- I. Manufacturer's Instructions: Submit copy of manufacturer's written installation instructions for specified roofing system.
- J. Maintenance Data: To include in maintenance manuals.
- K. Executed copies of warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. Manufacturer Qualifications: Approved manufacturer with roofing systems comparable to that specified for this Project, with minimum five years' experience in manufacture of thermoplastic roof membrane products in successful use in similar applications.
- C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:
 1. An authorized full-time technical employee of the manufacturer.
 2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
 - 1. Protect stored liquid material from direct sunlight.
 - 2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
 - 1. Store in a dry location.
 - 2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT / FIELD CONDITIONS

- A. Protect building, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed, weathertight.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove temporary plugs from roof drains at end of each day.
 - 4. Remove and discard temporary seals before beginning work on adjoining roofing.

1.9 WARRANTY

- A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.
 - 1. Form of Warranty: Manufacturer's standard warranty form.
 - 2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.
 - 3. Warranty Period: 30 years from date of completion.
- B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.
 - 1. Inspections to occur in following years: 2, 5, 10, 15, 20 and 25 following completion.
- C. Installer Warranty: Installer's warranty signed by Installer, as follows.
 - 1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.
 - 2. Scope of Warranty: Work of this Section.
 - 3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.
 - 1. Manufacturers of comparable products: Approved by Architect prior to bid.
- B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 10,000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing system materials to be compatible with one another and adjacent materials under conditions of service and installation required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures calculated in accordance with ASCE-7 and applicable code.

1. Calculate pressures for Allowable Stress Design, including a safety factor multiplier of 2.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to ANSI/SPRI/FM 4435 ES-1, capable of resisting design pressures calculated in accordance with ASCE-7 and applicable code.

E. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. Roofing system manufacturer's details and recommendations.
2. FM 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
3. FM 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
4. NRCA Roofing Manual for construction details and recommendations.
5. SMACNA Architectural Sheet Metal Manual for construction details.

F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

2.3 MATERIALS, GENERAL

A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

2.4 THERMOPLASTIC MEMBRANE MATERIALS

A. KEE Roof Membrane:

1. Thermoplastic Ketone Ethylene Ester (KEE) coated polyester fabric-reinforced sheet, ASTM D6754.

- a. Basis of design product: Tremco, TremPly KEE Single Ply Roof Membrane.

- b. Breaking Strength, minimum, ASTM D751: Machine direction, 500 lbf/in (87 kN/m); Cross machine direction, 400 lbf/in (70 kN/m).
- c. Tear Strength, minimum, ASTM D751: Machine direction, 120 lbf (162 N/m); Cross machine direction, 140 lbf (190 N/m).
- d. Elongation at Break, ASTM D751: 20 percent.
- e. Dynamic Impact/Puncture Resistance, ASTM D5635: 30 J, minimum.
- f. Minimum Membrane Thickness, nominal, less backing, ASTM D751: 60 mils (1.5 mm).
- g. Thickness over fiber, optical method: 0.016 inches (0.406).
- h. Accelerated Weathering, ASTM G155 and ASTM G154: Not greater than 15,000 hr., no cracking or crazing.
- i. Abrasion Resistance, ASTM D3389: Not greater than 2,000 cycles, H-18 wheel, 1,000 g load.
- j. Color: **White**

2.5 BASE FLASHING MATERIALS

- A. Sheet Flashing: Manufacturer's standard, smooth-backed, sheet flashing of same material, type, reinforcement, thickness and color as KEE roof membrane.

2.6 ADHESIVE MATERIALS

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - 2. Membrane Bonding Adhesive:
 - a. Bonding adhesive, solvent based fast drying, VOC-compliant, for bonding KEE smooth-backed single ply membranes and flashings to substrates.
 - 1) Basis of design product: Tremco, TremPly KEE LV Bonding Adhesive.
 - 2) VOC, maximum, ASTM D 3960: 200 g/L.
 - 3. Flashing Membrane Adhesive:
 - a. Same product as membrane adhesive.

2.7 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
- B. Prefabricated Flashings: As recommended by roof membrane manufacturer, for pipe, penetration and miscellaneous flashings.
- C. Fasteners, General: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FM 4470, designed for fastening roofing components to substrate,

tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

1. Use fasteners of type listed in manufacturer's tested assembly for required wind uplift resistance.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 mm by 3 mm) thick; with anchors.
- E. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.
 1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.
 - a. Basis of design product: Tremco, TremSEAL Pro.
 - b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.
 - c. Hardness, Shore A, ASTM C661: 40.
 - d. Adhesion to Concrete, ASTM C794: 35 pli.
 - e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).
 - f. Color: Closest match to substrate.
- F. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories, as recommended by roofing system manufacturer.

2.8 ROOF INSULATION AND INSULATION ACCESSORIES

- A. Roof Insulation, General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from insulation manufacturer's standard sizes, suitable for application, and of thicknesses indicated. Provide roof insulation accessories recommended by insulation manufacturer for intended use and compatible with roofing.
 1. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.
- B. Roof Insulation:
 1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.
 - a. Compressive Strength, ASTM D1621: Grade 2: 20 psi (138 kPa).
 - b. Conditioned Thermal Resistance at 75 deg. F (24 deg. C): 14.4 at 2.5 inches (50.8 mm) thick.
 - c. Provide 2 layers of 2.5 inch-thick polyisocyanurate insulation.

C. Insulation Cover Board:

1. Gypsum panel, cellulosic fiber reinforced, water-resistant, ASTM C1278/C1278M.
 - a. Basis of design product: USG Securock, Gypsum-Fiber Roof Board.
 - b. Thickness: 1/2 inch (13 mm).

D. Roof Insulation and Cover Board Adhesive:

1. Urethane adhesive, bead-applied, low-rise two-component solvent-free low odor, formulated to adhere roof insulation to substrate.
 - a. Basis of design product: Tremco, Low Rise Foam Insulation Adhesive.
 - b. Flame Spread Index, ASTM E84: 10.
 - c. Smoke Developed Index, ASTM E84: 30.
 - d. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.
 - e. Tensile Strength, minimum, ASTM D412: 250 psi (1720 kPa).
 - f. Peel Adhesion, minimum, ASTM D903: 17 lbf/in (2.50 kN/m).
 - g. Flexibility, 70 deg. F (39 deg. C), ASTM D816: Pass.

E. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

F. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

G. Substrate Joint Tape: 6- or 8-inch- (150- or 200-mm-) wide, coated, glass fiber.

2.9 WALKWAY MATERIALS

A. Walkway Material:

1. Protection walkway roll, reinforced KEE membrane roll with diamond-tread, slip-resistant surface, fabricated for heat welding to compatible KEE membrane surface.
 - a. Basis of design product: Tremco, TremPly KEE Protection Walkway Roll.
 - b. Roll Size: 30 inches by 100 ft (760 mm by 25.4 m).
 - c. Thickness: 0.060 inch (1.5 mm).
 - d. Breaking strength: 450 lbs (77 kN/m).
 - e. Color: **Light Gray**.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - a. Verify that perimeter nailers for copings and roof edge flashings are securely fastened according to ANSI/SPRI/FM 4435 ES-1, and applicable code, to resist uplift pressures.
 3. Verify that substrate is sound and dry.
 4. Steel Roof Deck: Refer to Division 05 "Steel Decking" Section.
 - a. Verify that deck is securely fastened and properly supported with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
- A. Remove existing roofing and protect existing building in accordance with requirements of Division 07 Section "Preparation for Re-Roofing."
 - B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
 - C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
 - D. Protect existing roofing system that is indicated to remain, and adjacent portions of building and building equipment.
 1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
 2. Maintain temporary protection and leave in place until replacement roofing has been completed.
 - E. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.
 - F. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with roofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

3.3 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's written instructions and approved details.
- B. Cooperate with testing agencies engaged or required to perform services for installing roofing system.

3.4 ROOFING INSTALLATION DETAILS

- A. NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations; modify as required to comply with manufacturer's approved details and perimeter fastening requirements of FM references if applicable.

3.5 INSULATION AND INSULATION ACCESSORIES INSTALLATION

- A. Comply with roofing manufacturer's and insulation manufacturer's written instructions for installing roof insulation.
- B. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- C. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- D. Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.
 - 1. Where crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- F. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
 - 1. Flat Insulation System on Sloped Roof Deck: Install insulation at minimum thickness as follows:
 - a. Minimum total thickness of Continuous Insulation: 5.2 inches.
 - 1) Minimum thickness of base layer: 2.6 inches.
 - 2) Minimum thickness of each subsequent layer: 2.6 inches.

- b. Minimum Continuous Insulation R-value: Not less than: Not less than 30.
- 2. Insulation Drain Sumps: Tapered insulation sumps, not less than 4 by 4 ft. (1,200 by 1,200 mm), sloped to roof drain.
 - a. Sump to maximum depth of not more than 1 inch (25 mm) less than the Project-stipulated continuous insulation thickness based upon code requirements.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- I. Insulation Installation Method:
 - 1. Adhered Insulation Application Method: Install each layer of insulation and adhere to substrate as follows:
 - a. Prime substrate with primer as recommended by manufacturer and allow to dry.
 - b. Adhere insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - c. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- J. Cover Board Installation:
 - 1. Comply with roofing system and cover board manufacturer's written installation instructions.
 - 2. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
 - a. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - b. At internal roof drains, conform to slope of drain sump.
 - c. Trim cover board, so that water flow is unrestricted.
 - d. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 3. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.
 - a. Set cover boards in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining cover in place.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.
- B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow adhesive to become tacky before installing membrane roofing; do not allow adhesive to fully dry. Roll membrane into adhesive. Do not apply adhesive to splice area of membrane.
- E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- G. Welded Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

- A. Membrane Flashings: Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
 - 1. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
 - 2. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
 - 3. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
 - 4. Seal top termination of base flashing with a metal termination bar and a continuous bead of joint sealant.

- B. Extend base flashing up walls or parapets a distance of 8-12 inches (200-300 mm) above roofing and 6 inches (150 mm) onto field of roofing, unless otherwise recommended by roofing manufacturer.

- 1. Comply with roofing manufacturer's and NRCA details.

3.8 WALKWAY INSTALLATION

- A. Walkways, General: Install walkways according to roofing manufacturer's written instructions.

- 1. Install walkways at following locations:
 - a. Provide one walkway at each flat roof area from roof hatch past mechanical units.

- B. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

- A. Roofing Inspector: Contractor shall engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

- 1. Engage a qualified roofing inspector for a minimum of 2 full-time days on site, per 40-hour crew week, to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with applicable criteria established in NRCA's "Quality Control and Quality-assurance Guidelines for the Application of Membrane Roofing Systems."

- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

- 1. Notify Architect 48 hours in advance of date and time of inspection.

- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

- 1. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect.

- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition

free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075416

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Exposed trim and fascia.
2. Metal flashing.
3. Copings.
4. Roof edge fascia.
5. Scuppers.
6. Gutters and downspouts.
7. Cast iron boots.
8. Precast concrete splash blocks.

- B. Related Sections include the following:

1. Division 4 Section "Unit Masonry (Assemblies)" for mockup requirements to include sheet metal flashing and trim.
2. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
3. Division 7 Section "Composite Wall Panels" for installing sheet metal flashing and trim integral with composite wall panels.
4. Division 7 Section "Standing Seam Metal Roofing" for metal roofing, flashings and trims associated with the metal roof.
5. Division 7 Section "Thermoplastic Polyolefin (TPO) Roofing" for sheet metal flashing and trim required to be used in conjunction with membrane roofing systems.
6. Division 7 Section "Joint Sealants" for elastomeric sealants to be installed in attachments, joints and penetrations of sheet metal flashing and trim.
7. Division 7 Section "Roof Accessories" for flashings required for various roof-penetrating items.
8. Division 21 Fire Protection Sections, Division 22 Plumbing Sections, Division 23 HVAC Sections and Division 26 Electrical Sections for various roof-mounted and penetrating items requiring sheet metal flashing and trim assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install flashings capable of resisting design forces according to recommendations in FMG Loss Prevention Data Sheet 1-49. Manufacture and install copings and roof edge flashings tested according to ANSI\SPRI ES-1 and capable of resisting design forces.
 - 1. Refer to Structural Drawings for wind design criteria. At a minimum, design sheet metal flashings and trim to meet a 72 mph windspeed warranty.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes. For copings and roof edge flashings, allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements.
 - 1. Temperature Change (Range): 120 deg. F, ambient; 180 deg. F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - a. Custom formed copings and roof edge flashings will be required for curved walls.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 - 6. Details of edge conditions, including eaves, crickets, and counterflashings as applicable.
 - 7. Details of special conditions.

8. Details of connections to adjoining work.
 9. Detail formed flashing and trim at a scale of not less than 3 inches per 1 foot.
 10. Details of transitions between downspouts, cast iron boots and sub-surface storm drain systems.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Samples shall show the full range to be expected for each color required.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Full scale sample thru-wall scupper box fabricated in accordance with details on Drawings.
 3. Full scale sample conductor head fabricated in accordance with details on Drawings.
 4. Trim, Copings, Roof Edge Flashings, Metal Closures, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 5. Accessories and Miscellaneous Materials: Full-size Sample.
- D. Qualification Data: For qualified fabricator.
- E. Maintenance Data: For sheet metal flashing, trim and accessories to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. The mockups required by this Section shall be installed as components of the full-scale masonry assemblies mockup specified in Division 4 Section "Unit Masonry (Assemblies)".
1. Build mockups of typical roof conditions, including coping assembly, scupper box and/or conductor head, fascia, fascia trim, and/or apron flashing, including supporting construction cleats, seams, fasteners, attachments and accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- D. Pre-installation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings".

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 1. Surface: Smooth, flat.
 2. Exposed Finishes:

- a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Color: As selected by Architect from manufacturer's full range of available two-coat colors.
 - b. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- 3. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- 4. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - a. Color: As selected by Architect from full range of industry colors and color densities.
 - b. Color Range: Noticeable variations in the same piece are unacceptable. 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.
- C. Stainless-Steel Sheet: ASTM A240 or ASTM A666, Type 304, dead soft, fully annealed.
 - 1. Finish: 2D dull, cold rolled (for installations not exposed to view).
 - 2. Finish: 4 polished directional satin (for installations exposed to view).
 - 3. Surface: Smooth, flat.
- D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality.
 - 2. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 - 3. Surface: Smooth, flat.
 - 4. Exposed Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Color: As selected by Architect from manufacturer's full range of available two-coat colors.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A153 or ASTM F2329 or Series 300 stainless steel.
- C. Solder:
 - 1. For Stainless Steel: ASTM B32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.
- I. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene or polypropylene film top surface laminated to a layer of butyl or SBS-modified

asphalt adhesive, with release-paper backing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
- b. Henry Company.
- c. Owens Corning.
- d. SDP Advanced Polymer Products Inc.

J. Felt: ASTM D226, Type II (No. 30), asphalt-saturated organic felt; non-perforated.

K. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to the greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. On-Site Fabrication: Subject to compliance with specified requirements, sheet metal flashing and trim components, with the exception of copings, may be fabricated on-site or shop-fabricated using UL-certified roll-forming equipment if sheet metal flashing and trim components are of same profile and warranted by manufacturer to be equal to factory-formed components. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances of 1/4 inch in 20 feet on slope and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- I. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- J. Do not use graphite pencils to mark metal surfaces.

2.4 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carlisle Syntec Systems.
 - 2. ATAS International, Inc.
 - 3. Cheney Flashing Company.
 - 4. Hickman Company, W. P., an OMG, Inc. company.
 - 5. Johns Manville.
 - 6. Metal-Era, Inc.
 - 7. Petersen Aluminum Corporation, a Carlisle company.
 - 8. Una-Clad; Firestone Building Products.

2.5 COPINGS

- A. Copings: Fabricate in minimum 96 inch-long, but not exceeding 12 foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to anchor the exterior leg.
 - 1. Coping Profile: As indicated on Drawings.
 - 2. Joint Style: Butted with expansion space and 6 inch-wide, exposed cover plate.
 - 3. Coping Material: Aluminum, 0.050 inch thick.
 - 4. Finish: Class 1 clear anodic finish.
 - 5. Corners: Shop or factory-mitered ONLY.
 - 6. Special Fabrications: Radiused Sections.

2.6 ROOF-EDGE FASCIAS

- A. Roof-Edge Fascia and Gravel Stop: Fabricate in minimum 96 inch-long, but not exceeding 12 foot-long sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to anchor the exterior leg.
 - 1. Fascia Profile: As indicated on Drawings.
 - 2. Joint Style: Butted with expansion space and 6 inch-wide, exposed cover plate.
 - 3. Fascia Material: Aluminum, 0.050 inch thick.
 - 4. Finish: Class 1 clear anodic finish.
 - 5. Corners: Shop or factory-mitered ONLY.
 - 6. Special Fabrications: Radiused Sections.

2.7 MISCELLANEOUS LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Counterflashing: Fabricate from aluminum, 0.032 inch thick.
- B. Roof-Penetration Flashing: Fabricate from one of the following materials:
 - 1. Copper: 16 oz./sq. ft.
 - 2. Stainless Steel: 0.019 inch thick.

2.8 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Parapet Scuppers: Fabricate one-piece welded scuppers to dimensions and details indicated on Drawings. Provide a 1-1/2-inch wide, one-piece picture frame trim at the exterior face of the building.
 - 1. Scupper Material: Fabricated from 16 Ga. stainless steel as detailed.
 - 2. Face Frame Material: One piece face frame fabricated from 16 Ga. stainless steel.
 - a. Color: Provide powder coated finish on one piece face frame. Color as selected by Architect from full range of RAL color numbers.
- B. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated on Drawings, complete with outlet tubes. Separate dissimilar metals where conductor heads come into contact with scupper boxes. Fabricate from the following material:
 - 1. Aluminum: 0.050 inch thick, Class 1 clear anodic finish.
 - 2. Metallic-Coated Steel Sheet: 18 Ga. steel sheet.
- C. Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter

thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop-fabricate interior and exterior corners.

1. Gutter Profile: Style A, according to cited sheet metal standard. Expansion Joints: Lap type or built in.
2. Accessories: Wire-ball downspout strainer; valley baffles, where applicable. Provide outlet tubes, end caps and other special pieces as required.
3. Material: Aluminum, 0.050 inch thick, Class 1 clear anodic finish. Metallic-Coated Steel Sheet: 18 Ga. steel sheet.

- D. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with shop-fabricated, mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricated Hanger Style: Fig 1-35A, according to SMACNA's "Architectural Sheet Metal Manual." Material: Aluminum, 0.050 inch thick, Class 1 clear anodic finish.
2. Metallic-Coated Steel Sheet: 18 Ga. steel sheet.

2.9 CAST IRON BOOTS

- A. Cast Iron Boots: Prefinished, gray iron castings complying with ASTM A48, contoured interior flow design with no boxed corners, weld seams or choke points. Include integral lug slots and side wall cleanout. Provide flexible rubber adaptor for connection to drainage pipe.
- B. Basis of Design Products: J.R. Hoe & Sons, Middlesboro, KY www.downspoutboots.com.
1. Material: Cast iron.
 2. Length: Minimum 28 inches with integral side wall cleanout.
 3. Shape: Rectangular.
 4. Offset Configuration: As required.
 5. Opening Size: As required to receive downspout.
 6. Finish: Powder coat. Color to be selected from manufacturer's full range of available colors.

2.10 PRECAST CONCRETE SPLASH BLOCKS

- A. Precast Concrete Splash Blocks: Precast concrete splash blocks with 3/16 inch radiused corners and 1/16-inch eased edges designed to channel water away from the base of the building.
- B. Basis of Design Products: Modern Precast www.modernprecast.com.
1. Material: Concrete.
 2. Length: 36 inches.
 3. Width: 18 inches.
 4. Thickness: 3-7/8 inches
 5. Shape: Rectangular trough.
 6. Color: Standard gray.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine walls, roof edges and parapets for suitable conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof specialty and sheet metal flashing and trim systems.
 - 1. Install roof specialties and sheet metal flashing and trim level, plumb and true to line and elevation with limited oil-canning. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats for securing sheet metal not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other, or where metals contact corrosive substrates such as pressure treated wood or cementitious construction, protect against galvanic action by one of the following methods:
1. Paint contact surfaces with bituminous coating or by other permanent separation coating as recommended by SMACNA.
 2. Separate contact surfaces with felt (No. 30).
 3. Separate contact surfaces with self-adhering sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of a corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4-inch for wood screws and metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder aluminum sheet.
 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- F. Rivets: Rivet joints in uncoated aluminum where indicated or where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA standards, and as detailed on Drawings. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Parapet Scuppers: Install scuppers where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face in accordance with roofing manufacturer's acceptable standards and details, and to achieve roofing manufacturer's warranty.

1. Install scuppers as detailed on Drawings.
 2. Anchor scupper face trim to exterior wall and seal with elastomeric sealant. Refer to details on Drawings.
 3. Flash and seal scupper into adjacent roof to form a complete, watertight installation.
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet O.C. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
1. Calculate maximum storm water flows for roof areas to be drained by each gutter and size gutters to accommodate calculated flow volumes.
- D. Downspouts: Join sections with 1-1/2 inch telescoping joints with upper sections inserted into lower sections. Provide fasteners designed to hold downspouts securely following the specified attachment Figure. Locate fasteners at top and bottom of downspout and at approximately 60 inches centers in between.
1. Provide elbows at base of downspouts to direct water away from building, or allow for connection into subsurface storm water system.
 2. As a minimum size, calculate maximum storm water flows for the roof areas to be drained by each downspout and size downspouts to accommodate calculated flow volumes.
 3. Install downspouts into cast iron boots. **PVC boots are not acceptable.**
 4. Provide rubber boot transition caps at downspout boots to finish off the downspout to boot connection, and to prevent debris from entering the boot.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standards. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification. Refer to details on Drawings.
1. Install copings in accordance with ANSI/SPRI/FM 4435/ES-1.
 2. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24 inch centers.
 3. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24 inch centers.
 4. All joints shall be weathertight.
- C. Roof Edge Fascias: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification. Refer to details on Drawings.

1. Install roof edge fascias in accordance with ANSI/SPRI/FM 4435/ES-1.
 2. Interlock exterior bottom edge of roof edge fascia with continuous cleat anchored to substrate at 24 inch centers.
 3. All joints shall be weathertight.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standards unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 4 Section "Unit Masonry (Assemblies)".

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4-inch in 20 feet on slope and location lines as indicated, and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trims that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof hatches.
 - 2. Roof Edge Protection Guards
- B. Related Sections include the following:
 - 1. Division 7 Section "Sheet Metal Flashing and Trim" for shop and field-formed metal flashing, roof-drainage systems and miscellaneous sheet metal trim and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally-induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant and field-assembled work.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.

3. Other roof-mounted or roof structure-mounted items, including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported or installed.

PART 2 - PRODUCTS

2.1 ROOF HATCHES

- A. Roof Hatches: Metal roof-hatch units with lids and insulated, double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Babcock-Davis.
 - b. Bilco Company (The).
 - c. J. L. Industries, Inc. ; a division of the Activar Products Group.
 - d. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom.
- B. Type and Size: Single-leaf lid. Sizes as indicated on Drawings.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Aluminum sheet, 0.090 inch thick; mill finish.
- E. Construction:

1. Insulation: Cellulosic-fiber, Glass-fiber, or Polyisocyanurate board; R-Value of 12.0 or higher, according to ASTM C 1363.
 2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 4. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.
- F. Hardware: Stainless-steel spring latch with turn handles, butt or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches.
- G. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
 2. Height: 42 inches above finished roof deck.
 3. Material: Steel tube or aluminum.
 4. Post: 1-5/8-inch-diameter pipe.
 5. Finish: Manufacturer's standard baked enamel or powder coat; safety yellow color.

2.2 — ~~ROOF EDGE PROTECTION GUARDS~~

- A. ~~Non-Penetrating Roof Guardrail. The system is a non-penetrating roof guardrail designed for flat roof edge protection that, includes railing sections, weighted base plates and accessories in the configuration and locations indicated on the Drawings.~~
- B. ~~Basis of Design: 360 Mobile Safety Rail System: Provide EDGE Fall Protection LLC's 360 Mobile Safety Rail System~~
- C. ~~System top and mid rail provided in accordance with OSHA Standards 29 CFR 1910.23 (a)(2).~~
- D. ~~Structural Load: 200 lb (90.7 kg), minimum, in any direction to all components in accordance with OSHA Regulation 29 CFR 1926.502.~~
- E. ~~Height: 42 inches (1067 mm), minimum.~~
- F. ~~Railings: 1 5/8 inch (41 mm) O.D. hot rolled pickled electric weld tubing, free of sharp edges and snag points.~~
- G. ~~Mounting Bases: 104# Class 30 gray iron material cast with four receiver posts. Rubber pads are standard on bottom of bases.~~
- H. ~~Receiver Posts: Provided with a positive pin locking system into base and rail interface that allow rails to be mounted in any direction. Receiver posts shall have drain holes.~~
- I. ~~Toe Board Brackets.~~

- J. ~~Finishing Rail: D-shaped railing extension for ladder landings, length of rail section and D-loop as indicated on the Drawings and as required.~~
- K. ~~Securing Pins: 1010 carbon steel, zinc plated and yellow chromate dipped. Pins shall consist of collared pin and latch that connects to lynchpin.~~
- L. ~~Roof Pads: Provide TPO Roof Pad under each base to protect roof membrane.~~
- M. ~~Base Mover: Provide Base Mover, Part #400062 two wheeled steel cart to transport one base unit. (ADDENDUM 4)~~

2.3 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Mill Finish: As manufactured.
- B. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- C. Stainless-Steel Sheet and Shapes: ASTM A 240 or ASTM A 666, Type 304.
- D. Steel Shapes: ASTM A 36, hot-dip galvanized according to ASTM A 123 unless otherwise indicated.
- E. Steel Tube: ASTM A 500, round tube.
- F. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123.
- G. Steel Pipe: ASTM A 53, galvanized.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.
- C. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.
- D. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
 - 1. Install roof hatch so top surface of hatch curb is level.
 - 2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
- D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.
- B. Clean off excess sealants.
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal fire assemblies.
 - 3. Penetrations in smoke barriers.
- B. Related Sections:
 - 1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers of products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace Construction Products.
 - 3. Hilti, Inc.
 - 4. Johns Manville.
 - 5. Nelson Firestop Products.
 - 6. Specified Technologies Inc.
 - 7. 3M Fire Protection Products.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Do not make penetrations in rated assemblies larger than capabilities of tested products available to seal penetration.
- B. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- C. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes:

1. Exterior sealants.
2. Exterior EIFS sealants.
3. Exterior and interior traffic sealants.
4. Interior sealants.
5. Interior food contact sealants.
6. Interior sanitary sealants.
7. Exterior and interior water immersed sealants.
8. Metal lap joint sealants.
9. Threshold and sheet metal bedding sealants.
10. Joint accessories.
11. Security sealants.

- B. Related Sections include the following:

1. Division 4 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 7 Section "Through Penetration Firestop System" for building joint-sealant systems.
3. Division 8 Section "Glazing" for glazing sealants.
4. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
5. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 SUBMITTALS

- A. Shop Drawing:

1. Submit a Sealant Schedule, and related details, indicating specific installation and interface between sealants and building materials for each type of joint sealant and joint backing material used in this specification. Use SAME reference designations as indicated in this Specification for preparation of the Joint Sealant Schedule in Part 3.6. Submittals are subject to the requirements of Division 1 Specification Section "Submittals."

- B. Product Data:
 - 1. For each joint-sealant product indicated.
- C. Samples:
 - 1. Submit standard cured color samples and charts for each sealant type illustrating full range of standard and custom colors.
- D. Manufacturer's Certificate:
 - 1. Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
 - 2. For manufacturer's products that include the phrase, "but are not limited to the following," the Contractor shall be responsible to provide certification that the submittal product complies with the specified product. This certification is subject to the requirements of Division 1 Specification Section "Submittals," Part 1, Definitions.
- E. Qualifications Data:
 - 1. For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified. Provide SWRI (Sealant, Waterproofing and Restoration Institute) Validation Certificate.
- F. Compatibility and Adhesion from sealant manufacturer indicating the following:
 - 1. Building materials forming joint and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
 - 3. Preconstruction Compatibility and Adhesion Field Test for each sealant and building material.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. Submit recommended inspection intervals.
 - 2. Submit instructions for repairing and replacing failed sealed joints.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Provide SWRI (Sealant, Waterproofing and Restoration Institute) Validation Certificate.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: 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.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience for the following sealant types:
1. Multi-component sealants cure by chemical reaction. Cure times are predictable depending on atmospheric temperature. Silicone sealant cure is not affected by temperature, however, frost and moisture at bond line will impair adhesion.
 2. Single component sealants cure by reaction with moisture. Cure times will vary depending on atmospheric humidity and temperature.
 3. Fast cure (FC) sealants provide lesser cure times than corresponding standard cure products. Longer cure times will permit more accumulation of dust and other air-borne contamination on surface of sealant, potentially causing apparent color change.
 4. Sealant Types are M – Multi-Component and S – Single Component.
 5. Sealant Grades are P – Pourable or Self-Leveling used for horizontal traffic joints and NS – Non-Sag or Gunnable used for vertical and non-traffic joints.
 6. Sealant Classes are 25, 50, and 100/50 (extension/compression) representing movement capability in percent of joint width. Joint movement is based on the relative percentage of installed width. Design to a minimum of 4 times anticipated movement to accommodate design tolerances and expected movement based on coefficient of thermal expansion.
 7. Sealant Uses are T – Traffic, NT – Non-Traffic, I – Immersion, M – Mortar, A – Aluminum, and O – Other. Use O includes color anodized aluminum, metals other than aluminum, painted surfaces, brick, stone, tile, and wood for example.
 8. Immersion rated sealant applications require primer.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.

- E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of standard and custom colors.

2.2 URETHANE SEALANT TYPES – For exterior or interior use.

- A. **U1** - Multi-Component, Non-Sag, Urethane: ASTM C920, Type M, Grade NS, Class 50; Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; Dynatrol II.
 - 2. Polymeric Systems, Inc.; PSI-270.
 - 3. Tremco, Inc.; Dymeric 240 FC.
- B. **U2** - Multi-Component, Traffic-Grade Urethane: ASTM C920, Type M, Grade NS, Class 50; Uses T, Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Polymeric Systems, Inc.; PSI-270
 - 2. Tremco, Inc.; Dymeric 240 FC.
- C. **U3** - Single-Component, Non-Sag Urethane: ASTM C920, Type S, Grade NS, Class 100/50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Sika Corporation, Construction Products Division; Sikaflex-15LM.
 - 2. Tremco, Inc.; Dymonic 100
- D. **U4** - Single-Component, Non-Sag Urethane: ASTM C920, Type S, Grade NS, Class 25, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; Dynatrol I-XL.
 - 2. Sika Corporation, Construction Products Division; Sikaflex-1a.
 - 3. Tremco, Inc.; Dymonic or Fulkem 116.
- E. **U5** - Single-Component, Pourable, Traffic-Grade Urethane: ASTM C920, Type S, Grade P, Class 25, Uses T. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; Urexpan NR-201.
 - 2. Tremco, Inc; Vulkem 45SSL.
 - 3. Sika Corporation, Construction Products Division; Sikaflex-1CSL.
- F. **U6** - Immersible, Single Component, Pourable, Traffic-Grade Urethane: ASTM C 920, Type S, Grade P, Class 25, Uses T and I. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Sika Corporation, Construction Products Division; Sikaflex-1CSL.
 - 2. Tremco, Inc.; Vulkem 45 SSL.

- G. **U7** - Immersible, Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C920. Type M, Grade P, Class 25, for Use T and I. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. LymTal International, Inc.; Iso-Flex 880GB.
2. May National Associates, Inc.; Bondaflex PUR 2 SL.
3. Tremco, Inc.; Vulkem 245

2.3 SILICONE SEALANT TYPES – For exterior or interior use.

- A. **S1** - Single-Component, Non-Staining, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to the following:

1. Dow Corning Corporation; 756SMS, 791, 795 or 995.
2. Tremco, Inc.; Spectrem 3.
3. Pecora Corporation; 864, 895 or 898.

- B. **S2** - Single Component, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 100/50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Dow Corning Corporation; 790
2. Pecora Corporation; 301NS, 311NS.
3. Tremco, Inc.; Spectrem 1.

- C. **S3** - Single Component, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Dow Corning Corporation; 791, 795 or 995.
2. Pecora Corporation; 864, 895 or 898.
3. Tremco, Inc.; Spectrem 2, Proglaze SSG.

- D. **S-4** - Single Component, Field-Tintable, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Pecora Corporation; 890 FTS.
2. Tremco, Inc.; Spectrem 4TS.

- E. **S5** - Mildew-resistant, Single Component, Acid-Curing Silicone: ASTM C920, Type S, Grade NS, Class 25, uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. BASF Building Systems; Omniplus
2. Dow Corning Corporation; 786 Mildew Resistant.
3. Tremco, Inc.; Tremsil 200 Sanitary.

2.4 LATEX SEALANT TYPES – For Interior Use Only

- A. **L1** – Acrylic Latex or Siliconized Acrylic Latex, ASTM C834, Type OP, Grade NF. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. BASF Building Systems; Sonolac.
 2. Pecora Corporation; AC-20+.
 3. Tremco, Inc.; Tremflex 834.
- B. **L2** - Acoustical Joint Sealant for Exposed and Concealed Joints: ASTM C1311 Manufacturer's standard Non-sag, paintable, no staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. Tremco, Inc.; Acoustical Sealant.
 2. Pecora Corporation; AC-20 FTR, AIS-919.
 3. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 SOLVENT-RELEASE-CURING-JOINT SEALANTS:

- A. **B1** - Butyl-Rubber-Based Joint Sealant: ASTM C 1311. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following.
1. Tremco, Inc.; Tremco Butyl Sealant.
 2. Bostik, Inc.; Chem-Calk 300.
 3. Pecora Corporation; BC-158.

2.6 PREFORMED JOINT SEALANTS – For exterior or interior applications per manufacturer's standards.

- A. **PF1** - Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of procured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. Dow Corning Corporation; 123 Silicone Seal
 2. Pecora Corporation; Sil-Span
 3. Tremco, Inc.; Simple Seal.
- B. **PF2** - Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu.ft. (160 kg/cu.m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping. Subject to compliance with

requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Tremco, Inc.; illbruk illmod 600.
2. EMSEAL Joint Systems, Ltd.; Emseal 25V.
3. School International, Inc.; Sealtite, Sealtite 50N.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASATM C 1330, of type indicated below and size and density to control sealant depth and otherwise contribute to producing optimum sealant performance, paired to the sealant type. List the type on the Sealant Schedule.
 1. **Type C:** Closed-cell material with a surface skin.
 2. **Type O:** Open-cell material.
 - a. Bostik, Inc.
 - b. Pecora Corporation
 - c. Tremco, Inc.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant back materials, free of oil residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include, but are not limited to, the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous surfaces include, but are not limited to, the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. **Joint Priming:** Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. **Masking Tape:** Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. **General:** Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. **Sealant Installation Standard:** Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead ¼ inch (6 mm) inside masking tape.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

Sealant types should be selected from the available listed products in Part 2 of this specification section. These sealants shall be indicated on the submittal schedule, using the same reference designation as indicated in Part 1.3.A. of this specification section.

- A. Exterior or Interior Sealant Joints

1. Applications:

- a. Control and expansion joints in cast-in-place concrete.
- b. Joints between [architectural] [structural] precast concrete units.
- c. Control and expansion joints in unit masonry.
- d. Control and expansion joints in stone masonry.
- e. Butt joints between metal panels.
- f. Joints between different materials listed above.
- g. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
- h. Control and expansion joints in soffits and overhead surfaces.

2. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified
- B. Interior Food Contact Sealant Joints.
1. Applications:
 - a. Joints in kitchen counter tops and work surfaces.
 - b. Joints between food service equipment and surrounding construction.
 - c. Other interior joints where incidental food contact may occur.
- C. Interior Sanitary Sealant Joints.
1. Applications:
 - a. Joints in toilet room and bathroom counter tops.
 - b. Joints between plumbing fixtures and adjacent materials.
 - c. Joints between locker room lockers and adjacent materials.
 - d. Joints between food service equipment and surrounding construction.
 - e. Other interior joints in wet areas where needed to limit mold and mildew growth.
- D. Immersed Sealant Joints.
1. Applications:
 - a. Joints in fountains and water features.
 - b. Joints in swimming pools.
 - c. Joints in vertical and horizontal surfaces of other potable water storage structures.
- E. Metal Lap and Bedding Sealant Joints.
1. Applications:
 - a. Concealed lap and hook joints in sheet metal flashing and trim.
 - b. Bedding joints under metal thresholds and saddles.
 - c. Bedding joints between sheet metal flashing and other materials.
- F. Preformed Joint Sealants:
1. Applications:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Joints between [architectural] [structural] precast concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Control and expansion joints in stone masonry.
 - e. Butt joints between metal panels.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
 - h. Control and expansion joints in soffits and overhead surfaces.

- i. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
- j. Joints between EIFS and other materials.

G. Interior Prison Security Sealants:

1. Applications:

- a. Control and expansion joints on exposed interior surfaces of floors, walls, etc., and at inmate/secure areas.
- b. Perimeter joints on exposed interior surfaces of interior and exterior openings, i.e., window and door frames, etc.
- c. Joints in precast walls, ceilings, and floor joints at inmate/secure areas.
- d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, and similar openings, and at inmate/secure areas. Refer to Security Sealants paragraph above for additional information.
- e. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified, and at inmate/secure areas.
- f. Joints between plumbing fixtures and adjacent materials at inmate/secure areas.
- g. Joints between locker room lockers and adjacent materials at inmate/secure areas.

END OF SECTION 079200

SECTION 079500 – EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes metal interior expansion joint cover assemblies for floors, walls and ceilings.
- B. Related Requirements:
 - 1. Division 7 Section "Firestopping" for fire-resistive assemblies used in conjunction with expansion joint cover assemblies.
 - 2. Division 7 Section "Joint Sealants" for liquid-applied and premolded elastomeric sealants for filling expansion joints.
 - 3. Division 9 Sections for finishes scheduled to be applied to walls, ceilings and floors.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches long in size.
- C. Samples for Initial Selection: For each type of expansion control system indicated.
 - 1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
- D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches long in size.
- E. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion control system.

2. Expansion control system location cross-referenced to Drawings.
3. Nominal joint width.
4. Movement capability.
5. Materials, colors, and finishes.
6. Product options.
7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Where indicated, provide expansion joint cover assemblies identical to those assemblies whose fire resistance has been determined per ANSI/UL 263, NFPA 251, or ASTM E 119, including hose stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Fire-Resistance Ratings: Not less than the rating of adjacent construction.
- B. Provide for accessibility compliance where required per new or existing conditions. Do not exceed maximum height variation as permitted by accessibility requirements.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, cross-connections, and other accessories as required to provide continuous expansion control systems.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide expansion joint cover assemblies manufactured by Construction Specialties, Inc. (C/S Group), or comparable products by one of the following:
 1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
 2. Balco, Inc.
 3. JointMaster/InPro Corporation.
 4. MM Systems Corporation.
 5. Nystrom, Inc.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Floor-to-Floor:
 1. Basis-of-Design Product: C/S Group "GFST-200" where floor finishes up to 1/8-inch-thick are scheduled; "GFS-200" at all other locations.
 2. Design Criteria:
 - a. Nominal Joint Width: 2 inches, or as otherwise indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Load Capacity:
 - 1) Uniform Load: 150 lb/sq. ft.
 - 2) Concentrated Load: 2,000 lb.
 - 3) Maximum Deflection: 0.5 inch.
 - e. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.
 3. Type: Recessed elastomeric seal, with hidden center plate.
 - a. Cover-Plate Design: Plain, serrated, or recessed to accept field-applied finish materials, depending on type required.
 - 1) Cover-Plate Recess Depth: For models required to accept flooring, recess depth shall be 1/8 inch.
 - b. Metal: Aluminum.
 - c. Seal Material: Santoprene.
- D. Floor-to-Wall:

1. Basis-of-Design Product: C/S Group "GFSTW-200" where floor finishes up to 1/8-inch-thick are scheduled; "GFSW-200" at all other locations.
2. Design Criteria:
 - a. Nominal Joint Width: 2 inches, or as otherwise indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.
3. Type: Recessed elastomeric seal, with hidden center plate.
 - a. Cover-Plate Design: Plain, serrated, or recessed to accept field-applied finish materials, depending on type required.
 - 1) Cover-Plate Recess Depth: For models required to accept flooring, recess depth shall be 1/8 inch.
 - b. Metal: Aluminum.
 - c. Seal Material: Santoprene.

E. Wall-to-Wall:

1. Basis-of-Design Product:
 - a. Gypsum Board Assembly Walls: C/S Group "FWF-200;" at 90-degree corners, "FWFC-200."
 - b. Gypsum Board Assembly Walls to Masonry Walls (90-degree corners): C/S Group "FWFC-200."
 - c. All Masonry Walls: C/S Group "FWF-200M;" at 90-degree corners, "FWFC-200M."
2. Design Criteria:
 - a. Nominal Joint Width: 2 inches, or as otherwise indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.
3. Type: Elastomeric seal.
 - a. Metal: Aluminum.
 - b. Seal Material: Santoprene.

F. Wall-to-Ceiling:

1. Basis-of-Design Product:

- a. Gypsum Board Assembly Ceilings (or similar rigid materials): C/S Group “FWFC-200.”
- b. Gypsum Board Assembly Ceilings to Masonry Walls (90-degree corners): C/S Group “FWFC-200.”
- c. Do not provide expansion joint cover assemblies for acoustical tile or similar suspended grid ceiling systems.

2. Design Criteria:

- a. Nominal Joint Width: 2 inches, or as otherwise indicated on Drawings.
- b. Movement Capability: -25 percent/+75 percent.
- c. Type of Movement: Thermal.
- d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.

3. Type: Elastomeric seal.

- a. Metal: Aluminum.
- b. Seal Material: Santoprene.

G. Ceiling-to-Ceiling:

1. Basis-of-Design Product:

- a. Gypsum Board Assembly Ceilings (or similar rigid materials): C/S Group “FWF-200.”
Do not provide expansion joint cover assemblies for acoustical tile or similar suspended grid ceiling systems.

2. Design Criteria:

- a. Nominal Joint Width: 2 inches, or as otherwise indicated on Drawings.
- b. Movement Capability: -25 percent/+75 percent.
- c. Type of Movement: Thermal.
- d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.

3. Type: Elastomeric seal.

- a. Metal: Aluminum.
- b. Seal Material: Santoprene.

2.4 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.
 1. Color: As selected by Architect from manufacturer's full range for each type or location.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.
- D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Repair or grout block-out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 - 5. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.
- E. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Factory primed, field painted steel doors.
 - 2. Factory primed, field painted steel door frames.
 - 3. Factory primed, field painted borrowed-lite frames.
 - 4. Factory primed, field painted fire-rated door and frame assemblies.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section "Flush Wood Doors" for wood doors that get installed in hollow metal frames.
 - 3. Division 8 Section "Fire-Rated Framing and Glass" for specialized, frames and glass for fire-rated glass walls.
 - 4. Division 8 Section "Door Hardware" for door hardware and weather-stripping.
 - 5. Division 8 Section "General Glazing" for glass in steel doors and sidelights.
 - 6. Division 8 Section "Fire-Rated Glazing" for fire-rated glass in steel doors and sidelights.
 - 7. Division 9 Section "Painting" for field painting primed doors and frames.
 - 8. Divisions 26 through 28 Electrical Sections for power wiring and low voltage requirements for electrified hardware.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/ SDI A250.8.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings".
 - 1. The Pre-installation Conference shall include representatives of the Owner's access control and security vendors. Prior to proceeding with the Work, the Contractor shall

coordinate all equipment and rough-in requirements with these Owner vendors to ensure all required pathways, junction boxes, etc., are installed correctly.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Door hardware supplier shall furnish templates, template reference number and/or physical hardware to the steel door and frame supplier to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Include the following:
 - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
 - 2. Elevations of each door design.
 - 3. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Locations of reinforcement and preparations for hardware.
 - 6. Details of each different wall opening condition.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
 - 10. Details of conduit and preparations for power, signal, and control systems. **Include point-to-point wiring diagrams showing the following:**
 - a. Power requirements for each electrically operated door hardware component.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- E. Door Schedule: Submit schedule of doors and frames using **SAME** reference numbers for details and openings as those on Contract Documents.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg. F maximum in 30 minutes of fire exposure.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- D. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

1.8 COORDINATION

- A. Field Measurements: Verify actual dimensions of openings by field measurement before fabrication.
- B. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete and masonry inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- C. Coordinate requirements for installation of electrified door hardware, access control and security systems.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain hollow doors and frames from a single source, from a single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steelcraft; an Allegion company.
 - 2. Amweld Building Products, LLC.
 - 3. CECO Door Products; an ASSA ABLOY Group company.
 - 4. Curries Company; an ASSA ABLOY Group company.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg. F above ambient after 30 minutes of standard fire-test exposure.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

2.3 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A569.
- B. Cold-Rolled Steel Sheet: Carbon steel complying with ASTM A366, commercial quality, or ASTM A620, drawing quality, special killed.
- C. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

- D. Frame Anchors: ASTM A591, Commercial Steel (CS), 4oz coating designation; mill phosphatized. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A153, Class C or D as applicable.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: 1-3/4-inch flush panel; full flush door edges with continuous laser weld.
 - a. Provide undercuts as noted on the Door Schedule.
 - 2. Core Construction: As follows:
 - a. Standard Interior Doors: Manufacturer's standard honeycomb core.
 - b. Fire Doors: Manufacturer's standard core as required to provide fire-protection and temperature-rise ratings indicated.
 - c. Exterior Doors: 1.8 lb/cu. ft. density polyurethane core, laminated to both face sheets with contact adhesive; capable of carrying the following minimum thermal-resistance properties:
 - 1) ASTM C518, Calculated: 10.0 R-Value; 0.10 U-Factor.
 - 2) ASTM C1363, Operable: 2.9 R-Value; 0.35 U-Factor.
 - 3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth.
 - a. Vertical Edges for Single-Acting Doors: Beveled edge; 1/8 inch in 2 inches.
 - b. Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

4. Top and Bottom Edges: Closed with inverted 15-gauge-thick minimum end closures or channels of same material as face sheets, extending full width of the door and welded to face sheet.
 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Extra heavy-duty, Level 3, Model 2, seamless design, minimum 0.053-inch thick (16 Ga.) galvanized steel sheet faces.
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Heavy-duty, Level 2, Model 2, seamless design, minimum 0.042-inch-thick (18 Ga.) cold-rolled steel sheet faces Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
 - a. At interior locations noted to be galvanized, provide extra heavy-duty, Level 3, Model 2 doors.
- D. Hinge Reinforcement: Minimum 7 gauge plate, 1-1/4 inch x 9 inches, or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.5 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated (galvanized) steel sheet.
1. Fabricate frames with mitered or coped corners, face-welded unless otherwise indicated.
 2. Frames for Level 3 Steel Doors: 16-gauge-thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet; provide metallic-coated steel sheet where specifically indicated.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as face-welded, unless otherwise indicated.
 3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
 - a. Frames with sidelites in drywall installations shall be welded.

- 4. Frames for Level 2 and Level 3 Steel Doors, Wood Doors and Borrowed Lights: 16-gauge-thick steel sheet.
 - a. Fabricate interior frames from metallic-coated steel sheet where doors are noted to be galvanized in the Door Schedule.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
- E. Plaster Guards: Provide minimum 0.0179-inch-thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- F. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry (Assemblies)."

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 19 gauge thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 7 gauge thick.
 - 2. Stud-Wall Type: Designed to engage steel stud, welded to back of frames; not less than 19 gauge thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Provided at each jamb, formed from A60 metallic-coated material, minimum 19-gauge-thick.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 22-gauge-thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 22-gauge-thick, fabricated from same material as frames in which they are installed.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

- B. Grout Guards: Formed from same material as frames, minimum 8-gauge-thick.
- C. Metal Louvers: Door and frame manufacturer's standard metal louvers, unless otherwise indicated. Provide louvers where noted in the Door Schedule.
 - 1. Blade Type: Vision proof, inverted V or Y shape.
 - 2. Metal and Finish: Galvanized steel, minimum 20-gauge-thick, factory-primed for factory-painted, powder-coated finish. Match pre-finished door and frame paint color, where applicable.
 - 3. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 90 minutes and less; meet fire rating as indicated.

2.9 FABRICATION

- A. Fabricate hollow metal doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory-cut openings in doors.
 - 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.

- 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware. Provide minimum 14-gauge closer reinforcement.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections.
- G. Electrified Hardware Coordination: Factory-weld 18 gauge electrical knockout boxes to frame for electrical hardware preparation, including, but not limited to, through-wire transfer hardware, raceways and wiring harnesses, door position switches, electric strikes, magnetic locks and jamb-mounted card readers, as specified in the hardware sets in Division 8 Section "Door Hardware" and Division 26 through 28 Electrical Sections.
1. Provide electrical knockout boxes with dual 1/2-inch and 3/4-inch knockouts.
 2. Conduit shall be coordinated and installed in the field from middle hinge box and strike box, and strike box to door position box.
 3. Electrical knockout boxes shall comply with NFPA requirements and accommodate electrical door hardware, per door hardware set requirements.

4. Electrical knockout boxes for continuous hinges shall be located in the center of vertical dimension on hinge jamb.
- H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
 6. Glazing: Comply with requirements in Division 8 Sections "General Glazing" and "Fire-Rated Glazing" and with hollow metal door manufacturer's written instructions.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA-1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

2.11 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780.
 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.12 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP-8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Contractor shall verify the accuracy of all dimensions indicated for existing openings in which new hollow metal frames and doors are scheduled to be installed, as well as existing frames scheduled to remain and accommodate new doors and/or hardware. Verify existing frame conditions to include, but not be limited to, locations of strikes and hinges and hinge backsets, for new hardware provisions.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. **Field-apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.**
 2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 4. In-Place Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 5. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

- b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Division 8 Sections "General Glazing" and "Fire-Rated Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly, between 2 inches o.c. and 9 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for door hardware requirements.
 - 2. Division 8 Section "General Glazing" for glass view panels in flush wood doors.
 - 3. Division 8 Section "Fire-Rated Glazing" for glass view panels in fire-rated flush wood doors.
 - 4. Division 8 Section "Hollow Metal Doors and Frames" for metal frames for wood doors.
 - 5. Divisions 26 through 28 Electrical Sections for power wiring and low voltage requirements for electrified hardware.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Details of doors, including vertical and horizontal edge details.
 - 3. Indicate dimensions and locations of cutouts.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire ratings for fire doors.
 - 6. Indicate preparations for power, signal, and control systems.
- C. Door Schedule: Use **SAME** reference designations indicated on Drawings in preparing schedule for doors and frames.

- D. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with WDMA Architectural Woodwork Quality Standards Illustrated.
 - 1. Provide WDMA Quality Certification Labels or a WDMA letter of licensing for Project indicating that doors comply with requirements of grades specified.
 - 2. When requested, provide evidence that the installer has successful experience completing projects of similar scope and with products as specified herein.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist), or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

- a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Basis of Design Product – Aspiro Series by Forte Opening Solutions. Subject to compliance with all specified requirements, the following manufacturers' products may also be incorporated into the Work:
 - 1. Flush Wood Doors:
 - a. VT Industries/Eggers.
 - b. Lambton.
- B. Manufacturers other than those listed above will not be accepted – No substitutions will be allowed.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species and Cut: Maple, plain sliced.
 - 3. Veneer flitch match: Book match, running match.
 - 4. Pair Match: Provide for doors hung in same opening or separated only by mullions.
 - 5. Stiles: Same species as faces.

2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
 - 1. Particleboard: ANSI A208.1, Grade LD-2, 32 lb. density.
 - 2. Blocking: Provide solid wood blocking in particleboard-core doors for installation of hardware.
- B. Interior Veneer-Faced Doors:
 - 1. Core: Particleboard.
 - 2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed and then veneered or laminated in a one-step hot press method.
- C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated for installation of hardware.
 - a. Doors with exit devices provide top rail, bottom rail and 5 x 10 right and left lock blocks.
3. Edge Construction: At hinge stiles, provide manufacturer's standard veneer-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
 - a. At locations where new doors are being retrofitted into existing frames, provide lumber edge doors to all for minor field fitting.
4. Pairs: Furnish formed-steel edges and astragals with intumescent seals for pairs of fire-rated doors, unless otherwise indicated.
 - a. Finish steel edges and astragals with baked enamel.
5. Pairs with Surface Mounted Panic Devices: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.
6. Intumescent Seals For Fire Rated Doors: Category "A" doors with manufacturer's standard concealed intumescent seals.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors:
 1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular beads.
 3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.
- C. Metal Louvers: Where doors are indicated in the Door Schedule to receive louvers, provide the following:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Louvers, Inc.; a division of the Activar Construction Products Group.
 - b. Anemostat Products; a Mestek company.
 - c. L & L Louvers, Inc.
 - d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - e. McGill Architectural Products.
2. Blade Type: Vision-proof, inverted Y or V.
3. Metal and Finish: Cold-rolled steel, 18-gauge frames with 22-gauge blades, factory-finished. Color to be selected by Architect from manufacturer's full range of available colors.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Pre-machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light and Louver Openings: rim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

- A. General: Comply with WDMA Architectural Woodwork Quality Standards Illustrated for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: WDMA System TR-6 catalyzed polyurethane, or UV cured polyurethane.

3. Staining: To be selected by Architect from manufacturer's full range of stain colors.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects, and replace at no cost to Owner.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083300 - OVERHEAD ROLLING DOORS, GRILLES, & SHUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric operated overhead rolling service doors.
2. Electric and manual operated, automatic closing, rolling counter fire doors.

B. Related Sections:

1. Metal Fabrications. Door opening jamb and head members.
2. Rough Carpentry. Door opening jamb and head members.
3. Door Hardware. Masterkeyed cylinder.
4. Division 26. Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, installation of control station and wiring, and connection to alarm systems.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Fire Rated Doors & Shutters: Provide doors with Underwriters' Laboratories, Inc. label for the fire rating classification as noted on drawings.

B. Design Requirements:

1. Air Infiltration to Comply With:
 - a. ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) Standard 90.1-2007, 2010 & 2013 requirements of less than .3 CFM/FT2
 - b. IECC (International Energy Conservation Code) 2012 requirements of less than 1.0 CFM/FT2
2. Wind Loading: Supply doors to withstand up to 20 psf design wind load
3. Cycle Life: Design doors of standard construction for normal use of up to 20 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the door
4. Seismic Performance: Provide manufacturer's seismic calculations confirming ASCE7-10
5. Insulated Door Slat Material Requirements:
 - a. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84

- b. Minimum R-value of 8.0 (U-value of 0.125) as calculated using the ASHRAE Handbook of Fundamentals
 - c. Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero
- 6. Safety: Chain operated doors shall be designed so that the door immediately stops upward or downward travel and is maintained in a stationary position when the hand chain is released by user.

1.3 SUBMITTALS

- A. Submit the following items:
 - 1. Product Data
 - 2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide manufacturer ISO 9001:2008 registration.
 - b. Provide manufacturer and installer qualifications.
 - c. Provide manufacturer's installation instructions.
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications: ISO 9001:2008 registered and a minimum of five years experience in producing fire and smoke control units of the type specified.
 - 2. Installer Qualifications: Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

- A. Follow manufacturer's instructions.

1.6 WARRANTY

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.
- B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cornell Iron Works, Inc.
 - 2. McKeon Rolling Steel Door Company, Inc.
 - 3. Overhead Door Corporation.
 - 4. Raynor.

2.2 ELECTRIC AND MANUAL OPERATED OVERHEAD INSULATED ROLLING DOORS

- A. Electric Operated Doors: ~~B140B and A170D~~ **020B (ADDENDUM 4)**
- B. Basis of Design: Cornell Model: ESD30
- C. Curtain: Air infiltration rate of less than .3 CFM/FT², validated by an independent testing agency. Test report required.
 - 1. Fabrication: Slat Material: Galvanized Steel/Galvanized Steel: Manufacturer recommended gauge based on performance requirements. Minimum 24/24 gauge, Grade 40, ASTM A 653 galvanized steel zinc coating
 - a. Insulation: 7/8 inch (22 mm) foamed-in-place, closed cell urethane
 - b. Total Slat Thickness: 15/16 inch (24 mm)
 - c. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
 - d. Minimum R-value: 8.0
- D. Endlocks: Fabricate interlocking sections with high strength [nylon] endlocks on alternate slats each secured with two ¼" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.
 - 1. Nylon: Required up to 21'-5" width (DBG - Distance Between Guides)
- E. Bottom Bar Configuration: Insulated Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge. Minimum 4" tall x 1-1/16" thickness.
 - 1. Air Infiltration Certification Label: Must be affixed to bottom bar

- F. Guides Fabrication: Thermal break required. Minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar. Top 16 ½" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service
- G. Counterbalance Shaft Assembly:
1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width
 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs . Provide wheel for applying and adjusting spring torque.
- H. Brackets: Fabricate from minimum 3/16 inch steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures
- I. Hood: Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
- J. Weather stripping:
1. Bottom Bar: Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar
 2. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain
 3. Lintel Seal: Double brush seal with EPDM sandwiched between the two brush seals at door header to impede air flow.
 4. Hood: Neoprene/rayon baffle to impede air flow above coil
- K. Operation - Electric
1. Motor Basis of design – Cornell Standard Use – Model MG (Industrial Duty Gear Head) Operator:
 - a. The operator must not extend above or below the door coil when mounted front-of-coil. Rated for a maximum of 20 cycles per hour (not to be used for consecutive hours)
 - b. UL listed (to comply with UL requirements in The United States and Canada), Totally Enclosed Non Ventilated gear head operator(s) rated (1/3) (1/2) or (3/4) hp as recommended by door manufacture for size and type of door, 115 Volts, Single Phase.
 - c. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, provisions for auxiliary push-up operation, and control station(s).
 - d. Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device.

- e. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position.
 - f. Operator shall be equipped with a disconnect cable for auxiliary push-up operation. Operator drive and door driven sprockets shall be provided with #50 roller chain.
 - g. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided.
 - h. Operator shall be capable of driving the door at a speed of 8 to 9 inches per second. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.
- 2. Control Station: Flush mounted: "Open/Close" key switch with "Stop" push button; NEMA 1B.
 - 3. Control Operation: Momentary Contact to Close: Fail-safe, UL325-2010 Compliant Entrapment Protection for Motor Operation
 - a. 2-wire, E.L.R. electric sensing/weather edge seal extending full width of door bottom bar.
 - 4. Sensing/Weather Edge: Automatic reversing control by an automatic sensing switch within neoprene or rubber astragal extending full width of door bottom bar
 - a. Electric sensing edge device. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.

~~2.3 — ELECTRICALLY OPERATED OVERHEAD ROLLING FIRE DOORS~~

~~A. — Doors: B136C~~

~~B. — Basis of design: Cornell Iron Works, Inc. — Model: ERD10~~

~~C. — Slats: Galvanized Steel with Finish: Minimum 18 gauge, Grade 40 steel, ASTM A 653 galvanized steel zinc coating.~~

~~D. — Endlocks: Fabricate interlocking continuous slat sections with high strength steel endlocks secured with two ¼" (6.35 mm) rivets per UL requirements.~~

~~E. — Bottom Bar:~~

- ~~1. Configuration: Structural Steel Angles: 2 structural steel angles minimum 2"x2"x1/8".~~

~~F. — Guides Fabrication~~

- ~~1. Minimum 3/16 inch structural steel Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar. Top 16 ½" of coil side~~

~~guide angles to be removable for ease of curtain installation and as needed for future curtain service.~~

~~G. Counterbalance Shaft Assembly:~~

- ~~1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width~~
- ~~2. Spring Balance: Oil tempered, heat treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.~~

~~H. Brackets: Fabricate from minimum 1/4 inch steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures~~

~~I. Hood: Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch steel intermediate support brackets~~

~~J. OPERATION~~

- ~~1. Motor Operation Basis of Design: Cornell AlarmGard Advanced Fire Door Motor Operation.~~
- ~~2. UL, cUL listed NEMA 1 enclosure, horsepower as recommended by manufacturer, 115v single phase service. Provide a totally enclosed non ventilated motor, removable without affecting the setting of limit switches; thermal overload protection, planetary gear reduction, adjustable rotary limit switch mechanism and a transformer with 24v secondary output. All internal electrical components are to be prewired to terminal blocks.~~
 - ~~a. Provide a failsafe motor operated door assembly requiring no ancillary or externally mounted release devices, cables, chains, pulleys, reset handles or mechanisms~~
 - ~~b. Provide an internal electrical failsafe release device that requires no additional wiring, external cables or mounting locations.~~
 - ~~c. Provide an internal solenoid brake mechanism to hold the door at any position during normal door operation.~~
 - ~~d. Provide logic for [1] fully monitored safety reversing devices such that the failure of any single monitored device will cause the motor operator to automatically revert to constant pressure to close.~~
 - ~~e. Electrically activate door system automatic closure by notification from central alarm system or power outage.~~
 - ~~f. Provide an automatic alarm closure selectable time delay of zero or ten seconds.~~
 - ~~g. Control automatic closure speed with an internal, totally enclosed, variable rate centrifugal governor without the use of electrical pulsation, constant rate viscosity, oscillation type or other exposed governing devices.~~
 - ~~h. Maintain automatic closure speed at not more than 9" per second.~~
 - ~~i. Enable safety edge function during alarm closing while power is present for [3] cycles. Enable door to rest upon obstruction following this sequence.~~

- j. ~~Electrically reset internal failsafe release device and door operating system upon restoration of electrical power and upon clearing of the alarm signal without requiring human interaction.~~
- k. ~~Provide selectable ability for the door system to automatically self-cycle to the fully open position following automatic reset without requiring human interaction.~~
- l. ~~Provide an integral, non-resettable cycle counter.~~
- m. ~~Ensure that manual resetting of spring tension, release devices, linkages or mechanical dropouts will not be required.~~
- n. ~~Provide minimum #50 roller chain for drive connection from motor drive assembly to the door drive shaft.~~
- o. ~~Install system only with manufacturer supplied or specified fasteners.~~
- p. ~~Notify electrical contractor to mount control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the door system wiring instructions.~~
- q. ~~Drop test and reset door system twice by all means of activation and comply fully with NFPA 80 Section 5.~~

3. Control Station:

- a. ~~Flush mounted: "Open/Close" key switch with "Stop" push button; NEMA 1B~~
- b. ~~Momentary contact to close: Fail safe, UL325-2010 Compliant Entrapment Protection for Motor Operation. Continuously monitored, wireless sensing/weather edge seal extending full width of door bottom bar.~~

K. ~~Electric Sensing Edge Device:~~

- 1. ~~Provide only a wireless sensing edge connection to motor operator.~~
- 2. ~~Electric coiling cords or take-up reels are not allowed to connect bottom sensing edge to motor.~~

L. ~~Locking:~~

- 1. ~~Motor Operated: Keyed cylinder locking into both jambs operable from both sides of curtain with motor interlock cutout switches. (ADDENDUM 4)~~

2.4 FINISHES

1. Steel Finishes:

- a. ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding. Baked-on base coat and baked-on polyester finish coat
- b. Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better

2. Aluminum Finishes:

- a. Clear anodized.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
- B. Comply with NFPA 80 and follow manufacturer's installation instructions.

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 FIELD QUALITY CONTROL

- A. Site Test: Test doors for normal operation and automatic closing. Coordinate with authorities having jurisdiction to witness test and sign Drop Test Form.

3.5 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.6 DEMONSTRATION

- A. Demonstrate proper operation, testing and reset procedures to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION 083300

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes the following:
 - 1. Exterior storefront framing systems.
 - 2. Interior entrance systems.
 - 3. Manual-swing aluminum doors.
- B. Related sections include the following:
 - 1. If your project is LEED and you're pursuing Building Envelope Commissioning, refer to the Addendum 4 version of this section in Project 3084 for language specific to commissioning. Also, use the performance requirements noted in this section as they differ from a non-commissioned building envelope.
 - 2. Division 4 Section "Unit Masonry (Assemblies)" for mockup requirements to include aluminum framed storefront systems.
 - 3. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 - 4. Division 8 Section "Glazed Aluminum Curtain Walls".
 - 5. Division 8 Section "General Glazing" for glazing in aluminum-framed storefront systems.
 - 6. Division 8 Section "Door Hardware" for door hardware installed in aluminum door and frame assemblies.
 - 7. Divisions 26 through 28 Electrical Sections for power wiring and low voltage requirements for electrified hardware.

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.

- C. Thermally Broken Construction: Provide aluminum-framed entrance systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site in compliance with Division 1 Section "Project Meetings".
 - 1. The Pre-installation Conference shall include representatives of the Owner's access control and security vendors. Prior to proceeding with the Work, the Contractor shall coordinate all equipment and rough-in requirements with these Owner vendors to ensure all required pathways, junction boxes, etc., are installed correctly.

1.5 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency evidencing compliance with requirements.
- D. Shop Drawings: For aluminum-framed entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work and the following:
 - 1. Layout and installation details, including anchors.
 - 2. Elevations at 1/4 inch = 1 foot, and window unit elevations at 3/4 inch = 1 foot scale.
 - 3. Full-size section details of typical composite members, including reinforcement and stiffeners.
 - 4. Details for flashing and drainage.
 - 5. Location of weep holes.
 - 6. Hardware, including operators.
 - 7. Glazing details.
 - 8. Accessories.
 - 9. **Include point-to-point wiring diagrams showing the following:**
 - a. Power requirements for each electrically operated door hardware component.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

- E. Cutaway Sample: For each type of vertical-to-horizontal framing intersection of systems made from minimum 6 inch lengths of full-size components, and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
 - 6. Structural sealant joints.
- F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- G. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- H. Qualification Data: For Installer.
- I. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- J. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.
- K. Source quality-control reports.
- L. Field quality-control reports.
- M. Sample Warranties: For special warranties.
- N. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, registered in the state in which the project is located, to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with the performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $1/175$ of the glass edge length for each individual glazing lite, or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to $1/360$ of clear span or $1/8$ inch, whichever is smaller.
 - a. Operable Units: Provide a minimum $1/16$ -inch clearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than $1/240$ of clear span plus $1/4$ inch for spans greater than 11 feet $8\text{-}1/4$ inches or $1/175$ times span, for spans less than 11 feet $8\text{-}1/4$ inches.

E. Structural: Test according to ASTM E330 as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity for relevant exposure category, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E283 for infiltration as follows:

1. Fixed Framing and Glass Area:

- a. Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
 - 2. Maximum Water Leakage: According to AAMA 501.1. No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F (using $U_{cog}=0.29$), as determined according to NFRC 100.
 - 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.35 as determined according to NFRC 200.
 - 3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- J. Noise Reduction: Test according to ASTM E90, with ratings determined by ASTM E1332, as follows.
 - 1. Sound Transmission Class: Not less than 32 for 1-inch insulated glazing and 36 for laminated glazing.
 - 2. Outdoor-Indoor Transmission Class: Not less than 27 for 1-inch insulated glazing and 30 for laminated glazing.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.
- L. Performance Requirements of Operable Units: Testing shall demonstrate compliance with requirements indicated in AAMA 101-03 for air infiltration, water penetration, and structural performance for type, grade, and performance class of operable units required. Where required design pressure exceed the minimum for specified window grade, comply with requirements of AAMA 101, Section 3, "Optional Performance Classes," for higher than minimum performance class.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
 1. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each component and each type of entrance and storefront system through one source from a single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field-testing, or in-service performance.
 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Standards: Comply with AWS D1.2, "Structural Welding Code - Aluminum."

1.8 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Mockup shall be a component of the comprehensive mockup specified in Division 4 Section "Unit Masonry (Assemblies)".

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.10 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace window components that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to the following:
 1. Structural failures including excessive deflection.
 2. Failure of system to meet specified performance requirements including water leakage, air infiltration or condensation.
 3. Noise or vibration created by wind and thermal and structural movements.
 4. Water penetration through fixed glazing and framing areas.
 5. Adhesive sealant failures.
 6. Cohesive sealant failures.
 7. Failure of operating components to function normally.
 8. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: 2 years from date of Substantial Completion.
- D. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, peeling, or chipping.
 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Basis of Design Products are by YKK AP America, Inc. Subject to compliance with requirements, other manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Kawneer North America.
 - 2. EFCO Corporation.
 - 3. Oldcastle Building Envelope (formerly Vistawall Architectural Products).
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront systems as well as glazed aluminum curtain wall systems, including operable units and accessories, from the same manufacturer.
- C. Storefront Framing Products:
 - 1. Thermally Broken 2-inch x 4-1/2-inch Storefront Systems: YES 45 TU (center set, flush glazed storefront system for insulated glass).
 - a. For use generally at exterior storefront locations. Where removable mullions are a component of the hardware set for thermally broken entrance doors, 6-inch storefront systems are required.
 - 2. Thermally Broken 2-inch x 6-inch Storefront Systems: YES 60 TU (center set, flush glazed storefront system for insulated glass).
 - a. For use generally at exterior storefront locations where the use of thermally broken doors AND removable mullions are a component of the assembly, and also where noted on Drawings or where required by wind loads against the overall frame.
 - 3. Non-Thermally Broken 1-3/4-inch x 4-1/2-inch Storefront Systems: YES 45 FS (center set, flush glazed storefront system for monolithic glass).
 - a. For use at interior locations where noted on Drawings.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below:
 - 1. Sheet and Plate: ASTM B209.
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B429.
 - 4. Structural Profiles: ASTM B308
 - 5. Bars, Rods, and Wire: ASTM B211.
 - 6. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36.
2. Cold-Rolled Sheet and Strip: ASTM A1008.
3. Hot-Rolled Sheet and Strip: ASTM A1011.

C. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

D. Glazing: Refer to Division 8 Section "General Glazing".

E. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

F. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

G. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

H. Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at manufacturer's option, provide compressible stripping for glazing and weatherstripping such as molded EPDM or neoprene gaskets complying with ASTM D2000 Designation 2C415 to 3BC620, or molded PVC gaskets complying with ASTM D2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.

I. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 COMPONENTS

A. Framing Components: Provide manufacturer's standard components complying with specified requirements.

B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide non-staining, nonferrous shims for aligning system components.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to retain fastener threads.
 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 3. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- E. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding flashing, compatible with adjacent materials and of type recommended by manufacturer.
- G. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
1. Compression Weather Stripping: Molded neoprene complying with ASTM D2000 requirements or molded PVC complying with ASTM D2287 requirements.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.4 DOORS

- A. Doors: Basis of Design Products; YKK AP America, Inc. – 50T Wide Stile Door (thermally broken doors), and 50D Wide Stile Door (non-thermally broken). As scheduled, thermally broken doors shall be used at all exterior locations. Non-thermally broken doors shall be used at all interior locations.
1. Thermally Broken Door Construction: 2-inch overall thickness, with nominal 1/8-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded.
 2. Non-Thermally Broken Door Construction: 1-3/4-inch overall thickness, with nominal 1/8-inch thick, extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded.
 3. Door Design: Wide stile (all doors).
 - a. Stile Width: 5 inches.
 - b. Top Rail: 5 inches.
 - c. Mid Rail: 6-1/2 inches.
 - d. Bottom Rail: 10 inches
 - 1) Verify stile and rail dimensions indicated for entrance doors will properly accommodate and conceal prescribed hardware components, including, but not limited to, exit devices and closers. Report any discrepancies to the Architect.

4. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide non-removable glazing stops on outside of door.
- B. Door Hardware: As specified in Division 8 Section "Door Hardware".

2.5 VENTING WINDOWS

- A. Aluminum Windows: Basis-of-Design Product - YKK AP America, Inc., YES SSG-TU Vent, manufacturer's standard narrow profile, operable vent units, complying with AAMA/WDMA/CSA 101/I.S.2/A440-08.
 1. Window Type: Awning/Project-Out configuration.
 2. Minimum Performance Class: AW.
 3. Minimum Performance Grade: 65.
 4. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch thickness at any location for main frame and sash members.
 - a. Thermally Broken Construction:
 5. Mullions: Between adjacent windows, fabricated of extruded aluminum matching finish of window units.
 6. Fasteners, Anchors, and Clips: AISA 300-series (400-series for self-drilling); nonmagnetic stainless steel, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
 - a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch thick, reinforce interior with nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
 7. Hardware: Manufacturer's standard stainless steel, steel and bronze, including the following:
 - a. Hinges: Stainless steel, 4-bar type.
 - b. Cam-action handles and strikes: White bronze.
 - c. Steel or bronze operating arms.
 8. Sliding-Type Weather Stripping: Woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric; complying with AAMA 701/702.
 9. Insect Screens: Provide removable insect screen on each operable exterior sash, with operable wicket for venting handle access, and with screen frame finished to match window unit, complying with SMA 1004 or SMA 1201, and as follows:
 - a. Aluminum Wire Fabric: 18-by-18, 18-by-16, or 18-by-14 mesh of 0.013-inch-diameter, coated aluminum wire.

- B. Glazing: Same as adjacent aluminum-framed entrances and storefront glazing.

2.6 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.
 - 2. Fabricate components for head and sill-receptor frame construction with shear-block construction at intermediate horizontal components.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation. Provide ventilator units where detailed on Drawings.
- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 - 1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames

2.7 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Finish: AAMA 612-02 Combined Coatings, Class 1, Clear Anodic Finish. Coating thickness of no less than .7 mill (18 microns).
 - 1. Color must match glazed-aluminum curtain wall framing, along with various types of sheet metal flashing and trim, to the greatest extent possible.
 - 2. Color uniformity shall not differ more than 5 Hunter units, in accordance with ASTM D2244.
 - 3. Gloss retention shall not exceed 50% change following ASTM D523.
 - 4. Chalk Resistance shall not exceed a Number 8 rating, based on ASTM D4214.
- E. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

2.8 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- G. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- I. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

- J. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 10 feet; 1/4 inch over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 FIELD QUALITY CONTROL

- A. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.
- B. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 ADJUSTING AND CLEANING*

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084113

SECTION 085820 MISCELLANEOUS WINDOWS & ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Speaking Apertures
- B. Deal Trays

1.2 RELATED SECTIONS

- A. Division 7 Section – Sheet Metal Flashing and Trim.
- B. Division 7 Section 07920 – Joint Sealants.
- C. Division 8 Security Glazing

1.3 REFERENCES

- A. ASTM A 240 – Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
- B. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B 221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM C 1048 – Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, glazing, fasteners, hardware, finish, electrical wiring diagrams, options, and accessories.
- C. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual, including operation, maintenance, adjustment, and cleaning instructions, trouble shooting guide, parts list, and electrical wiring diagrams.
- D. Warranty: Submit manufacturer's standard warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide products from manufacturers complying with the requirements.

2.2. SPEAKING APERTURES

- A. Electronic Two-Way Speaking Apertures: Fabricate from aluminum, designed to allow passage of speech at normal speaking volume without distortion. Provide 2 speaker apertures in window between A204 and A201.
 - 1. Shape: Circular.
- B. Basis of Design: CR Laurence "Norcon Thru-Glass Two Way Electronic Communicator with hands free headset"
 - 1. Material: Satin anodized aluminum.
 - 2. Removable gooseneck microphone.
 - 3. Hands free operation.
 - 4. Cordless Battery powered.
 - 5. Microphone on non-secure side.
 - 6. On/Off switch.
 - 7. Integral volume control.
 - 8. UL Level 3 Bullet Resistant
 - 9. Provide with hands free headset
 - 10. Location: Reception A204.

2.4 Transaction Drawer

- A. Basis of Design: CR Laurence "Large Capacity Counter Mounted Thru-Wall Transaction Drawer (TD1724TWC3)"
 - 1. Materials: 11 gauge brushed Stainless steel.
 - 2. Inside drawer dimensions: 12-7/8" W x 20-3/4" D x 6-1/4" H.
 - 3. UL Level 3 bullet resistance.

4. Location: Reception A204.

2.5 ALUMINUM FINISH

A. Powder Coat Painted:

1. System: Heated phosphate-cleaned, electrostatic powder-coated, infrared oven-cured.
2. Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive pass-thru windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive pass-thru windows are plumb, level, square, accurately aligned, correctly located, and in tolerance.

3.3 INSTALLATION

- A. Install pass-thru windows in accordance with manufacturer's instructions.
- B. Install pass-thru windows plumb, level, square, true to line, and without warp or rack.
- C. Install pass-thru window components weathertight.
- D. Anchor pass-thru windows securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.
- E. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- F. Sheet Metal Flashing: Install sheet metal flashing as specified in Section 07620 (07 62 00).
- G. Joint Sealants: Install joint sealants as specified in Section 07920 (07 92 00).
- H. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- I. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 ADJUSTING

- A. Adjust doors to be weathertight in closed position.
- B. Adjust doors and operating hardware to function properly and for smooth operation without binding.

3.5 CLEANING

- A. Clean pass-thru windows promptly after installation in accordance with manufacturer's instructions.
- B. Remove excess joint sealant in accordance with sealant manufacturer's instructions.
- C. Do not use harsh cleaning materials or methods that would damage glazing or finish.

3.6 PROTECTION

- A. Protect installed pass-thru windows to ensure that, except for normal weathering, pass-thru windows will be without damage or deterioration at time of substantial completion.

END OF SECTION 085820

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
- B. Related Sections include the following:
 - 1. Division 8 Section "Steel Doors and Frames"
 - 2. Division 8 Section "Flush Wood Doors"
 - 3. Division 8 Section "Aluminum Entrances and Storefronts"

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiation between manufacturer-installed and field-installed wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
 - 2. Detail interface between electrified door hardware and access fire alarm, control, and security building control system.

- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.
1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - 1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
 5. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit the final Door Hardware Schedule after Samples, Product Data, coordination with Shop

Drawings of other work, delivery schedules, and similar information has been completed and accepted.

- E. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- F. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
 - 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- G. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
 - 1. Include lists of completed projects with project names and addresses of architects and owners, and other specified information.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.
- I. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- J. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Electrified Door Hardware Supplier Qualifications: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
 - a. Engineering Responsibility: Prepare data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies like those indicated for this Project.

2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
1. Electrified Door Hardware Qualifications: Experienced in providing consulting services for electrified door hardware installations.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
- E. Regulatory Requirements: Comply with provisions of the following:
1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, FED-STD-795, "Uniform Federal Accessibility Standards," as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - 2) Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - 3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch (13 mm) high, Not more than 3/4 inch (19 mm) high for exterior sliding doors. Bevel raised thresholds with a slope of not more than 1:2.
 2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds.
 - c. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
 - d. Thresholds: Not more than 1/2 inch (13 mm) high.

3. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
1. Test Pressure: Test at atmospheric pressure.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Address for delivery of keys.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- I. All Electric Door Hardware shall be furnished and installed by the General Contractor. All Electric Door Hardware shall be wired by the Electrical Contractor. Both the Electrical & General Contractor shall meet and coordinate all work before proceeding.
- J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item with Door Number related to the final Approved Door Hardware Schedule and include basic installation instructions with each item or package.
- C. Deliver keys to manufacturer of key control system, or Owner as Directed.

- D. Deliver keys to Owner by registered mail or overnight package service.

1.6 COORDINATION

- A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- B. Templates: Obtain and distribute to the parties' involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures include excessive deflection, cracking, or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period for Locksets: Ten, (10) years from date of Substantial Completion, unless otherwise indicated.
- D. Warranty Period for Manual Closers: Twenty-Five, (25) years from date of Substantial Completion, unless otherwise indicated.
- E. Warranty Period for Exit Devices: Ten, (10) years from date of Substantial Completion, unless otherwise indicated.
- F. Warranty Period for Electrical Exit Devices: Two, (2) years from date of Substantial Completion, unless otherwise indicated.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.
- C. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and the Door Hardware Schedule at the end of Part 3.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated and named manufacturer's products. Retain subparagraph below for electrified door hardware.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
 - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

2.2 HINGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Butt Hinges:
 - a. Best Hinge Company, Inc.
 - b. Hager Hinge Company, Inc.
 - c. Bommer Hinge Company, Inc.

- B. Standards: Comply with the following:
 - 1. Hinges ANSI/BHMA Standard A156.1 Grade 1
- C. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- D. Concealed bearings are made from engineered polymer material with PTFE and Aramid fiber; bearing is maintenance free, no oil, no grease.
- E. Butt hinges are equipped with easily seated, non-rising pin. Hole in bottom of pin enables quick pin removal for ease of installation.
- F. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Butt Hinges: Stainless Steel or Brass or Bronze
 - 2. Interior Butt Hinges: Steel or Brass or Bronze
- G. Hinge Options: Comply with the following were indicated in the Door Hardware Schedule or on Drawings:
 - 1. Hospital Tips: Slope ends of hinge barrel.
 - 2. Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
 - 3. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - a. Outswinging exterior doors.
 - b. Outswinging corridor doors with locks.
- H. Fasteners: Comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Wood Screws: For wood doors and frames.
 - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 - 4. Screws: Phillips flat-head screws; machine screws drilled and tapped holes for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mechanical Locks and Latches:
 - a. Best Locking Systems, Inc., No Substitution
- B. Standards: Comply with the following:
 - 1. Bored Locks and Latches: BHMA A156.2.

2. Mortise Locks and Latches: BHMA A156.13.
 - C. Bored Locks: ANSI A156.2, BHMA Series 4000, Grade 1, and is UL Listed.
 - D. Mortise Locks: Stamped steel case with steel or brass parts; ANSI A156.13, Series 1000, BHMA Grade 1 Operational and Grade 2 Security and be UL Listed.
 - E. Certified Products: Provide door hardware listed in the following BHMA directories:
 1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
 2. Electromagnetic Locks: BHMA's "Directory of Certified Electromagnetic & Delayed Egress Locks."
 - F. Lock Trim: Comply with the following:
 1. Lever: Mortise Locks & Latches, Forged or Cast brass, bronze or stainless-steel construction
 2. Lever: Cylindrical Locks & Latches, Zinc material with a minimum wall thickness of .060
 3. Dummy Trim: Match lever lock trim and escutcheons.
 - G. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
 1. Bored Locks: BHMA A156.2.
 2. Mortise Locks: BHMA A156.13.
 - H. Lock Throw: Comply with testing requirements for bolt lengths to comply with labeled fire door requirements, and as follows:
 1. Bored Locks: Minimum 9/16-inch latch bolt throw.
 2. Mortise Locks: Minimum 3/4-inch latch bolt throw.
 3. Deadbolts: Minimum 1-inch bolt throw.
 - I. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
 - J. Mortise Locks & Latches shall have an anti-friction, 3/4-inch throw latch bolt with anti-friction piece made of self-lubricated stainless steel. Latch bolt with plastic insert and three-piece latch bolt are unacceptable on this project.
 - K. Mortise Locks & Latches shall have levers to be operated with a roller bearing spindle hub mechanism.
 - L. Cylindrical Locks & Latches to have solid shank with no opening for access to keyed lever keeper.
- 2.4 DOOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Bolts:
 - a. Architectural Builders Hardware, Inc.
 - b. Burns Manufacturing, Inc.
 - c. Hager Company, Inc.

B. Standards: Comply with the following:

1. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
2. Manual Flush Bolts: BHMA A156.16.

C. Flush Bolts: BHMA Grade 1, designed for mortising into door edge.

D. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Mortise Flush Bolts: Minimum 3/4-inch (19-mm) throw.

2.5 EXIT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. DormaKaba / Precision, No Substitution

B. Standard: BHMA A156.3.

1. BHMA Grade: Grade 1

C. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

F. Exit device shall be "touch pad" type with a touch pad that shall extend a minimum of one half (1/2) of the door width.

G. Exit device lock stile chassis shall be investment cast steel. Stamped steel units will not be accepted. All device latch bolts shall be stainless steel and shall be deadlocking type.

H. Exit device strikes shall be adjustable type investment cast stainless steel.

- I. Exit device should include sound reduction dampening for both depression and extension of the touch pad.
- J. Exit device end cap shall be all metal and secured with a bracket that interlocks both at the touch bar channel base and hinge side filler to prevent end cap "peel-back".
- K. All exposed surfaces of the exit device housing shall be no less than 14 gauge brass or bronze; or no less than 16-gauge stainless steel. Aluminum housing type exit devices are not acceptable.
- L. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 1. Operation: Rigid
- M. Outside Trim: Lever, Lever with cylinder, Pull, pull with cylinder, material and finish to match locksets, unless otherwise indicated.
 - 1. Match design for locksets and latchsets, unless otherwise indicated.

2.6 CYLINDERS AND KEYING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cylinders:
 - a. Best Locking Systems, Inc., No Substitution
 - b. All cylinders shall be Cormax 7-pin interchangeable cores.
- B. Standards: Comply with the following:
 - 1. Cylinders: BHMA A156.5.
- C. Cylinder Grade: BHMA Grade 1, Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Seven.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 4. Bored-Lock Type: Cylinders with tailpieces to suit locks.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's locksets.
- E. Construction Keying: Comply with the following:

1. Construction Cores: Provide Brass construction cores in all locksets and cylinders that are replaceable by permanent cores.
 - a. Replace Brass construction cores with permanent cores, as indicated in keying schedule
- F. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:
 1. Existing System: Master key or grand master key locks to Owner's existing Best Master Key system.
- G. Keys: Provide nickel-silver keys complying with the following:
 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: **"DO NOT DUPLICATE."**
 2. Quantity: In addition to one extra blank key for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.
 - e. Control Keys: Five
 - f. Construction Master Keys: Ten
 - g. Construction Core Control Keys: Five

2.7 STRIKES

- A. Standards: Comply with the following:
 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 3. Dustproof Strikes: BHMA A156.16.
- B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece antifriction latch bolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- C. Dustproof Strikes: BHMA Grade 1

2.8 ACCESSORIES FOR PAIRS OF DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Coordinators:
 - a. Architectural Builders Hardware, Inc.
 - b. Burns Manufacturing Company, Inc.
2. Removable Mullions:
 - a. Allegion / Von Duprin, No Substitution
3. Astragals:
 - a. Architectural Builders Hardware, Inc.
 - b. National Guard Products, Inc.

B. Standards: Comply with the following:

1. Coordinators: BHMA A156.3.
2. Removable Mullions: BHMA A156.3.

C. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

2.9 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Surface-Mounted Closers:
 - a. Dormakaba USA, Inc., No Substitution

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.

C. Surface Closers: BHMA Grade 1

D. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."

E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.10 PROTECTIVE TRIM UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metal Protective Trim Units:
 - a. Architectural Builders Hardware, Inc.
 - b. Burns Manufacturing Company, Inc.
- B. Standard: Comply with BHMA A156.6.
- C. Materials: Fabricate protection plates from the following:
 - 1. Stainless Steel: 0.050 inch (1.3 mm) thick; beveled 4 sides.
- D. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.
- E. Furnish protection plates sized 2" less than door width on push side and 1" less than door width on pull side, by height specified in Door Hardware Schedule.

2.11 STOPS AND HOLDERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Architectural Builders Hardware Mfg., Inc.
 - 2. Triangle Brass Manufacturing Company, Inc.
- B. Standards: Comply with the following:
 - 1. Stops and Bumpers: BHMA A156.16.
 - 2. Combination Overhead Holders and Stops: BHMA A156.8.
 - 3. Door Silencers: BHMA A156.16.
- C. Stops and Bumpers: BHMA Grade 1
- D. Combination Overhead Stops and Holders: BHMA Grade 1
- E. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

2.12 DOOR GASKETING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Door Gasketing:
 - a. National Guard Products, Inc.

- b. Reese Manufacturing Co., Inc.
 - 2. Door Bottoms:
 - a. National Guard Products
 - b. Reese Manufacturing Co., Inc.
 - B. Standard: Comply with BHMA A156.22.
 - C. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors were indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
 - D. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
 - E. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
 - F. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.
 - G. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
 - H. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
 - I. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.
- 2.13 THRESHOLDS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. National Guard Products, Inc.
 - 2. Reese Manufacturing Co., Inc.
 - B. Standard: Comply with BHMA A156.21.

2.14 FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 - 3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
 - 4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
 - 5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.15 FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 - 1. BHMA 600: Primed for painting, over steel base metal.
 - 2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 - 3. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
 - 4. BHMA 630: Satin stainless steel, over stainless steel base metal.
 - 5. BHMA 652: Satin chromium plated over nickel, over steel base metal.
 - 6. BHMA 689: Aluminum painted, over any base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."

3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule. Supply key cabinet with 25% expansion. Factory installs keys in cabinet or in field with owner's representative. Key cabinet to be supplied with a "Complete System" equal to the Telkee System.
 - D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated above accessible ceilings, in equipment room. Verify location with Architect.
 1. Configuration: Provide one power supply for each door opening.
 2. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
 - E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- 3.4 FIELD QUALITY CONTROL
- A. Independent Architectural Hardware Consultant: Owner or Architect will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.
- 3.5 ADJUSTING
- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.
- 3.6 CLEANING AND PROTECTION
- A. Clean adjacent surfaces soiled by door hardware installation.
 - B. Clean operating items as necessary to restore proper function and finish.
 - C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.
- 3.7 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.
- 3.8 DOOR HARDWARE SCHEDULE

Hardware Schedule
SOLANCO SD, DISTRICT ADMIN. OFFICES

Hardware Set #: 0001 - SGL DRS HMD & HMF EXTERIOR
 001A 002 021 110A 114A 115A

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB199 4.5 x 4.5 x NRP x SEC. ST.	630	BEST
1 RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1 POWER TRANSFER PT1200 x EZ	628	ABH
1 POWER SUPPLY RPSMLR2	600	PRECISION
1 RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1 WIRE HARNESS EZDK-6-X		ABH
1 WIRE HARNESS EZDK-192		ABH
1 WIRE HARNESS EZDK-32		ABH
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1 KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1 RAIN DRIP 16A x FULL WIDTH + 4"	628	NGP
1 DOOR SWEEP 200NA x FULL WIDTH	628	NGP
1 THRESHOLD 896V x 1/4-20-2" COMBO	628	NGP
1 DOOR CONTACT BY SECURITY CONTRACTOR		
1 CARD READER BY SECURITY CONTRACTOR		
1 OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0002 - SGL DRS HMD & HMF EXTERIOR
 020A 112A

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB199 5 x 4.5 x NRP x SEC. ST.	630	BEST
1 RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1 POWER TRANSFER PT1200 x EZ	628	ABH
1 POWER SUPPLY RPSMLR2	600	PRECISION
1 RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1 WIRE HARNESS EZDK-6-X		ABH
1 WIRE HARNESS EZDK-192		ABH
1 WIRE HARNESS EZDK-32		ABH
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1 KICK PLATE 16" x 2" LDW .050 x B4E x CTSK	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1 RAIN DRIP 16A x FULL WIDTH + 4"	628	NGP
1 DOOR SWEEP 200NA x FULL WIDTH	628	NGP
1 THRESHOLD 896V x 1/4-20-2" COMBO	628	NGP
1 DOOR CONTACT BY SECURITY CONTRACTOR		
1 CARD READER BY SECURITY CONTRACTOR		
1 OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0003 - PRS DRS HMD & HMF EXTERIOR
019A

Opening to Have:

Qty	Description	Finish	Mfg
6	HINGE FBB199 4.5 x 4.5 x NRP x SEC. ST.	630	BEST
2	RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
2	POWER TRANSFER PT1200 x EZ	628	ABH
1	REMOVABLE MULLION KR822 x ST989 x MCS822	689	PRECISION
1	POWER SUPPLY RPSMLR2	600	PRECISION
1	RIM EXIT DEVICE TS-C-2102 x 4902A	630	PRECISION
1	RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
2	WIRE HARNESS EZDK-6-X		ABH
2	WIRE HARNESS EZDK-192		ABH
2	WIRE HARNESS EZDK-32		ABH
2	DOOR CLOSER 8916FC x SDST x LSN	689	DORMAKABA
2	KICK PLATE 16" x 1" LDW .050 x B4E x CTSK	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1	MULLION SEAL 5100N x MULLION x FULL HEIGHT	BLK	NGP
1	RAIN DRIP 16A x FULL WIDTH + 4"	628	NGP
2	DOOR SWEEP 200NA x FULL WIDTH	628	NGP
1	THRESHOLD 896V x 1/4-20-2" COMBO	628	NGP
2	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0004 - PRS DRS HMD & HMF EXTERIOR
012A

Opening to Have:

Qty	Description	Finish	Mfg
6	HINGE FBB199 5 x 4.5 x NRP x SEC. ST.	630	BEST
2	FLUSH BOLT 1855S 1" x 6-3/4" x 12"	626	ABH
1	ELECTRIC LOCKSET 9KW-3-7-DEU-15D-S3-RQE-C x ABC x CORMAX	626	BEST
1	ASTRAGAL A548B x BEVEL EDGE x FULL HEIGHT	630	ABH
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-60		ABH
2	DOOR CLOSER 8916FC x SDST x LSN	689	DORMAKABA
2	KICK PLATE 16" x 1" LDW .050 x B4E x CTSK	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1	RAIN DRIP 16A x FULL WIDTH + 4"	628	NGP
2	DOOR SWEEP 200NA x FULL WIDTH	628	NGP
1	THRESHOLD 896V x 1/4-20-2" COMBO	628	NGP
2	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0005 - SGL DRS WD & HMF LABEL
106 107 108 118 144 145 146 147

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	PRIVACY LOCKSET 45H0-L-15H x VIB	630	BEST
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA

1 WALL STOP AB409	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0006 - SGL DRS WD & HMF
013 014

Opening to Have:

Qty	Description	Finish	Mfg
1	HINGE FBB168 4.5 x 4.5	652	BEST
1	PULL PLATE AB125 x AB70B 3-1/2" x 15"	630	ABH
1	PUSH PLATE AB70C 4" x 16" .050 x B4E	630	ABH
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0007 - SGL DRS WD & HMF LABEL

116	117	121	122	123	125	126	127	128	129	130	131
132	135	137	138	154	155	156	157	158	159	160	161
163	164	165	167	168	169	170	171	172	175	176	177
178	179										

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	OFFICE LOCKSET 9K-3-7-AB-15D-S3 x ABC x CORMAX	626	BEST
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0008 - SGL DRS WD & HMF LABEL

133	148	149	151B	152	162	173
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Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	PASSAGE LATCHSET 9K-3-0-N-15D-S3	626	BEST
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0009 - SGL DRS WD & HMF LABEL

124	136
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Opening to Have:

Qty	Description	Finish	Mfg
1	HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1	STOREROOM LOCKSET 9K-3-7-D-15D-S3 x ABC x CORMAX	626	BEST
1	DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0010 - SGL DRS WD & HMF LABEL
113 114C 139 142 143 153 166

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	STOREROOM LOCKSET 9K-3-7-D-15D-S3 x ABC x CORMAX	626	BEST
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0011 - SGL DRS WD & HMF
151A

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	PASSAGE LATCHSET 9K-3-0-N-15D-S3	626	BEST
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0012 - SGL DRS WD & HMF LABEL
141

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	RIM EXIT DEVICE FL-2114 x 4914A	630	PRECISION
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0013 - SGL DRS WD & HMF LABEL
134

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	ELECTRIC LOCKSET 9KW-3-7-DEU-15D-S3-RQE-C x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0013.1 - SGL DRS WD & HMF
003 004 018

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	ELECTRIC LOCKSET 9KW-3-7-DEU-15D-S3-RQE-C x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO
1	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0014 - SGL DRS WD & HMF
115B

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	CLASSROOM LOCKSET 9K-3-7-R-15D-S3 x ABC x CORMAX	626	BEST
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	KICK PLATE 16" x 2" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0015 - PRS DRS WD & HMF LABEL
112C

Opening to Have:

Qty	Description	Finish	Mfg
6	HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1	AUTOMATIC FLUSH BOLTS 1867 x FIRE BOLT x HMD	630	ABH
1	STOREROOM LOCKSET 9K-3-7-D-15D-S3-7/8 x 3/4" x ABC x CORMAX	626	BEST
1	ASTRAGAL A548B x BEVEL EDGE x FULL HEIGHT	630	ABH
1	COORDINATOR 3700 x FILLER BAR	BLK	ABH
2	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
2	KICK PLATE 16" x 1" LDW .050 x B4E x CTSK	630	ABH
2	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
2	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0016 - SGL DRS WD & HMF LABEL
110B

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	RIM EXIT DEVICE FL-2114 x 4914A	630	PRECISION
1	DOOR CLOSER 8916FC x SPA x LSN	689	DORMAKABA
1	KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH

1 MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1 WALL STOP AB409	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0017 - SGL DRS WD & HMF
104B

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1 STOREROOM LOCKSET 9K-3-7-D-15D-S3 x ABC x CORMAX	626	BEST
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
3 SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0018 - SGL DRS WD & HMF LABEL
104A

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB168 4.5 x 4.5	652	BEST
1 PASSAGE LATCHSET 9K-3-0-N-15D-S3	626	BEST
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0019 - SGL DRS WD & HMF EXTERIOR
103C

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB199 5 x 4.5 x NRP x SEC. ST.	630	BEST
1 RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1 RIM EXIT DEVICE 2103LD x 4903A	630	PRECISION
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1 RAIN DRIP 16A x FULL WIDTH + 4"	628	NGP
1 DOOR SWEEP 200NA x FULL WIDTH	628	NGP
1 THRESHOLD 896V x 1/4-20-2" COMBO	628	NGP
1 DOOR CONTACT BY SECURITY CONTRACTOR		
1 OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0020 - SGL DRS WD & HMF LABEL
103A 103B

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1 RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1 RIM EXIT DEVICE FL-2103 x 4903A x S301	630	PRECISION
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1 KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH
1 MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0021 - SGL DRS WD & HMF LABEL
001B

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1	RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	POWER SUPPLY RPSMLR2	600	PRECISION
1	RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
1	DOOR CLOSER 8916FC x SPA x LSN	689	DORMAKABA
1	KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0022 - SGL DRS WD & HMF
005A

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	STOREROOM LOCKSET 9K-3-7-D-15D-S3 x ABC x CORMAX	626	BEST
1	DOOR CLOSER 8916FC x FH x LSN	689	DORMAKABA
1	KICK PLATE 16" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0023 - SGL DRS WD & HMF
015

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1	RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	POWER SUPPLY RPSMLR2	600	PRECISION
1	RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
1	DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1	KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO
1	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0024 - SGL DRS WD & HMF LABEL
019B 020C

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5 x NRP	652	BEST
1	STOREROOM LOCKSET 9K-3-7-D-15D-S3 x ABC x CORMAX	626	BEST
1	DOOR CLOSER 8916FC x SPA x LSN	689	DORMAKABA
1	KICK PLATE 16" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP

Hardware Set #: 0025 - SGL DRS WD & HMF
022 025

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	STOREROOM LOCKSET 9K-3-7-D-15D-S3 x ABC x CORMAX	626	BEST
1	KICK PLATE 16" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0026 - SGL DRS WD & HMF
023 024

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 4.5 x 4.5	652	BEST
1	DEADBOLT (CLASSROOM) 48H7-R x ABC x CORMAX	626	BEST
1	PULL PLATE AB125 x AB70B 3-1/2" x 15" x CYLT	630	ABH
1	PUSH PLATE AB70C 4" x 16" .050 x B4E x CFC	630	ABH
1	DOOR CLOSER 8916FC x AF89 (REG ARM MOUNT) x LSN	689	DORMAKABA
1	KICK PLATE 16" x 2" LDW .050 x B4E x CTSK	630	ABH
1	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
1	WALL STOP AB409	630	ABH
3	SILENCERS 1229A	GRAY	TRIMCO

Hardware Set #: 0027 - SGL DRS HMD & HMF (BULLET RESISTANCE LEVEL-3)
100B 105

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 5 x 5 x NRP	652	BEST
1	RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	POWER SUPPLY RPSMLR2	600	PRECISION
1	RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
1	DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
3	SILENCERS 1229A	GRAY	TRIMCO

1 DOOR CONTACT BY SECURITY CONTRACTOR
 1 CARD READER BY SECURITY CONTRACTOR
 1 OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR
 Hardware Set #: 0028 - SGL DRS HMD & HMF LABEL (BULLET RESISTANCE LEVEL-3)
 102

Opening to Have:

Qty	Description	Finish	Mfg
3	HINGE FBB168 5 x 5 x NRP	652	BEST
1	ELECTRIC LOCKSET 9KW-3-7-DEU-15D-S3-RQE-C x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
1	DOOR CLOSER 8916FC x SPA x LSN	689	DORMAKABA
1	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0029 - PRS DRS HMD & HMF LABEL (BULLET RESISTANCE LEVEL-3)
 103 111A

Opening to Have:

Qty	Description	Finish	Mfg
6	HINGE FBB168 5 x 5 x NRP	652	BEST
1	AUTOMATIC FLUSH BOLTS 1867 x FIRE BOLT x HMD	630	ABH
1	MORTISE CYLINDER (IC) 1E74 x RP3 x ABC x CORMAX	626	BEST
1	POWER TRANSFER PT1200 x EZ	628	ABH
1	COORDINATOR 3700 x FILLER BAR	BLK	ABH
2	MOUNTING BRACKET 3751/3752	BLK	ABH
1	POWER SUPPLY RPSMLR2	600	PRECISION
1	RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1	WIRE HARNESS EZDK-6-X		ABH
1	WIRE HARNESS EZDK-192		ABH
1	WIRE HARNESS EZDK-32		ABH
2	DOOR CLOSER 8916FC x SPA x LSN	689	DORMAKABA
2	KICK PLATE 10" x 1" LDW .050 x B4E x CTSK	630	ABH
2	MOP PLATE 6" x 1" LDW .050 x B4E x CTSK	630	ABH
2	WALL STOP AB409	630	ABH
1	TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1	ASTRAGAL BY DOOR MANUFACTURER		
2	DOOR CONTACT BY SECURITY CONTRACTOR		
1	CARD READER BY SECURITY CONTRACTOR		
1	OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0030 - SGL DRS HMD & HMF EXTERIOR (BULLET RESISTANCE LEVEL-3)
109

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB199 5 x 5 x NRP x SEC. ST.	630	BEST
1 RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1 POWER TRANSFER PT1200 x EZ	628	ABH
1 POWER SUPPLY RPSMLR2	600	PRECISION
1 RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1 WIRE HARNESS EZDK-6-X		ABH
1 WIRE HARNESS EZDK-192		ABH
1 WIRE HARNESS EZDK-32		ABH
1 DOOR CLOSER 8916FC x SDS x LSN	689	DORMAKABA
1 KICK PLATE 10" x 2" LDW .050 x B4E x CTSK	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1 RAIN DRIP 16A x FULL WIDTH + 4"	628	NGP
1 DOOR SWEEP 200NA x FULL WIDTH	628	NGP
1 THRESHOLD 896V x 1/4-20-2" COMBO	628	NGP
1 DOOR CONTACT BY SECURITY CONTRACTOR		
1 CARD READER BY SECURITY CONTRACTOR		
1 OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0031 - SGL DRS HMD & HMF LABEL (BULLET RESISTANCE LEVEL-3)
111B

Opening to Have:

Qty Description	Finish	Mfg
3 HINGE FBB168 5 x 5 x NRP	652	BEST
1 RIM CYLINDER (IC) 1E72 x RP x ABC x CORMAX	626	BEST
1 POWER TRANSFER PT1200 x EZ	628	ABH
1 POWER SUPPLY RPSMLR2	600	PRECISION
1 RIM EXIT DEVICE MLR-TS-C-2103 x 4903A x S301	630	PRECISION
1 WIRE HARNESS EZDK-6-X		ABH
1 WIRE HARNESS EZDK-192		ABH
1 WIRE HARNESS EZDK-32		ABH
1 DOOR CLOSER 8916FC x SPA x LSN	689	DORMAKABA
1 WALL STOP AB409	630	ABH
1 TEAR DROP SEAL 5050B x HEAD & JAMBS	BLK	NGP
1 DOOR CONTACT BY SECURITY CONTRACTOR		
1 CARD READER BY SECURITY CONTRACTOR		
1 OPERATIONAL DESCRIPTION BY SECURITY CONTRACTOR		

Hardware Set #: 0032 - OVERHEAD COILING DOORS
005B 005C 020B 112B 114B

Opening to Have:

Qty Description	Finish	Mfg
1 RIM / MORTISE CYLINDER AS REQUIRED x CORMAX	626	BEST

END OF SECTION 087100

SECTION 088000 – GENERAL GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - a. Windows.
 - b. Doors.
 - c. Interior borrowed lites.
 - d. Aluminum framed entrances and storefronts.
 - e. Glazed aluminum curtain walls.
 - f. Sloped glazing systems and skylights.
 - g. Glass smoke draft curtains.
 - 2. Applied window films.
- B. Related Sections include the following:
 - 1. Division 8 Section "Fire-Rated Glazing" for fire-rated glazing in fire-rated hollow metal doors and frames and in fire-rated flush wood doors.
 - 2. Division 8 Section "Hollow Metal Doors and Frames" for hollow metal doors and frames to receive general glazing.
 - 3. Division 8 Section "Flush Wood Doors" for wood doors to receive general glazing.
 - 4. Division 8 Section "Aluminum Entrances and Storefronts" for aluminum storefront framing systems to receive general glazing.
 - 5. Division 8 Section "Glazed Aluminum Curtain Walls" for curtain wall systems to receive general glazing.
 - 6. Division 8 Section Fire-Rated Frames and Glazing for ASTM E119 compliant fire-rated glass walls.
 - 7. Division 10 Section "Demountable Partitions" for glazing installed integral with demountable partition systems.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass or fabricated glass as defined in referenced glazing publications.

- B. Glazing Fabricators: Firms that produce fabricated glass products from primary glass as defined in referenced glazing publications.
- C. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- D. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- E. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the fabricating process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to fabricator's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the fabricating process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to fabricator's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- G. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the fabricating process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to fabricator's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: Defective manufacturing, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing purposes only. Confirm glass thicknesses by analyzing Project design loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E1300 and ICC's International Building Code (applicable version) according to the following requirements:
 - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
 - 1) Wind Design Data: As indicated on (Structural) Drawings.
 - 2) Basic Wind Speed: 120 mph

3) Exposure Category: C

- b. Specified Design Snow Loads: As indicated on (Structural) Drawings, but not less than snow loads applicable to Project required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7, "Snow Loads".
- c. Probability of Breakage for Vertical Glazing: 8 lites per 1,000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

- d. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
- e. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1-inch, whichever is less.
- f. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- g. Minimum Glass Thickness for Exterior Lites:

1) Manufacturer's standard to meet wind load criteria, but not less than 6 mm.

- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

- D. Performance Characteristics: Provide glass with performance properties specified based on manufacturer's published test data as determined according to procedures indicated below:

- 1. For monolithic glass lites, properties are based on units with lites 6 mm thick.
- 2. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch-wide interspace.
- 3. Center-of-Glass thermal and optical performance properties shall be based on data and calculations from the current LBNL Windows 7.3 computer program expressed as Btu/sq. ft. x h x deg °F.
- 4. Fenestration Performance: Performance values that take into account the total fenestration (center-of-glass and framing members) normally identified with building energy codes such as ASHRAE-IESNA 90.1 and the IECC. Values can also be tested and certified by the National Fenestration Rating Council (NFRC).

1.5 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glazing Schedule: Use same designations indicated on Drawings and specified herein for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- E. Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants have been tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- F. Product Test Reports: From a qualified testing agency, indicating the specified products comply with requirements based on comprehensive testing of standard products. Provide product test reports for each glass product.
- G. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Monolithic Float Glass: Obtain all monolithic float glass from one source from a single manufacturer.
- C. Source Limitations for Insulating Glass: Obtain all insulating-glass units from one source from a single fabricator using the same type of glass and other components for each type of unit specified.
- D. Source Limitations for Laminated Glass: Obtain all laminated glass units from one source from a single fabricator using the same type of glass and other components for each type of unit indicated.
- E. Source Limitations for Glazing Accessories: Obtain all glazing accessories from one source from a single manufacturer for each product and installation method indicated.

- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to the following publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA Publications: NGA "Glazing Manual", "Sealant Manual" and "Laminated Glass Design Guide."
 - 2. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."
 - 3. SIGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Preinstallation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings".
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.
- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
 - 1. Insulated Glass Certification Council (IGCC)

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.10 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.
- B. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass fabricator agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass fabricator agreeing to furnish replacements for laminated-glass units that deteriorate as defined in "Definitions" Article within specified warranty period indicated below
 - 1. Warranty Period: 5 years from date of Substantial Completion.
- D. Manufacturer's Special Warranty for Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass fabricator agreeing to furnish replacements for coated-glass that deteriorates as defined in "Definitions" Article within specified warranty period indicated below. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as required by applicable glazing code.

2.2 MANUFACTURERS AND FABRICATION

- A. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Monolithic Float Glass

- a. Vitro Architectural Glass.
 - b. Guardian Glass, Inc.
 - c. Pilkington, Inc.
 - d. AGC.
- B. Available Fabricators: Subject to compliance with requirements, fabricators of the products specified include, but are not limited to, the following:
 - 1. Glass Enterprises, Inc.
 - 2. Viracon, Inc.
 - 3. Oldcastle Glass
 - 4. Trulite.

2.3 MONOLITHIC FLOAT GLASS

- A. Float Glass: ASTM C1036, Type 1, Class 1 (clear), Class 2 (tinted) transparent glass, flat, Quality q3 (glazing select); class, kind and condition indicated.
 - 1. Provide Kind FT (fully tempered), Category 2, where safety glass is required by the applicable glazing codes.
- B. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 1. Flatness Tolerances
 - a. Roller-Wave or Ripple: Deviation from flatness at any peak shall be targeted not to exceed 0.003-inch as measured per peak to valley for 1/4-inch (6 mm) thick glass.
 - b. Bow and Warp: The bow and warp tolerances targeted shall not exceed 1/32-inch per linear foot.

2.4 INSULATING GLASS

- A. Insulating Glass Units – General: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E2190 for Class CBA units and with requirements specified in this Article.
 - 1. **Type IG-1 Insulated Glass:** Insulated glass units consisting of two lites of clear, annealed glass separated by a 1/2-inch sealed air space. Provide insulated units with low “E” coating. Unless otherwise noted, for use in the building’s perimeter openings **primarily facing North and East**. Refer to Schedules and Frame Elevations for applied use.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with “Vitro Glass Solarban 60 Clear” or comparable product with the following characteristics:
 - 1) Ultra Violet: 18%.
 - 2) Visible Light Transmittance: 70%.
 - 3) Total Solar Energy Transmittance: 34%.
 - 4) Winter Night-time U Value: .29.

- 5) Summer Day-time U Value: .27.
- 6) Shading Coefficient: .45.
- 7) Solar Heat Gain Coefficient: .39.
- 8) Light to Solar Gain: 1.79.

b. Insulating Glass Unit Make-up

- 1) Outboard Lite: "Vitro Glass Solarban 60 Clear", 1/4 inch-thick.
- 2) Low "E" coating on 2nd. surface.
- 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
- 4) Inboard Lite: 1/4 inch-thick clear glass.
- 5) Overall Thickness: 1-inch.

2. **Type IG-2 Insulated Glass:** Insulated glass units consisting of two lites of clear, annealed glass separated by a 1/2-inch sealed air space. Provide insulated units with low "E" coating. Unless otherwise noted, for use in the building's perimeter openings **primarily facing South and West**. Refer to Schedules and Frame Elevations for applied use.

a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 70 Clear" or comparable product with the following characteristics:

- 1) Ultra Violet: 6%.
- 2) Visible Light Transmittance: 64%.
- 3) Total Solar Energy Transmittance: 24%.
- 4) Winter Night-time U Value: .28.
- 5) Summer Day-time U Value: .26.
- 6) Shading Coefficient: .31.
- 7) Solar Heat Gain Coefficient: .27.
- 8) Light to Solar Gain: 2.37.

b. Insulating Glass Unit Make-up

- 1) Outboard Lite: "Vitro Glass Solarban 70 Clear", 1/4 inch-thick.
- 2) Low "E" coating on 2nd surface.
- 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
- 4) Inboard Lite: 1/4-inch-thick clear glass.
- 5) Overall Thickness: 1-inch.

3. Provide Kind FT (fully tempered) where safety glass is required by the applicable glazing codes.

4. Locations: Insulating glass shall be used in all exterior windows, curtainwalls, storefronts/entrances, windows/vents and doors. At a minimum, insulating glass units in doors and sidelites (below the door head-height) and other locations indicated on Drawings or required by applicable code, shall consist of tempered glass.

B. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Dual air seal of polyisobutylene (PIB), and secondary seal of silicone.

2.5 LAMINATED GLASS

- A. Laminated Glass – General: ASTM C1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with interlayers to comply with interlayer manufacturer's written recommendations.
 2. Interlayer Thickness: Provide thickness not less than that indicated, and as needed to comply with requirements; one or multiple layers, formulated to absorb the majority of all naturally-occurring ultraviolet (UV) radiation from sunlight and provide long-term stability with built-in UV filtering.
 3. Basis-of-Design Products: Subject to compliance with requirements, provide the following interlayer products, or comparable interlayer products by other manufacturers that meet the specified standard of quality:
 - a. Polyvinyl butyral (PVB): Kuraray "Butacite."
 - b. Acoustic: Kuraray "Acoustic."
 - c. High-Security: Kuraray "SentryGlas."
 4. **Type ILG-1 Insulated Laminated Safety Glass:** Insulated glass units consisting of one lite of 1/4-inch-thick clear tempered glass and one lite of 7/16-inch-thick laminated tempered glass (two 3/16 inch-thick lites of clear, tempered safety glass laminated with a high-security, .060 interlayer equal to Kuraray "SentryGlas"), separated by a 3/8 inch-thick sealed air space. Provide insulated units with low "E" coating. Primarily for use at the building's primary entrance points **where noted on Drawings primarily facing North and East**. Refer to Schedules for applied use.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 60 Clear" or comparable product, with the following characteristics:
 - 1) Ultra Violet: 18%.
 - 2) Visible Light Transmittance: 70%.
 - 3) Total Solar Energy Transmittance: 34%.
 - 4) Winter Night-time U Value: .29.
 - 5) Summer Day-time U Value: .27.
 - 6) Shading Coefficient: .45.
 - 7) Solar Heat Gain Coefficient: .39.
 - 8) Light to Solar Gain: 1.79.
 - b. Insulating Glass Unit Make-up:
 - 1) Outboard Lite: "Vitro Glass Solarban 60 Clear," 1/4-inch-thick.
 - 2) Low "E" coating on 2nd surface.
 - 3) 3/8-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.

- 4) Inboard Lite: 7/16-inch-thick clear laminated glass as follows:
 - a) First Ply: Clear tempered glass, 3/16-inch-thick.
 - b) Interlayer: High-Security, 0.060-inch-thick; clear.
 - c) Second Ply: Clear tempered glass, 3/16-inch-thick.
 - d) Overall Inboard Lite Thickness: 7/16-inch.
 - 5) Overall Thickness: 1-1/16-inch.
5. **Type ILG-2 Insulated Laminated Safety Glass:** Insulated glass units consisting of one lite of 1/4-inch-thick clear tempered glass and one lite of 7/16-inch-thick laminated tempered glass (two 3/16-inch-thick lites of clear, tempered safety glass laminated with a high-security, .060 interlayer equal to Kuraray "SentryGlas"), separated by a 3/8-inch thick sealed air space. Provide insulated units with low "E" coating. Primarily for use at the building's primary entrance points **where noted on Drawings primarily facing South and West**. Refer to Schedules for applied use.
- a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 70 Clear" or comparable product, with the following characteristics:
 - 1) Ultra Violet: 6%.
 - 2) Visible Light Transmittance: 64%.
 - 3) Total Solar Energy Transmittance: 24%.
 - 4) Winter Night-time U Value: .28.
 - 5) Summer Day-time U Value: .26.
 - 6) Shading Coefficient: .31.
 - 7) Solar Heat Gain Coefficient: .27.
 - 8) Light to Solar Gain: 2.37.
 - b. Insulating Glass Unit Make-up:
 - 1) Outboard Lite: "Vitro Glass Solarban 70 Clear," 1/4-inch-thick.
 - 2) Low "E" coating on 2nd surface.
 - 3) 3/8-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
 - 4) Inboard Lite: 7/16-inch-thick clear laminated glass, as follows:
 - a) First Ply: Clear tempered glass, 3/16-inch-thick.
 - b) Interlayer: High-Security, 0.060 inch-thick; clear.
 - c) Second Ply: Clear tempered glass, 3/16-inch-thick.
 - d) Overall Inboard Lite Thickness: 7/16-inch.
 - 5) Overall Thickness: 1-1/16 inch.
6. **Type LG-1 Monolithic Two-Ply Laminated Safety Glass:** Glass units consisting of two lites of 1/4-inch-thick clear tempered glass laminated with a .060 clear interlayer equal to Kuraray "SentryGlas". For use in the building's interior openings where noted on Drawings.

- a. Overall Thickness: 9/16-inch

2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C864.
 - 2. EPDM, ASTM C864.
 - 3. Silicone, ASTM C1115.
 - 4. Thermoplastic polyolefin rubber, ASTM C1115.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rods as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C1281 and AAMA 800.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. VOC Content: For Sealants used inside weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, subpart D.
- C. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- D. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- E. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 APPLIED WINDOW FILMS

- A. Security Window Film: Optically clear, micro-layered polyester film, nominally 8 mils (0.008-inch) thick, with a durable acrylic abrasion resistant coating over one surface, and a pressure activated adhesive on the other that forms a physical bond to the glass. Install with Impact Protection Adhesive (IPA) attachment system.

1. Basis of Design: 3M Scotchshield Ultra S800 Safety and Security Film; www.3m.com. Subject to compliance with requirements, equal products by other manufacturers are acceptable upon approval by Architect.
- B. Sun Control Window Film: Optically clear, metallized polyester window film designed to reduce 99% of harmful UV rays that cause fading. Film reduces glare and is wet applied with clear adhesive. Film thickness is nominally 2 mils (0.002-inch) thick.
 1. Basis of Design: 3M Sun Control Window Film Neutral 70; www.3m.com. Subject to compliance with requirements, equal products by other manufacturers are acceptable upon approval by Architect.

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep system.
 3. Minimum required face or edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where the length plus width is larger than 50-inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 088000

SECTION 088100 – FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes fire-rated glazing for the following products and applications:
 - 1. Hollow metal or flush wood doors and frames.
- B. Related Sections include the following:
 - 1. Division 8 Section "Flush Wood Doors." for vision panels in fire-rated interior wood doors.
 - 2. Division 8 Section "Hollow Metal Doors and Frames." for vision panels in interior fire-rated hollow metal doors and frames and interior borrowed lite frames.
 - 3. Division 8 Section "General Glazing" for non-fire-rated glazing products.
 - 4. Division 8 Section "Fire-Rated Frames and Glazing" for specialized fire-rated glass wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Fire-rated glass, wireless glazing material listed for use in locations such as doors and borrowed lites with fire rating requirements ranging from 20-minutes to 90-minutes, compliant with required hose stream test.
- B. Glass Design: Provide glass lites for various openings in nominal thicknesses indicated, but not less than the thicknesses required to meet applicable codes and specified ratings.
- C. Fire-Rated Glazing Limitations: Comply with the references noted in Paragraph 1.4 below.

1.4 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Standard for Fire Doors and Other Opening Protectives.
 - 2. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
 - 3. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. UL 9: Standard for Fire Tests of Window Assemblies.

2. UL 10B: Standard for Fire Tests of Door Assemblies.
 3. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.
- D. Consumer Product Safety Commission (CPSC):
1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.
- E. American National Standards Institute (ANSI):
1. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- F. Glass Association of North America (GANA)
1. GANA – Glazing Manual.
 2. FGMA – Sealant Manual.

1.5 SUBMITTALS

- A. General: Comply with the requirements of Division 1 Section “Submittals”.
- B. Product Data: Provide manufacturer’s technical data for each fire-rated glass product and glazing material indicated, including installation and maintenance instructions.
- C. Samples: Provide minimum 12-inch-square samples of each glass product specified.
- D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- E. Product Certificates: Signed by manufacturer of fire-rated glass products certifying that products furnished comply with requirements. Products shall be permanently labeled, designating type and thickness of glass, by a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.
- F. Product Test Listing: Comply with UL, based on comprehensive testing of current products.
- G. Qualification Data: For firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- H. Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- I. Product Test Reports: From a qualified testing agency, indicating the specified products comply with requirements based on comprehensive testing of standard products. Provide product test reports for each glass product.
- J. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 and ASTM E152.
- C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- D. Fire-Rated Glass Labeling: Each lite shall be permanently labeled, designating type and thickness of glass, certifying it for use in tested and rated fire-protective assemblies, by a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.
- E. Safety Glass: Category II materials complying with testing requirements in CPSC 16 CFR 1201 and ANSI Z97.1.
- F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to the following publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Glazing Manual"
 - 2. FGMA Publications: FGMA's "Sealant Manual".
 - 3. CSFM Publications: CSFM's "Fire Tests for Door and Window Assemblies".
- G. Preinstallation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings". Attendance is required by Contractor, Installer, and all others affected by installation of the Work.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.
 - 3. Review installation methods and procedures and requirements for adjacent or adjoining work by others.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-rated glazing materials in manufacturer's factory packaging, undamaged, complete with installation instructions.
- B. Protect fire-rated glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- B. Field Measurements: Verify actual dimensions for openings by field measurement prior to fabrication. Show recorded measurements on Shop Drawings. Coordinate measurements and fabrication schedule with construction progress to avoid construction delays.

1.9 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Fire-Rated Glass: Written warranty made out to Owner and signed by fire-rated glass manufacturer agreeing to furnish replacements for fire-rated glass units that deteriorate within specified warranty period indicated below.

- 1. Warranty Period: Lifetime, no dollar limit warranty.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thicknesses are indicated, they are intended as minimum thicknesses. Provide glass lites in thicknesses as required to comply with requirements and fire-ratings indicated.

2.2 MANUFACTURERS

- A. As the Basis of Design standard, this Specification is based upon Products manufactured and distributed by SAFTI *FIRST* Fire-Rated Glazing Solutions, Brisbane, CA; 888-653-3333; info@safti.com. Subject to compliance with all specified requirements, manufacturers who offer equal products to those specified are also acceptable and include, but are not limited to, the following:
 - 1. Technical Glass Products.
 - 2. McGrory Glass.
 - 3. Vetrotech.
- B. Source limitations: Obtain fire-rated glazing from a single source from a single manufacturer. Distributors of fire-rated glazing are not considered manufacturers.

2.3 FIRE-RATED GLASS

- A. Fire-Rated Glass, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
1. **Type FR-1** Fire-Rated Glass: Monolithic glazing, clear, flat glass; 1/4-inch nominal thickness. Refer to Door Schedules for applications.
 - a. Basis-of-Design Product: SAFTI *FIRST* SuperLite 1, 20-minute fire and safety rated glazing with the following characteristics:
 - 1) Fire-Rating: 20-minutes with hose stream.
 - 2) Thickness: 1/4-inch (6 mm)
 - 3) Appearance: Clear, wireless and tint free.
 - 4) Weight: 3 lbs./sq. ft.
 - 5) Visible Light Transmission: 88%.
 - 6) Sound Transmission Rating: Must meet 28 STC rating, minimum.
 - 7) Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Category I and II, and ANSI Z91.1 Classes A and B.
 - b. Uses: Doors, sidelites, transoms, etc. with a fire-rating of up to 20-minutes.
 2. **Type FR-2** Fire-Rated Glass: Monolithic glazing, clear, flat glass; 3/4-inch nominal thickness. Refer to Door Schedules for applications.
 - a. Basis-of-Design Product: SAFTI *FIRST* SuperClear 45-HS, 45-minute fire and safety rated glazing with the following characteristics:
 - 1) Fire-Rating: 45-minutes with hose stream.
 - 2) Thickness: 3/4-inch (19 mm)
 - 3) Appearance: Clear, wireless and tint free.
 - 4) Weight: 9 lbs./sq. ft.
 - 5) Visible Light Transmission: 83%
 - 6) Sound Transmission Rating: Must meet 37 STC/35 OITC in standard hollow metal frames. Glass and frame must be tested as an assembly.
 - 7) Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Category I and II, and ANSI Z91.1 Class A and B.
 - b. Uses: Doors, sidelites, transoms, etc. with a fire-rating of up to 45-minutes.
 2. **Type FR-3** Fire-Rated Glass: Monolithic glazing, clear, flat glass; 3/4-inch nominal thickness. Refer to Door Schedules for applications.
 - a. Basis-of-Design Product: SAFTI *FIRST* SuperLite X 45/60/90, fire and safety rated glazing with the following characteristics:
 - 1) Fire-Rating: Up to 90-minutes with hose stream.
 - 2) Thickness: 3/4-inch (19 mm)

- 3) Appearance: Clear, wireless and tint free.
- 4) Weight: 9 lbs./sq. ft.
- 5) Visible Light Transmission: 83%
- 6) Sound Transmission Rating: Must meet 37 STC/35 OITC in standard hollow metal frames. Glass and frame must be tested as an assembly.
- 7) Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Category I and II, and ANSI Z91.1 Class A and B.

- b. Uses: Doors with a labeled fire-rating of 60 or 90-minutes. For 45-minute applications, use SuperClear 45 HS.

2.4 GLAZING TAPE FOR FIRE-RATED GLAZING MATERIALS

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam coiled on release paper over adhesive on two sides with a maximum water absorption by volume of 2%.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Silicone Sealant: One part natural curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100%).

1. Available products include, but are not limited to the following:

- a. Dow Corning 795; Dow Corning Group.
- b. Silglaze-II 2800; General Electric Co.
- c. Spectrem 2; Tremco, Inc.

- C. VOC Content: For Sealants used inside weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, subpart D.
- D. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- E. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

2.6 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass framing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Minimum required face or edge clearances.
 - 3. Observable edge damage or face imperfections.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 FIRE-RATED GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- G. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
- H. Glaze vertically into labeled fire-rated metal frames with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

- I. Place glazing tape on free perimeter of glazing and push against tape for full contact at perimeter.
- J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- K. Install removable stop and secure without displacement of tape.

3.4 CLEANING AND PROTECTION

- A. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 088100

SECTION 088723 - SAFETY AND SECURITY WINDOW FILM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Safety and Security Film.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. Section 084113 – Aluminum Storefront Entrances: Windows and Storefront Systems to receive Safety and Security film.
2. Section 088800 - Glazing: General Glazing applications to receive Safety and Security film.

1.3 REFERENCES

- A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning: Engineers; Handbook of Fundamentals, 1997 Edition.
- B. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
- C. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
- D. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
- E. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- F. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight.

1.4 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
1. Flame Spread: 25, maximum.
 2. Smoke Developed: 450, maximum.

- B. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

1.5 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
- E. Performance Submittals:
 - 1. Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the 1997 ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.

2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
 - a. Name of building.
 - b. The name and telephone number of a management contact.
 - c. Type of glass.
 - d. Type of film.
 - e. Amount of film installed.
 - f. Date of completion.
 3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.
 4. Provide an application analysis to determine available energy cost reduction and savings.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: 3M Company, Distributed through Energy Products Distribution, which is located at: 9223 Harford Road, Baltimore, MD 21234; Toll-Free 1-800-537-3911 Tel: 410-882-0800; Fax: 410-882-5890; Email: mhondroulis@epdwindowfilm.com; Web: www.epdwindowfilm.com or approved equal.

2.2 SAFETYAND SECURITY WINDOW FILM

A. General:

1. 3M Ultra 800 High Performance Safety and Security Window Films - Ultra 800 installed with 3M Impact Protection Adhesive Attachment System.
 - a. Film Material - Clear: Optically clear micro-layered polyester film, laminated to additional clear micro-layered polyester film (Multi Layered), with a durable acrylic abrasion resistant coating over the surface. The film is clear and will not contain dyed polyester.
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, Ultra 800 - Ultra Prestige Safety and Security Window Film - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:

1. Film Color: Clear.
2. Thickness: Nominal 8.0 mils (0.3mm).
3. Emissivity: 0.87 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
4. U-Factor: 1.09.
5. Visible Light Transmission (ASTM E 84): 85 percent.
6. Visible Reflection (ASTM E 903): Not more than 10 percent.
7. Ultraviolet Transmission (ASTM E 903): Less than 2 percent.

8. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.90.
9. Tear Resistance (ASTM D 1004): Greater than 1200 lbs.
10. Safety Rating: Category II (400 ft.-lbs).
11. Tensile Strength (ASTM D 882-95a): 32,000 psi.
12. Breaking Strength (Per Inch Width): 225 lbs.
13. Puncture Propagation Tear (ASTM D 2582-93): 19.2 lbs.
14. Young Modulus (ASTM D 882-95a): 500 kpsi nominal.

PART 3 EXECUTION

- A. Window film and Impact Adhesive Attachment System to be installed per manufacturers recommendations.

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
- C. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.

- D. Apply film to glass and lightly spray film with slip solution.
- E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
- F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
- G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 088723

SECTION 088810 - FIRE RATED FRAMES AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Fire resistive, temperature rise framing systems with aluminum cladding for interior applications.
- 2. Fire-rated glazing for use in fire-resistive temperature rise framing systems.
- 3. Full vision temperature-rise doors for use in fire-resistive temperature rise framing systems.

- B. Related Sections include the following:

- 1. Division 8 Section "Hollow Metal Doors and Frames" for standard rated and non-rated hollow metal doors and frames.
- 2. Division 8 Section "Flush Wood Doors" for flush wood doors for use in the frames specified in this Section.
- 3. Division 8 Sections "Aluminum-Framed Entrances and Storefronts" and "Glazed Aluminum Curtain Walls" for standard, non-rated aluminum storefront and curtain wall framing.
- 4. Division 8 Section "Door Hardware" for door hardware.
- 5. Division 8 Section "Fire-rated Glazing" for fire-rated glazing used in fire-rated hollow metal doors and frames and fire-rated flush wood doors.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):

- 1. ASTM E119 - Methods for Fire Tests of Building Construction and Materials.
- 2. ASTM E2074 - Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies

- B. National Fire Protection Association (NFPA):

- 1. NFPA 80: Standard for Fire Doors and Other Opening Protectives.
- 2. NFPA 251: Standard Methods of Tests of Fire Resistance of Building Construction and Materials.
- 3. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.

4. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies.

C. Underwriters Laboratories, Inc. (UL):

1. UL 9: Standard for Fire Tests of Window Assemblies.
2. UL 10B: Standard for Fire Tests of Door Assemblies.
3. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.
4. UL 263: Fire Tests of Building Construction and Materials.

D. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

E. American National Standards Institute (ANSI):

1. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

F. Glass Association of North America (GANA)

1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Fire-Resistive Wall Assembly Certifications: Installed Products must meet the 120-minute fire resistive wall assemblies tested in accordance with ASTM E119, NFPA 251, UL 263 and ULC-S101.
2. Fire Resistive, Temperature Rise Door Assembly Certifications: Installed Products must meet the 90 minute fire resistive temperature rise door assemblies tested in accordance with NFPA 252, UL 10B and UL 10C, and must meet 250 deg. F/450 deg. F temperature rise door requirements.
3. Door Certifications: Doors must be tested in accordance with ASTM E2074-00, NFPA 80, NFPA 252, UL 10B and UL 10C.
4. Testing Laboratory: Fire tests must be conducted by a nationally recognized independent testing laboratory.
5. Glazing: Provide fire-resistive glazing that meets ASTM E-119/UL 263/ULC-S101 up to the max. size tested. All glazing used in doors, sidelites or any hazardous location must meet CPSC Cat. I or II impact safety.
6. Max. Door Opening Sizes: Installed Products must meet up to 4'-8" wide x 10'-0" high for single doors, and 8'-0" wide by 10'-0" high in pair doors with no intermediate rails required.
7. Fire Resistive, Temperature Rise Door Assembly Certifications: Installed Products must meet the 45 minute fire resistive temperature rise door assemblies tested in accordance with NFPA 252, UL 10B and UL 10C, and must meet 250 deg. F/450 deg. F temperature rise door requirements.

- B. Listings and Labels: Fire-resistive, temperature rise framing systems shall be under current follow-up service by a nationally recognized independent laboratory approved by OSHA, and shall maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.
- C. Appearance: Assemblies must have a neat, finished appearance with a minimum of joints at decorative cover intersections.

1.5 SUBMITTALS

- A. Product Data: For each product and component specified. Include technical data, construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Submit shop drawings showing layout, profiles, all assembly components and adjacent conditions affecting installation.
- C. Samples: Submit samples for finishes, colors and textures.
- D. Maintenance Data: For assemblies and components, to include in maintenance manuals.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original packaging undamaged, complete and with installation instructions.
- B. Store products off the ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions for openings by field measurements prior to fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- B. Preinstallation Conference: Conduct conference at Project site. Attendance is required by Contractor, Installer, and all others affected by installation of the Work.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for frames, doors and glazing during and after installation.
 - 3. Review installation methods and procedures and requirements for adjacent or adjoining work by others.

1.8 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is not intended to limit other rights that the Owner may have under the Contract Documents.

- 1. Warranty Period: 5-years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. As the Basis of Design standard, this Specification is based upon Products manufactured and distributed by SAFTI *FIRST* Fire-Rated Glazing Solutions, Brisbane, CA; T: 888-653-3333; E: info@safti.com. Subject to compliance with requirements, manufacturers who offer equal products to those specified are also acceptable and include, but are not limited to, the following:

- 1. Technical Glass Products
 - 2. Vetrotech, Inc.

- B. Source limitations: Obtain fire-rated framing and glazing from a single source from a single manufacturer. Distributors of fire-rated framing and glazing are not considered manufacturers.

2.2 MATERIALS

- A. Framing: Fire resistive, temperature rise framing system rated for 120 minutes. Basis of Design: SAFTI *FIRST* GPX Architectural Series Framing.

- 1. Properties:
 - a. Window/Wall Frame Thickness: 2-1/2-inches standard. Door profile thickness: 5-inches Standard.
 - b. Fire resistive aluminum door capable of accommodating concealed hardware.
 - c. Internal framing: Internal tube steel framing shall conform to ASTM A501. Formed steel retainers shall be galvanized conforming to ASTM A527.
 - d. Insulation: The framing system shall insulate against the effects of fire, smoke and heat transfer from either side. The perimeter of the framing system to the rough opening shall be firmly packed with mineral wool fire stop insulation or appropriately rated intumescent sealant as required by applicable model codes.
 - e. Fasteners: Type recommended by manufacturer. No exposed fasteners allowed.
 - f. Glazing accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant glazing tape. Glazing panels shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone. Silicone setting blocks are recommended.

- B. Glass: Assemblies that comply with ASTM E119/UL 263/ULC-S101 and meeting specified fire-rating. Basis of Design: SAFTI *FIRST* SuperLite II-XL.

- 1. Properties:

- a. Individual Lites shall be permanently identified with a listing mark and a permanent logo.
 - b. Glazing material installed in hazardous locations (subject to human impact) shall be certified to meet the applicable requirements for fire-rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
 - c. Temperature rise on the unexposed side of glazing material shall be limited to 250 deg. F when required.
 - d. Pressure glazing is acceptable.
- C. Doors: Fire-rated temperature-rise doors meeting specified fire-rating. Basis of Design: SAFTI *FIRST* GPX Builder's Series Temperature-Rise Door.
 - 1. Properties:
 - a. Constructed in accordance with the individual manufacturer's listings or in accordance with HMMA 861-06 and HMMA 850.
 - b. Meets 250 deg. F/450 deg. F at 30 minutes.
 - c. Standard Door Profile: 6-inch rail and 2-inch frame with 10-inch ADA compliant bottom rail.

2.3 FABRICATION

- A. Assemblies shall be furnished knocked down for field assembly and will be glazed in the field. Unitized assemblies are acceptable should configurations and job site conditions allow.
- B. Door assemblies shall be factory prepared for field mounting of hardware.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.
- B. Covers shall be chemically cleaned and pretreated; then, finished as follows:
 - 1. AAMA 612-02 Combined Coatings, Class 1, Clear Anodic Finish. Coating thickness of no less than .7 mil (18 microns).
- C. Protect finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- D. Noticeable variations in the same piece are not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate conditions with Installer present, and that substrate conditions are acceptable for product installation in accordance with all manufacturer's instructions. Openings shall be plumb, square and within allowable tolerances. Notify Architect of any conditions that might jeopardize the integrity of the installed framing system. Do not proceed until such conditions are corrected.

- 1. Resuming work represents acceptance of substrate conditions.

3.2 INSTALLATION

- A. Installation shall be by a licensed installer and in strict accordance with the approved shop drawings.
- B. Comply with all manufacturer's product data including product technical bulletins and installation instructions.

3.3 CLEANING AND PROTECTION

- A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by methods approved by manufacturer.
- B. Clean glass not more than four days prior to date scheduled for inspection intended to establish date of Substantial Completion. Clean glass by method recommended by glass manufacturer.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 088810

SECTION 088853 – SECURITY GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Rated security glass
- B. Related Sections:
 - 1. Division 8 Section "Aluminum Framed entrances and Storefronts"
 - 2. Division 8 Section "Hollow Metal Doors and Frames"
 - 3. Division 8 Section "Glazed Aluminum Curtain Walls"

1.3 DEFINITIONS

- A. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated security glazing, as defined in referenced glazing publications.
- B. Glass Manufacturers: Firms that produce primary glass or fabricated glass as defined in referenced glazing publications.
- C. Glazing Fabricators: Firms that produce fabricated glass products from primary glass as defined in referenced glazing publications.
- D. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 COORDINATION

- A. Coordinate overall glazing thickness and width of glazing throat dimensions with approved detention door and frame Shop Drawings, to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for security glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Security Glazing Samples: For each type of security glazing; 12 inches square.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product indicated, from manufacturer.
- B. Product Test Reports: For each type of security glazing, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Product Test Reports: For each type of glazing sealant, for tests performed by a qualified testing agency.
- D. Preconstruction adhesion and compatibility test reports.
- E. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glazing installers who are certified under the National Glass Association Glazier Certification Program, and who have completed glazing projects similar in material, design and extent to that indicated for Project, and whose work has resulted in construction with a record of successful in-service performance.
- B. Security Glazing Testing Agency Qualifications: Subject to compliance with requirements, testing agency is one of the following:
 1. H. P. White Laboratory, Inc.
 2. Underwriters Laboratories, Inc.
 3. Wiss, Janney, Elstner Associates, Inc.
- C. Sealant Testing Agency Qualifications: Qualified according to ASTM C 1021 for testing indicated.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each security glazing type, tape sealant, gasket, glazing accessory, and glazing-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data based on previous testing of current sealant products and glazing materials match those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to security glazing, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect security glazing and glazing materials according to manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.12 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass fabricator agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article within specified warranty period indicated below.
- C. Warranty Period: 10 years from date of Substantial Completion.
- D. Manufacturer's Special Warranty for Coated Glass: Manufacturer agrees to replace coated glass that deteriorates within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining

and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

- E. Manufacturer's Special Warranty for Glass-Clad Polycarbonate: Manufacturer agrees to replace glass-clad polycarbonate that deteriorates within specified warranty period. Deterioration of glass-clad polycarbonate is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning glass-clad polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance and requirements, products that may be incorporated in the work include, but are not limited to the following:
1. Global Security Glazing
 2. Dluback Corporation
 3. Safti First
 4. LTI Smart Glass, Inc.
- B. Source Limitations for Security Glazing: Obtain security glazing from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each security glazing type indicated.
- C. Source Limitations for Glazing Sealants and Gaskets: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General:
1. Installed security glazing shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing; or other defects in construction.
 2. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated.

1. Design Procedure for Glass: ASTM E 1300 and ICC's International Building Code.
2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Basic Wind Speed: 90 mph.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glazing framing members and glazing components.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Windborne-Debris-Impact Resistance: Exterior glazing shall conform to enhanced-protection testing requirements in ASTM E 1996 for Wind Zone 1 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
 1. Large-Missile Test: For glazing located within 30 feet of grade.
 2. Small-Missile Test: For glazing located more than 30 feet above grade.

2.3 SECURITY GLAZING, GENERAL

- A. Glazing Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
- B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.
- C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.
- D. Fire-Test-Response Characteristics of Polycarbonate Sheets: As determined by testing polycarbonate sheets identical to those used in security glazing products by a qualified testing agency acceptable to authorities having jurisdiction.
 1. Self-ignition temperature of 650 deg F or more when tested according to ASTM D 1929 on plastic sheets in thicknesses indicated for the Work.
 2. Smoke-Developed Index of 450 or less when tested according to ASTM E 84, or smoke density of 75 or less when tested according to ASTM D 2843 on plastic sheets in thicknesses indicated for the Work.
 3. Burning extent of 1 inch or less when tested according to ASTM D 635 at a nominal thickness of 0.060 inch or thickness indicated for the Work.

2.4 SECURITY GLAZING

A. 1-1/8" BALLISTIC GLASS

1. Type **SG-3** Ballistic Glass: Nominally 1-1/8" thick clear glass clad polycarbonate, constructed of one layer of chemically or heat strengthened ¼" glass laminated to a proprietary make-up of exposed polycarbonate with an abrasion-resistant coating, and with an overall thickness of 1.072" nominal. Install with the polycarbonate on the secure side.
 - a. Forced Entry Resistance: UL 753 - Level 3 (44 Magnum)

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Field-applied sealants shall have a VOC content of 250 g/L or less.
4. Sealants shall comply with the testing and product requirements of the California Department of Health Services' (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Emissions from Indoor Sources Using Small-Scale Environmental Chambers."
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

- B. One-part Nonacid-Curing Silicone Sealant: ASTM C 920: Type S; Grade NS; Class 25; uses NT, M, G, A and, as applicable to joint substrates indicated, O; and with the additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for uses indicated:

1. 50 percent movement in both extension and compression for a total of 100 percent movement.
2. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer

rod as recommended in writing by tape and security glazing manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of security glazing and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit security glazing lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF SECURITY GLAZING

- A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Grind smooth and polish exposed security glazing edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing for security glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners, and throat depth.
 - 2. Minimum required face or edge clearances.
 - 3. Minimum required bite.
 - 4. Effective sealing between joints of framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving security glazing immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.
- F. Provide spacers for security glazing lites where the length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of security glazing. Install correct size and spacing to preserve required face clearances unless

gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and according to requirements in referenced glazing publications.
- H. Set security glazing in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set coated security glazing with proper orientation so that coatings and films face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by security glazing, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket securely in place between glazing unit and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center security glazing in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center security glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between security glazing and glazing stops to maintain face clearances and to prevent sealant from extruding into glazing channel and blocking weep systems. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to security glazing and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial washaway from security glazing.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.

- C. Wash security glazing on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash security glazing as recommended in writing by security glazing manufacturer.

END OF SECTION 088853

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
- B. Related Requirements:
 - 1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; and roof rafters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- C. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 10 lbf/sq. ft.

2.2 FRAMING SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ClarkDietrich
 - 2. MarinoWare
 - 3. Telling Industries
- B. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
- C. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
 - 1. Steel Studs and Tracks:
 - a. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
 - b. Depth: As indicated on Drawings.
 - 2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.
 - a. Minimum Base-Steel Thickness: As required by horizontal deflection performance requirements.
 - b. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Provide one of the following:

1. Single Long-Leg Track System: ASTM C645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 3. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width required.
1. Minimum Base-Steel Thickness: 0.0269 inch.
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.
1. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Minimum Base-Steel Thickness: 0.0296 inch.
 2. Depth: As indicated on Drawings.
- H. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- C. Flat Hangers: Steel sheet 1 by 3/16 inch by length required.

- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
 - 1. Depth: 2-1/2 inches.
- E. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: 0.0269 inch.
 - b. Depth: 2-1/2 inches.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
 - a. Minimum Base-Steel Thickness: 0.0296 inch.
 - 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Application: 16 inches o.c or as required by horizontal deflection performance requirements if closer spacing is required.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: [48 inches] <Insert dimension> o.c.
 2. Carrying Channels (Main Runners): [48 inches] <Insert dimension> o.c.
 3. Furring Channels (Furring Members): [16 inches] [24 inches] <Insert dimension> o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Specialty gypsum board.
 - 3. Exterior glass-mat gypsum board.
 - 4. Tile backing panels.
 - 5. Trims and Accessories.
 - 6. Joint treatment materials.
 - 7. Sound attenuation blankets, acoustical sealants and other auxiliary materials.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for gypsum sheathing, and for cavity air barrier installed over gypsum sheathing.
 - 2. Division 5 Section "Cold-Formed Metal Framing" for structural framing and suspension systems that support gypsum board panels.
 - 3. Division 7 Section "Thermal Insulation" for thermal insulation.
 - 4. Division 9 Section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- C. Samples for Initial Selection: For each type of trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. National Gypsum Company.
 - 5. USG Corporation.
- B. Regular Gypsum Wallboard: ASTM C1396.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
 - 3. Applications - General: Offices, conference rooms and similar low impact locations.

4. Applications – Specific: Base and face layers to multi-layer, low impact, non-fire-rated assemblies, and all wall and bulkhead locations 8'-0" and higher above finished floor.
- C. Gypsum Board, Type X: ASTM C1396.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Applications - General: Low impact, fire-rated wall, partition and ceiling applications where another specific type of gypsum wallboard is not required based on defined uses or the requirements of a specific UL Assembly.
 4. Applications – Specific: Base layer of multi-layer, fire-rated wall and partition applications where another specific Type X gypsum board is required based upon defined use or the requirements of a specific UL Assembly.
- D. Gypsum Ceiling Board: ASTM C1396.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Applications: Non-fire-rated ceilings locations.
- E. Abuse-Resistant Gypsum Board: ASTM C1396 gypsum board, tested according to ASTM C1629.
1. Core: 5/8-inch, Type X.
 2. Surface Abrasion: ASTM D4977, meets or exceeds Level 2 requirements.
 3. Indentation: ASTM D5420, meets or exceeds Level 1 requirements.
 4. Soft-Body Impact: ASTM E695, meets or exceeds Level 2 requirements.
 5. Hard-body Impact: ASTM 1629, meets or exceeds Level 1 requirements.
 6. Long Edges: Tapered.
 7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 8. Applications – General: Corridor walls up to 8'-0" (except where wall tile is the finish, use tile backing panels), classroom, small group instruction and other educational type rooms up to 8'-0", stair towers, including the underside of stair runs, and similar locations subject to moderate abuse.
 9. Applications – Specific: Face layer of multi-layer, fire-rated wall and partition assemblies where abuse-resistant gypsum board is required based upon defined use.
- F. Moisture and Mold-Resistant Gypsum Board: ASTM C1396. With moisture and mold-resistant core and paper surfaces.
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 4. Applications - General: Wall and ceiling assemblies in toilet rooms, shower rooms, locker rooms and similar type rooms subject to moisture and humidity where the final wall finish is paint.
 5. Applications – Specific: Face layer of multi-layer, fire-rated wall and partition assemblies where moisture and mold-resistant gypsum board is required based upon defined use.

- G. Flexible Gypsum Board: ASTM C1396; manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
2. Long Edges: Tapered.
3. Applications: Non-fire-rated curved walls and ceilings.

2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C1396. Manufactured to have increased fire-resistive capability.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. American Gypsum.
 - b. CertainTeed Corp.
 - c. Georgia-Pacific Gypsum LLC.
 - d. National Gypsum Company.
 - e. USG Corporation.
 2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 3. Long Edges: Tapered.
 4. Applications: Fire-rated wall, partition and ceiling assemblies where required by a specific UL Assembly.

2.5 EXTERIOR GYPSUM BOARD

- A. Glass-Mat Gypsum Sheathing Board: ASTM C1177, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Georgia-Pacific Gypsum LLC; DensGlass Sheathing.
 - b. CertainTeed Corporation; GlasRoc Sheathing.
 - c. National Gypsum Company; Gold Bond eXP Sheathing.
 - d. USG Corporation; Securock Glass-Mat Sheathing.
 2. Core: 5/8-inch, Type X.
 3. Edges: Square.
 4. Surface+
 5. : Fiberglass mat on face, back and long edges.
 6. Microbial Resistance: ASTM D6329, will not support microbial growth.
 7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 8. Humidity Deflection: ASTM C1177, not more than 1/8-inch.
 9. Permeance: ASTM E96, not less than 17 perms.
 10. Applications: All exterior gypsum board substrate boards.

2.6 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178, with manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. CertainTeed Corporation; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield.
 - c. National Gypsum Company; Gold Bond eXP Tile Backer.
 - d. USG Corporation; Durock Glass-Matt Tile Backerboard.
 - 2. Core: As indicated on Drawings.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 - 4. Applications: Substrate board for all interior ceramic and porcelain tile finishes.

2.7 TRIMS AND ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - 2. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. United States Gypsum Co.
 - b. National Gypsum Co.
 - c. Georgia-Pacific Corp.
 - d. Fry Reglet Corporation.
 - e. Gordon Inc.
 - f. Pittcon Industries.
 - 3. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint; one-piece, formed with V-shaped slot and removable strip covering slot opening.
- B. Exterior Trim: ASTM C1047.
 - 1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.

- b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Reveals: Where specifically indicated and exposed to view; interior architectural, decorative gypsum board reveal channels and control joints; extruded accessories of profiles and dimensions indicated.
 - 1. Material: Aluminum; alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
 - 2. Finish: Provide corrosion-resistant primer compatible with joint compound and finish materials specified. Provide in manufacturer's standard Class I or II clear anodic finish; reveal trim shall be painted where indicated on Drawings.
 - 3. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon Inc.
 - c. Pittcon Industries.
 - 4. Shapes: Provide the following, where indicated; provide control joints where indicated or as required per standards:
 - a. Standard Reveals: Equal to Fry Reglet Corp. "Channel Screed Reveal;" 1/4-inch width, unless otherwise noted; for use on ceiling and horizontal or vertical (non-control joint) applications.
 - b. Wall-Ceiling Reveals: Equal to Fry Reglet Corp. "'F' Reveal;" 1/4-inch width, unless otherwise noted; for horizontal wall-to-ceiling or vertical wall-to-wall applications.
 - c. Control Joints: Equal to Fry Reglet Corp. "2-Piece Control Joint;" 1/4-inch width, unless otherwise noted; for use on ceiling and vertical control joint applications.
 - d. Provide other shapes if specifically indicated on Drawings.
- D. Drywall Vents: Flush steel vents specifically designed for wall and ceiling drywall applications. Vents to include adjustable air flow blades, a removable, powder-coated tray to be finished (painted) to match the wall, and integral drywall finishing beads.
 - 1. Basis of Design Product: Drywall Pro Vents by Aria Vent.
 - 2. Material: Steel.
 - 3. Color: Satin white.
 - 4. Size: As indicated on Drawings.
 - 5. Locations: Where indicated on Drawings.

2.8 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. Joint Tape:

1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; "BOSS 826 Acoustical Sound Sealant."
 - b. Franklin International; "Titebond Acoustical Smoke & Sound Sealant."
 - c. Grabber Construction Products; "Acoustical Smoke & Sound Sealant."
 - d. Hilti, Inc.; "CP 506."
 - e. Pecora Corporation; "AIS-919."
 - f. Specified Technologies, Inc.; "Smoke 'N' Sound Acoustical Sealant."
 - g. United States Gypsum Co.; "USG Sheetrock Brand Acoustical Sealant."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8-inch wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4 to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated by type above.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Abuse-Resistant Type: As indicated by type above.
 - 5. Mold-Resistant Type: As indicated by type above.
 - 6. Flexible Type: Apply in double layer at curved assemblies.
 - 7. Type C: Where required for specific fire-resistance-rated assembly indicated.
 - 8. Glass-Mat Interior Type: As indicated on Drawings.
 - 9. Acoustically Enhanced Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layer with screws; fasten face layers with adhesive and supplementary fasteners.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.

2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4 inch gap where panels abut other construction or penetrations.
- B. Water-Resistant Backing Board: Install where indicated with 1/4 inch gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings, and if not indicated, according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where required based upon installed condition.
 4. U-Bead: Use where required based upon installed condition.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. Curved-Edge Cornerbead: Use at curved openings.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 3: Only where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view in the finished project, unless otherwise indicated.
 5. Level 5: At panel surfaces that will receive vinyl wall coverings or other similar graphic material finishes.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 – TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Porcelain wall tile.
 - 2. Metal edge strips.

- B. Related Requirements:

- 1. Division 3 Sections "Cast-in-Place Concrete" for Moisture Vapor Reduction Admixture.
 - 2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 3. Division 9 Section "Gypsum Board" for tile backing panels.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A 108 series of tile installation standards and in ANSI A137.1 and ANSI A137.3 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A 108.01, 108.02, 108.1A, 108.1B, 108.1C, 108.4 through 108.6, and 108.8 through 108.17, ANSI 108.19 which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
 - 2. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
 - 3. Meeting agenda includes but is not limited to:

- a. Tile and installation material compatibility.
- b. Grouting procedure.
- c. Maintenance and cleaning products and methods.
- d. Surface preparation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples: Contractor shall provide manufacturer's color PDF images of tile, grout, accessories & transition strips for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and grouting product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Metal edge strips.
 - 2. Joint sealants.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of wall tile installation with metal edge strips. Coordinate location with Owner and Architect. Do not order tile and metal edge strips until site mock up is approved by the architect and the owner.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 and ANSI A137.3 for labeling tile packages.
- B. Store tile and materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A 137.1 and ANSI A137.3 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A 108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by current edition TCNA Handbook Ceramic, Glass and Stone Tile Installation and TCNA Handbook for Gauge Porcelain Tile and Gauge Porcelain Tile Panels/Slab methods specified in tile installation schedules, and other requirements specified.
- C. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- D. Porcelain Tile - Type (PT):
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Daltile.
 - 2. Series: Volume 1.0.
 - 3. Composition: Porcelain.
 - 4. Module Size: 12 inches by 24 inches.
 - 5. Thickness: 5/16-inch.
 - 6. Tile Color/Finish: Stereo Grey VL73.
 - 7. Finish: Matte.
 - 8. Grout Color: As selected from manufacturer's full range of colors.
 - 9. Installation Pattern: 1/3 Staggered Bond.

2.2 PATCHING AND SKIMCOATING COMPOUND

- A. Cementitious patching and skimcoating compound.
 - 1. Basis of Design:
 - a. MAPEI Corporation: Provide one of the following:
 - 1) Mapecem Quickpatch.
 - 2) Planiprep PSC.

2. Approved Manufacturers: Subject to compliance with requirement.

- a. Laticrete International, Inc.
- b. Custom Building Products

2.3 SETTING MATERIALS

A. Large and Heavy Tile Mortar, Modified Dry-Set Mortar ("H" as rated by ANSI): Comply with requirements in ANSI A118.4H. Provide product that is approved by manufacturer for application thickness up to 1/2 inch.

- 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
- 2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
- 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4HT.

4. Basis of Design:

a. MAPEI Corporation: Provide one of the following:

- 1) Ultralite S2
- 2) Ultrabond ECO GPT
- 3) Granirapid System

5. Approved Manufacturers: Subject to compliance with requirement.

- a. Laticrete International, Inc.
- b. Custom Building Products

2.4 GROUT MATERIALS

A. Polymer-Modified Tile Grout: Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients. Comply with requirements in ANSI A118.7.

1. Basis of Design:

a. MAPEI Corporation: Ultracolor Plus FA

2. Approved Manufacturers: Subject to compliance with requirement.

- a. Laticrete International, Inc.
- b. Custom Building Products

2.5 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 7 Section "Joint Sealants."
1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 3. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
 4. Basis of Design:
 - a. MAPEI Corporation: Mapesil T Plus.
 5. Approved Manufacturers: Subject to compliance with requirement.
 - a. Laticrete International, Inc.
 - b. Custom Building Products
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Trowelable Floor/Wall Patch and Render Mortar: Quick-setting, polymer-modified, fiber-reinforced, cementitious rendering, patching, ramping and leveling mortar. Can be applied from 1/8 inch to 1-1/4 inches (3 mm to 3.2 cm).
1. Basis of Design:
 - a. MAPEI Corporation: Planitop 330 Fast.
 2. Approved Manufacturers: Subject to compliance with requirement.
 - a. Laticrete International, Inc.
 - b. Custom Building Products.
- B. Cement Grout Haze Remover: Professional-strength, water-based formulation that helps remove cement grout haze from tile, concrete and acid-resistant natural-stone surfaces; acidic, low-odor, and nonflammable.
1. Basis of Design:
 - a. MAPEI Corporation: UltraCare Cement Grout Haze Remover

2. Approved Manufacturers: Subject to compliance with requirement.

- a. Laticrete International, Inc.
- b. Custom Building Products.

C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring and wall applications.

2.7 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A 108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with adhesives, bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A 108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - c. Verify when using tiles with all edges shorter than 15 inches (38 cm) in length, the maximum allowable variation in the substrate is 1/4-inch in 10 feet (6 mm in 3.05 m) from the required plane, with no more than 1/16-inch variation in 12 inches (1.5 mm in 30 cm) when measured from the high points in the surface.
 - d. Verify when using large-format tiles with at least one edge of 15 inches (38 cm) and larger in length, the maximum allowable variation in the substrate is 1/8-inch in 10 feet (3 mm in 3.05 m) from the required plane, with no more than 1/16-inch of

variation in 24 inches (1.5 mm in 61 cm) when measured from the high points in the surface.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A 108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A 108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of Tile Installation Standards for providing 95 percent mortar coverage:
 - a. Tile composed of tiles 8 by 8 inches or larger.
 - b. Tile floors consisting of rib-backed tiles.
 - c. Tile floors in commercial applications.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Porcelain Wall Tile (PT): 1/8-inch.
- G. Expansion Joints: Comply with TCNA indications for type of installation and comply with their written recommendations for expansion joints for wall and floor applications. Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- H. Metal Edge Strips: Provide strips equal to Schluter System for transitions from tile to adjacent materials on floors, for wall transitions and corner applications. Refer to Drawings for details, and the following:
 - 1. Outside Corner Trim: Schluter Systems, "Quadec", Finish: Satin anodized aluminum.

3.4 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-Portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. Protection: Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
 - 1. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
 - 2. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations:

1. Tile Installation W202I-25: Medium-set mortar over CMU units in accordance with ANSI A108.5. For Restroom applications, apply waterproof membrane in accordance with ANSI A118.10.
 - a. Tile Type: PT.
 - b. Mortar: Improved Modified Dry-Set Cement Mortar, Non-Sag, for Large and Heavy Tile LHT/Medium-bed, modified dry-set mortar.
 - c. Grout: High-Performance Cement Grout that meets or exceeds ANSI A118.7.
2. Tile Installation W245-25: Medium-set mortar on backer units in accordance with ANSI A108.5 and A108.11. Restroom applications, apply waterproof membrane in accordance with ANSI A118.10.
 - a. Tile Type: PT.
 - b. Mortar: Improved Modified Dry-Set Cement Mortar, Non-Sag, for Large and Heavy Tile LHT/Medium-bed, modified dry-set mortar.
 - c. Grout: High-Performance Cement Grout that meets or exceeds ANSI A118.7.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Mineral-based, factory-painted acoustical ceiling panels.
 - 2. Fiberglass-based, factory-painted acoustical ceiling panels.
 - 3. Standard and specialty exposed grid suspension systems.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including, but not limited to, the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

- E. Field quality-control reports.
- F. Samples for Initial Selection: Contractor shall provide manufacturer's color PDF images of acoustical ceiling panels and suspension system for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Panels: Full-size panels equal to 2 percent of quantity installed, in each pattern and color provided.
 - 2. Suspension-System Components: Quantity of each exposed component equal 2 percent of quantity installed, in each color and style provided.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel or FRP ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS – TYPE (ACT1)

- A. Manufacturers and Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
 - 1. Basis of Design:
 - a. Armstrong World Industries, Inc.; Cirrus High-NRC, No. 568.
 - 2. Approved Manufacturers:
 - a. USG Interiors, Inc.; Eclipse High NRC, No. 76525.
 - b. CertainTeed, Saint-Gobain: Cashmere High NRC, No. Special-Order-Cashmere10.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish.

2. Color: White.
3. LR: 0.84.
4. NRC: 0.75.
5. CAC: Not less than 35.
6. Edge Detail: Beveled Tegal.
7. Thickness: 7/8 inches.
8. Modular Size: Nominal 24 by 48 inches.

- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- D. Suspension System Type: Applications and types as indicated on Drawings and Paragraph 2.9.B.

2.4 ACOUSTICAL PANELS – TYPE (ACT2) - *NOT USED*

2.5 ACOUSTICAL PANELS – TYPE (ACT3)

- A. Manufacturers and Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
 1. Basis of Design:
 - a. Armstrong World Industries, Inc.; Cirrus High-NRC, No. 511.
 2. Approved Manufacturers:
 - a. USG Interiors, Inc.; Equal to Armstrong.
 - b. CertainTeed, Saint-Gobain: Cashmere Customeline, No. Special-Order-Cashmere8.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 1. Type and Form: Type III, mineral base with painted finish.
 2. Color: Custom to match Sherwin Williams.
 3. LR: 0.85.
 4. NRC: 0.65.
 5. CAC: Not less than 35.
 6. Edge Detail: Beveled Tegal.
 7. Thickness: 7/8 inches.
 8. Modular Size: Nominal 24 by 48 inches.
- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

- D. Suspension System Type: Applications and types as indicated on Drawings and Paragraph 2.9.B. All components of grid and suspension trim color shall match color of selected ceiling panels unless otherwise indicated.

2.6 ACOUSTICAL PANELS – TYPE (ACT4) - *NOT USED*

2.7 ACOUSTICAL PANELS – TYPE (ACT5)

- A. Manufacturers and Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

- 1. Basis of Design:

- a. Gold Bond Brand; Gridstone Gypsum Ceiling Panels, No. GB5045.
 - 1) Grid System shall match remaining building.

- 2. Approved Manufacturers:

- a. USG Interiors, Inc.; Sheetrock Lay-In Ceiling Panel Clima Plus Vinyl, No. 3260.
 - b. CertainTeed, Saint-Gobain; Aquarock, No. 1182-CRF-1SV.

- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

- 1. Type and Form: Type III, mineral base with painted finish.
 - 2. Color: White.
 - 3. LR: 0.88
 - 4. Edge Detail: Square.
 - 5. Thickness: 5/8 inch
 - 6. Modular Size: Nominal 24 by 24 inches.

- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

- D. Suspension System Type: Applications and types as indicated on Drawings and Paragraph 2.9.C.

2.8 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

- 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

- B. Wire Hangers, Braces, and Ties: Provide the following wire types, based on Project requirements:

- 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.

- a. Hanger wire shall be 12 gauge/.105 (Diameter Range: .105-.107); Carbon: C1006; Length: 12 feet; Tensile: 54/62,000 KSI; Breaking Load Minimum: 475 pounds; Breaking Load Maximum: 540 pounds; Safe Load Maximum: 275 pounds; Finish: Hot Dip Galvanized; Galvanize Coating: Class I, in accordance with ASTM-641/A.
- 2. Stainless-Steel Wire: ASTM A 580, Type 304, nonmagnetic.
 - a. 1/16" air craft cable shall have a minimum breaking strength of 275 pounds.
- 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
- 4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch diameter bolts.
- E. Hold-Down Clips: Provide for all air lock and security applications, including vestibules, restrooms and locker rooms, where occurs; provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

2.9 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Basis of Design:
 - a. Armstrong World Industries, Inc.
 - 2. Approved Manufacturers:
 - a. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - b. CertainTeed, Saint-Gobain.
- B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically-zinc-coated, or hot-dip galvanized according to ASTM A 653, not less than G30 (Z90) coating designation; with prefinished 9/16-inch-wide metal caps on flanges.
 - 1. Basis of Design: Equal to Armstrong, "Suprafine".
 - 2. Structural Classification: Intermediate duty system.
 - 3. End Condition of Cross Runners: Butt-edge type.
 - 4. Face Design: Flat, flush.
 - 5. Cap Material: Cold-rolled steel.
 - 6. Cap Material @ moisture exposed areas (i.e. restrooms, shower etc): Aluminum cold rolled sheet.
 - 7. Cap Finish:
 - a. ACT1: White.
 - b. ACT3: Custom color to match ceiling panels.

- C. Wide-Face, Capped, Double-Web, Aluminum Suspension System @ ACT5: Main and cross runners roll formed from cold-rolled aluminum sheet; prepainted, electrolytically-zinc-coated, or hot- dip galvanized according to ASTM A 653, not less than G30 (Z90) coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
1. Basis of Design: Equal to Armstrong, "Prelude Plus XL Aluminum".
 2. Structural Classification: Heavy duty system.
 3. End Condition of Cross Runners: Butt-edge type.
 4. Face Design: Flat, flush.
 5. Cap Material: Cold rolled aluminum.
 6. Cap Finish: White.

2.10 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Basis of Design:
 - a. Armstrong World Industries, Inc.
 2. Approved Manufacturers:
 - a. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - b. CertainTeed, Saint-Gobain.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: If indicated, install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs or any other part of steel deck. Attach hangers to structural members only.
 - 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as indicated on Drawings.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 - 3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 - 5. Paint cut edges of panel remaining exposed after installation; precisely match color of exposed panel surfaces using coating furnished or recommended in writing for this purpose by acoustical panel manufacturer.
 - 6. Install hold-down clips for all air lock applications, including vestibules, and in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 - 7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095421 – LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes
 - 1. Wall-to-Wall acoustical metal ceiling panels.
 - 2. Exposed grid suspension system.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Division 9 Section "Plaster and Gypsum Board" for adjacent gypsum board.
 - 2. Division 9 Section "Acoustical Panel Ceilings" for adjacent ceiling system.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including, but not limited to, the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Qualification Data: For testing agency.

- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.
- F. Samples for Initial Selection: Contractor shall provide manufacturer's color PDF images of acoustical ceiling panels and suspension system for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Panels: Acoustical Metal Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
 - 2. Suspension-System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- B. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- C. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristics: ASTM E 84 and complying with ASTM E 1264 Classification.
- D. Acoustic Panels: As with other architectural features located at the ceiling, may obstruct, or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.
- E. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing panels, permit them to reach room temperature and stabilized moisture content.
- C. Handle panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.10 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
 - 1. Acoustical Panels: Sagging and warping
 - 2. Grid System: Rusting and manufacturer's defects.
- B. Warranty Period:
 - 1. Acoustical Metal panels: One (1) year from date of substantial completion
 - 2. Grid: One (1) year from date of substantial completion
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 – PRODUCTS

2.1 LINEAR METAL CEILING (MTL)

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
 - 1. [Armstrong World Industries, Inc.](#)

B. Acoustical Panels Type:

1. Product: MetalWorks Linear – Classic., No. 7161-FXSE.
2. Surface Texture: Smooth
3. Composition: Electrogalvanized Steel 0.028”.
4. Color: FXSE Effects Sesame.
5. Size: 6 inches by 96 inches.
6. Edge Profile: Linear.
7. Perforation Option: M-2 Perforated.
8. Noise Reduction Coefficient(NRC): 0.70.
9. Ceiling Attenuation Class (CAC) : N/A.
10. Sabin: N/A.
11. Articulation Class (AC): N/A.
12. Flame Spread: ASTM E 1264; Class A (FM).
13. Light Reflectance White Panel: N/A.
14. Dimensional Stability: Standard.

C. Panel Accessories:

1. Provide all necessary accessory components from manufacturer for a complete wall-to-wall installation.
2. Refer to drawings for details.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

- A. Follow manufacturer installation instructions.
- B. Install suspension system and panels in accordance with the manufacturer's instructions BPLA-297437, and in compliance with ASTM C636 and with the authorities having jurisdiction.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095421

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoplastic-rubber base.
 - 2. Rubber molding accessories.
 - 3. Rubber Stair Treads.
 - 4. Rubber Stair Landing Tile.

1.3 ACTION SUBMITTAL

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: Contractor shall provide manufacturer's color PDF images of rubber base, accessories, stair treads and landings for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient base and stair accessories shall comply with requirements of FloorScore certification.
- B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, the following manufacturers' products may be incorporated into the Work:
 1. Basis of Design:
 - a. Tarkett – Johnsonite.

2. Approved Manufacturers:
 - a. Roppe Corporation, USA.

2.3 THERMOPLASTIC-RUBBER BASE (RB)

- A. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).
 1. Group: 1 (solid, homogeneous)
- B. Style: B, Cove with top-set toe.
- C. Thickness: 0.125 inch.
- D. Height: 4-inches.
- E. Lengths: Coils in manufacturer's standard length but not less than 96 feet.
- F. Outside Corners: Job-formed.
- G. Inside Corners: Job-formed.
- H. Surface: Smooth.
- I. Colors: As selected by Architect from manufacturer's full range of colors and patterns produced for vinyl wall base complying with requirements indicated.
 1. Provide a minimum of (90) color selections.

2.4 RUBBER MOLDING ACCESSORY

- A. Description: Rubber nosing, cove caps, edging, reducers, joiners and transition strips.
- B. Profile and Dimensions: As indicated on drawings.
- C. Locations: Provide rubber molding accessories in areas indicated below:
 1. Transition Strips, Reducers and Adaptors.
- D. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.
 1. Provide a minimum of (36) color selections.

2.5 RUBBER STAIR ACCESSORIES (RBR)

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Rubber Treads: ASTM F 2169.
 1. Type: TP (rubber, thermoplastic).
 2. Class: 2 (with contrasting grit tape for the visually impaired).
 3. Pattern; Hammered (HTR) surface design, No. VIHMT.

4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
 5. Nosing Height: 2 inches.
 6. Thickness: 1/4 inch and tapered to back edge.
 7. Size: Lengths and depths to fit each stair tread in one piece.
- C. Landing Tile (RBR): Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- D. Locations: Provide rubber stair accessories in areas indicated.
- E. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.
1. Provide a minimum of (107) color selections.

2.6 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement-based or blended hydraulic-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated. Product cannot void any portion of the manufacturer's standard warranty
1. Adhesives shall have a VOC content of 50 g/L or less
 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Provide adhesive for the following substrates:
 - a. Porous Substrates: 960 Cove Base Adhesive.
 - b. Non-Porous Substrates and All Outside Corners: 946 Premium Contact Adhesive.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.

- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Luxury Vinyl Tile.
 - 2. Static Dissipative Tile.
 - 3. Rubber Floor Tile.
- B. Related Requirements:
 - 1. Division 3 Section "Cast-in-Place Concrete" for Moisture Vapor Reduction Admixture.
 - 2. Division 3 Section "Hydraulic Cement Underlayment" for Self-Leveling Underlayment.
 - 3. Division 9 Section "Resilient Base and Accessories" for resilient wall and accessories installed with resilient tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Attendees: The Installer and representatives as well as senior technician of manufacturers and fabricators involved in, or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.
- B. Review methods and procedures related to resilient flooring including, but not limited to, the following:
 - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review special designs and patterns.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Product Schedule: For floor tile. Use same designations indicated on Drawings.
- D. Samples: Contractor shall provide manufacturer's color PDF images of resilient flooring for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 60 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

- a. Size: Minimum **100 sq. ft.** for each type, color, and pattern in locations directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing. Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F Store floor tiles on flat surfaces.

1.10 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

- B. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.

1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage7.1.
 - a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
 - b. Average greater than 1 megohm and less than or equal to 1000 megohms when installed floor coverings are tested surface to ground.
2. Static-generation values reported by manufacturers may be limited by sensitivity of testing equipment used; consult manufacturers if static generation is critical.
3. Static Generation: Less than 300V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
4. Static Decay: 5000 to zero V in less than 0.25 seconds when tested per FED-STD-101C/4046.1.

2.2 LUXURY VINYL TILE (LVT)

- A. Product: Subject to compliance with requirements, provide the following:

1. Manufacturer: Mohawk.
2. Series: Hot and Heavy II.
3. Pattern: Secoya 5.0 C2104
4. Tile Standard: ASTM F 1700, Class III, Type B.
5. **Wear Layer: Quantum Guard Elite.**
6. Thickness: 5mm.
7. Wear Layer Thickness: 20 mil.
8. Finish: M-Force Ultra.
9. Size: 9.84 inches x 59.06 inches.
10. Color: 148 Knotty Oak.
11. Installation: Ashlar.

2.3 STATIC DISSIPATIVE TILE (SDT)

- A. Products: Subject to compliance with requirements, provide the following:

1. Manufacturer: Armstrong Commercial Flooring.
2. Series: Excelon SDT.
3. Tile Standard: ASTM F1066, Class 2, through-pattern.
4. Thickness: 0.125 inch.
5. Wear Surface: Smooth.
6. Tile Size: 12 inches by 12 inches.
7. Color: As selected by Architect from manufacturer's full range of colors.

2.4 RUBBER FLOORING (RBR)

A. Product: Subject to compliance with requirements, provide the following:

1. Manufacturer: Tarkett – Johnsonite
2. Product Standard: ASTM F1344.
 - a. Group: 1-A (solid, homogeneous)
3. Thickness: 0.125 inch.
4. Size: 24 inches by 24 inches
5. Pattern: Hammered.
6. Color: As selected by Architect from manufacturer's full range of colors.
 - a. Provide a minimum of (90) colors.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile, conductivity and substrate conditions indicated unless noted otherwise. Product cannot void any portion of the manufacturer's standard warranty.
1. Adhesives shall comply with the following limits for VOC content:
 - a. Adhesives: 50 g/L or less.
 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Provide adhesive for the following substrates:
 - a. Substrates without moisture vapor reduction admixture: Porous Adhesive.
 - b. Substrates with moisture vapor reduction admixture: Non-Porous Adhesive.
- C. Grounding Strips: Provided by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by the floor tile manufacturer for SDT.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Receive Resilient Tile Floor Manufacturer's written approval of substrate required before installation of any tile flooring. The Carpet and Resilient Tile Contractor is responsible for obtaining the Resilient Tile Flooring Manufacturer's written approval of the floor as an acceptable substrate for the installation of manufacturer's tile product specified. If the floor is not acceptable to the manufacturer, the general contractor is responsible for preparing the floor to receive the new tile, as specified in order paragraphs of this specification, including an underlayment or leveling compound where necessary to meet all requirements for a manufacturer's approval of the substrate.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction.
 - 2. Lay tiles in pattern of colors and sizes indicated on Drawings.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Static Dissipative Tile Install:

1. Embed grounding strips in static-control adhesive by the electrical contractor. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
2. Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
3. Engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.
4. Arrange for testing after static-control adhesives have fully cured and static-control resilient flooring has stabilized to ambient conditions and after ground connections are completed.
5. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.
6. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.
7. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 1. Sealer: Apply (2) coats of liquid floor polish to all SDT surfaces.
 2. Finish: Apply (4) coats of liquid floor polish to all SDT surfaces.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 – RESINOUS FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resinous flooring systems.
2. Engineered marble thresholds.
3. Metal edge trim.

B. Related Requirements:

1. Division 3 Sections “Cast-in-Place Concrete” for Moisture Vapor Reduction Admixture.
2. Division 7 Section "Joint Sealants" for sealants installed at joints in resinous flooring systems.
3. Division 9 Section “Gypsum Board” for base backing panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Attendees: The Installer and representatives as well as senior technician of manufacturers and fabricators involved in, or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.

B. Review methods and procedures related to resinous including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special designs and patterns.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer’s technical data, installation instructions, and

general recommendations for each resinous flooring material required. Include Health Product Declaration (HPD's) and certifications indicating compliance of materials with requirements.

- B. Samples for Verification: For each resinous flooring system required, 4.25 inches square, applied to a rigid backing in color and finish and topcoat indicated.
- C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on drawings in product schedule.
- D. Maintenance & Cleaning Data: For resinous flooring to include in maintenance manuals.

1.5 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy broadcast based system with stained concrete look).
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Engineered marble thresholds.
 - 2. Metal edge trim.

F. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 100-inch square floor area selected by Architect.
2. Include 100-inch length of integral cove base with inside and outside corner.
3. Simulate finished lighting conditions for Architect's review of mockups.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. ISO 9001-2008: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Add material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.
- B. Store components protected from exposure to harmful weather conditions and in a temperature controlled area as recommended by manufacturer. Do not allow product to freeze.
- C. Deliver products to areas to receive moisture treatment at least 48 hours prior to application to allow them to acclimate to the space.
- D. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate onsite mixing errors. No onsite weighing or volumetric measurements allowed.

1.9 ENVIRONMENTAL CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
 1. Maintain material and substrate temperature between 65 and 85°F (18 and 30°C) during resinous flooring application and for not less than 24 hours after application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier

must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

- E. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone.
- F. Do not install product of this Section until one (1) week after building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of one (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

2.2 MANUFACTURERS

- B. Acceptable Manufacturers: Subject to compliance with requirements, the following manufacturers' products may be incorporated into the Work:
 - 1. Basis of Design:
 - a. Stonhard.
 - 2. Approved Manufacturers:
 - a. [Sherwin-Williams Company; General Polymers.](#)
 - b. Key Resin/Durex.
 - c. Industrial Floor Corporation.
 - d. Miracle Method US Corporation.
 - e. Tnemec Company Inc.

2.3 RESINOUS FLOORING (RES1)

A. Resinous Flooring System

1. Basis of Design: "Stonclad GS with Tectop EF flake system with Stonproof ME7 Waterproofing System" as manufactured by Stonhard, Inc.; nominal 3/16-inch (5-mm) - thick system comprised of a penetrating, moisture tolerant, two-component epoxy primer, a high-performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments and two-component, 100-percent solids undercoat, brightly colored flake broadcast and two coats of a high-performance, two-component, clear 100-percent solids epoxy sealer.

- a. Build-up of broadcast- or liquid-rich (slurry) -type systems shall not be accepted.

B. System Characteristics:

1. Color and Pattern: Custom.
 1. Color A: 106, 107, 108, 144, 145, 146 and 147.
 2. Color B: 002, 005, 009 (Alt. Bid), 010 (Alt. Bid), 013, 014 and 021.
2. Wearing Surface: Texture field.
3. Integral Cove Base: 6 inches.
4. Overall System Thickness: Nominal 1/4-inch.
5. Flake Size: 1/4-inch.

C. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Body Coat(s): Stonclad GS
 - a. Resin: Epoxy
 - b. Formulation Description: 100 percent solids
2. Application Method: Metal Trowel
 - a. Thickness of Coats: 1/4"
 - b. Number of Coats: One
 - c. Aggregates: Pigmented Blended aggregate.
3. Undercoat(s): Tectop Undercoat
 - a. Resin: Epoxy
 - b. Type: Pigmented
 - c. Formulation Description: 100% high solids.
4. Broadcast Aggregate:
 - a. Multi-color vinyl flakes broadcast
 - b. Number of broadcasts: To refusal.
5. Topcoats: Tectop Sealer
 - a. Resin: Epoxy.
 - b. Formulation Description: 100% high solids.
 - c. Type: Clear gloss
 - d. Number of Coats: Two.

- e. Finish: Field verify for anti-slip texture.

2.4 ACCESSORY MATERIALS

- A. Primer: 100-percent solids, with type as recommended by manufacturer for substrate and body coats indicated; equal to Stonhard "Standard Primer."
- B. Waterproofing Membrane: Type as recommended by manufacturer for substrate and primer and body coats indicated.
- C. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- D. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.

2.5 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Engineered Marble Thresholds:
 - 1. Manufacture: MSI or Equal
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Finish: Polished.

2.6 METAL EDGE STRIPS

- A. Metal Edge Strips: Provide angle or L-shaped, strips equal to Schluter System for transitions from backer board substrate and resinous base to adjacent materials for wall transitions. Refer to Drawings for details, and the following:
 - 1. Wall Tile to Resinous Base Trim: Schluter Systems "Schiene", Finish: Satin nickel anodized aluminum.

PART 3 – EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re-circulates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 - 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
 - b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
 - c. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
 - d. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
 - 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other non-moving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply waterproofing membrane, where indicated, in manufacturer's recommended thickness.
 - 1. Apply waterproofing membrane to integral cove base substrates.
- D. Apply reinforcing membrane to substrate cracks.
- E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top-coating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: 6-inches high. Refer to drawings for detail.
- F. Apply self-leveling slurry body coats in thickness indicated for flooring system.
- G. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.
- H. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS/TRANSITIONS

- A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

- C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove non-complying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Modular carpet tile.
- B. Related Requirements:
 - 1. Division 3 Section "Cast-in-Place Concrete" for moisture vapor reduction admixture.
 - 2. Division 3 Section "Hydraulic Cement Underlayment" for Self-Leveling Underlayment.
 - 3. Division 9 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Attendees: The Installer and representatives as well as senior technician of manufacturers and fabricators involved in, or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.
 - 2. Review methods and procedures related to resilient flooring including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special designs and patterns.
 - d. Review delivery, storage, and handling procedures.
 - e. Review ambient conditions and ventilation procedures.
 - f. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: Contractor shall provide manufacturer's color PDF images of carpet tile for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpet Tile: Full-size units equal to 3 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floor covering Installers Association at the Master II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.10 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT)

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Manufacturer: Mannington.
2. Collection: Design Local.
3. Pattern: Nashville.
4. Color: Queen Villiage 14325.
5. Size: 18 inches by 36 inches.
6. Backing: Infinity Modular Certified NSF/ANSI-140 Gold
7. Installation: Brick Ashlar

2.2 CARPET TILE (EM)

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Manufacturer: Mohawk.
2. Collection: Living Product Challenge 2.0.
3. Pattern: Step Up II.
4. Color: Iron Ore 983.
5. Size: 24 inches by 24 inches.
6. Backing: EcoFlex Matrix.
7. Installation: Monolithic.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation on porous and non-porous surfaces.

1. Substrates without moisture vapor reduction admixture: Porous Adhesive.
2. Substrates with moisture vapor reduction admixture: Non-Porous Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division Section 3 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- D. For wood subfloors, where occur, verify the following:
 - 1. Underlayment over subfloor complies with requirements specified in Division Section 6 "Rough Carpentry."
 - 2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
 - 1. Carpet installation shall begin at the center point of the room and work out to the perimeter walls. Installation pattern to be ashlar.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097200 – WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Textile wall covering.
- B. Related Requirements:
 - 1. Division 9 Section “Gypsum Board Assemblies” for gypsum wall board.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement seams and termination points.
- C. Samples: Contractor shall provide manufacturer’s color PDF images of each type of wall covering and for each color, pattern, texture, and finish specified for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141 for appearance shading characteristics.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature (65 to 85 deg F) and humidity conditions at levels (not more than 50 percent) intended for occupants after Project completion during the remainder of the construction period.
- B. Wall Conditions: Gypsum board finish shall be completed to comply with AWCI Specification, Level 4 or higher. See Manufacturer's Installation Instructions for additional details.
- C. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- D. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Wall-covering system shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California

Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- B. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 45 or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265

2.2 ACOUSTICAL WALL COVERING (TWC1)

- A. Description: Provide products in rolls from same production run and complying with the following:
 - 1. Manufacturer: Maharam
 - a. WALLCOVERING HAS A MINIMUM TEN WEEK LEAD TIME.
 - 2. Pattern: Tek-wall Bastion.
 - 3. Color: 005 Mysterious.
 - 4. Total Weight: 15.3 oz.
 - 5. Width: 56 inches.
 - 6. Thickness: 0.375 inches.
 - 7. Fiber: 55% Polyester, 45% Solution Dyed Polyolefin
 - 8. Backing: 100% Acrylic.
 - 9. Installation: Refer to drawings.

2.3 ACOUSTICAL WALL COVERING (TWC2)

- A. Description: Provide products in rolls from same production run and complying with the following:
 - 1. Manufacturer: Maharam
 - a. WALLCOVERING HAS A MINIMUM TEN WEEK LEAD TIME.
 - 2. Pattern: Tek-wall Bastion.
 - 3. Color: 006 Pangolin.
 - 4. Total Weight: 15.3 oz.
 - 5. Width: 56 inches.
 - 6. Thickness: 0.375 inches.
 - 7. Fiber: 55% Polyester, 45% Solution Dyed Polyolefin
 - 8. Backing: 100% Acrylic.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
 - 1. Adhesive shall have a VOC content of 50 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099123 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.
- C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 7 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALLCOVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in sequential order.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 099123 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will supply a color selection.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Metal toilet enclosures.
 - c. Metal lockers.
 - d. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.

- d. Copper and copper alloys.
 - e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Requirements:

1. Division 2 Section "Cement Concrete Pavement" for traffic-marking paint.
2. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
3. Division 5 Section "Structural Steel" for shop priming structural steel.
4. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
5. Division 6 Section "Architectural Woodwork" for shop priming interior architectural woodwork.
6. Division 8 Section "Hollow Metal Doors and Frames" for factory priming steel doors and frames.
7. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification. Submit in same format as specification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).
- B. Colors: Match Architect's color selections.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Submit 4 sets of samples of each final color and finish.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to be demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Certifications:
1. Furnish a letter from the paint manufacturer or their factory representative certifying that the paint system proposed for this project are equal to or better than the specified systems in appearance and performance levels. Submit proof of equivalency for approval including generic type, descriptive information, VOC content, performance data, solids by volume, and recommended film thickness. Submittals not accompanied by this certification will be returned, "REJECTED."
- F. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Provide mock up of first and second coats of block filler or primer for approval of application.
 - b. Wall Surfaces: Provide samples on at least 100 sq. ft.

- c. Small Areas and Items: Architect will designate items or areas required.
- D. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface. Where materials are being applied over previously painted surfaces, apply mock up samples and perform field testing to check for compatibility, adhesion, and film integrity of the new materials to existing painted surfaces. Report in writing any condition that may affect application, appearance, or performance of the specified coating system.
 - 1. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 2. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
- C. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver left-over paint materials to Owner.
 1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:
 - a. Exterior: (2) gallons of each color applied.
 - b. Interior: (1) case of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, provide products from one of the following manufacturers. Sherwin-Williams is the basis of design and establishes the standard of quality required.
- B. Manufacturers' Names:
 1. Sherwin Williams (SW).
 2. Benjamin Moore.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience. Each system should be from the same manufacturer.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Match Architect's samples.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
- C. Where materials are being applied over previously painted surfaces, apply mock up samples and perform field testing to check for compatibility, adhesion, and film integrity of the new materials to existing painted surfaces. Report in writing any condition that may affect application, appearance, or performance of the specified coating system.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning. All surfaces must be clean, dry, and free of all oil, grease, surface contaminants, and substances that could impair adhesion.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - 2. All previously coated surfaces shall clean, dry, dull, and in sound condition prior to coating. All loose paints (either visible or not) shall be removed to expose a sound surface for repainting. All smooth, glossy surfaces shall be abraded to impart a surface profile that will promote adhesion of the subsequent coating system. A test-patch shall be applied prior to a full installation to assure adequate adhesion will be achieved.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.

2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
3. For Concrete Floors:
 - a. Surface must be clean, dry, and in sound condition. Remove stains, oil, dust, grease, dirt, rust, release agents, curing compounds and hardeners, salts, efflorescence, laitance, and other contaminants and foreign material to ensure adequate adhesion.
 - b. Follow recommendations as listed in the Sherwin Williams / General Polymers G-1 Surface Preparation Guide and ICRI Guideline #310-2-1997 for surface preparation.
 - c. Provide Concrete Surface Profile (CSP) as recommended by manufacturer for specified systems.
 - d. Determine alkalinity and moisture content of surfaces by performing appropriate tests. Document results in writing to GC and architect.
4. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - 1) Existing Wood: Scuff-sand/mechanically abrade the existing finish to impart a surface profile followed by thorough cleaning with a commercial cleaner/degreaser to remove all surface contaminants and rinse thoroughly.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, back-prime with spar varnish.
 - d. Back-prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
5. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Power Tool Clean steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 3.

- b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- 6. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- 7. Interior Grilles, Louvers and Sprinkler Escutcheons shall be painted in the field to match adjacent material color. Contractor shall prep and prime factory finished items to receive new paint finish in the field.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Exposed uninsulated metal piping.
 2. Exposed uninsulated plastic piping.
 3. Exposed pipe hangers and supports.
 4. Tanks that do not have factory-applied final finishes.
 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.

7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
 2. Panel boards.
 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. All interior and exterior exposed gypsum wallboard, including any bulkheads and soffits to be painted.
- I. All interior and exterior ferrous metal to be painted including any lintels, railings, grilles, and louvers (does not include factory or pre-finished items).
- J. All hollow metal doors and frames, interior and exterior, shall be painted.
- K. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- L. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- M. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- N. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- O. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- P. Marking and Identification: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
1. Be located in accessible concealed floor, floor-ceiling or attic spaces;
 2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.

- a. Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
 - 1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 - 2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
 - 3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.
- B. Pre-installation Meetings:
 - 1. Schedule a conference and inspection to be held on-site before field application of coating systems begins.
 - 2. Conference shall be attended by Contractor, Owner's representative, Engineer, Construction Manager, coating applicators, and a representative of coating material manufacturer.
 - 3. Topics to be discussed at meeting shall include:
 - a. A review of Contract Documents and accepted shop drawings shall be made and deviations or differences shall be resolved.
 - b. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, and protection following application.
 - c. Establish which areas on-site will be available for use as storage areas and working area

4. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work should be completed before coating application can begin.
5. Prepare and submit, to parties in attendance, a written report of pre-installation conference report shall be submitted with 3 days following conference.
6. Field Samples:
 - a. Provide a full coating system to the required sheen, color, texture, and recommended coverage rates. Simulate finished lighting conditions for reviewing in-place work.
7. The Architect, Construction Manager or Owners Representative will select one room, area, or combination of areas and surfaces and conditions for each type of coating and substrate to be coated. Apply coatings in this room, area, combination of areas and surfaces according to the schedule, or as specified. After finishes are accepted, this room, area or combination of areas and surfaces will serve as the standard of quality and for evaluation of coating systems of similar nature.
8. A manufacturer's representative shall be available upon request by the General Contractor or Painting subcontractor, to advise applicator on proper application technique and procedures.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
 1. Semi-Gloss Acrylic-Enamel Finish: two finish coats over a rust-inhibitive primer.
 - a. Primer: SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Finish Coats: SW, Waterbased Acrolyn 100 Waterbased Urethane Gloss.

3.8 INTERIOR PAINT SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 - 1. Flat Acrylic Finish (Ceiling and Bulkhead Applications): Two finish coats over a primer.
 - a. Primer: SW, ProMar 200 Zero VOC Latex Primer, B28W600.
 - b. Finish Coat: SW, Scuff Tuff Interior Waterbased Enamel, Flat, S22W00151 series.
 - 2. Low Luster Acrylic-Enamel Finish (Wall Application): Two finish coats over a primer.
 - a. Primer: SW, ProMar 200 Zero VOC Latex Primer, B28W600.
 - b. Finish Coats: SW, Scuff Tuff Interior Waterbased Enamel, Matte, S23W00151 series.
- B. Ferrous Metal: Provide the following finish systems over ferrous metal:
 - 1. Semi-Gloss Finish: Two finish coats over a primer.
 - a. Primer: SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Finish Coats: SW, Pro-Industrial Waterbased Catalyzed Epoxy Gloss.
- C. Galvanized Metal: Provide the following finish systems over galvanized metal:
 - 1. Semi-Gloss Finish: two finish coats over a primer.
 - a. Primer: Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Finish Coats: Pro Industrial Waterbased Catalyzed Epoxy Gloss.
- D. Concrete Masonry Units: Provide the following finish systems over primer for wall applications.
 - 1. Semi-Gloss Finish: Two finish coats over a primer.
 - a. Filler: SW, PrepRite Block Filler, B25W25.
 - b. Finish Coats: SW, ProMar 200 Zero VOC Latex Semi-Gloss, B31W2650 series
**Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.*
- E. Concrete Masonry Units Eg-Shel Epoxy Finish (EPX1): Provide the following epoxy finish systems over filler for wall applications.
 - 1. Eg-Shel Waterbased Epoxy Finish: Two finish coats over a filler.
 - a. Filler: PrepRite Block Filler, B25W25.
 - b. Finish Coats: Pro Industrial Waterbased Catalyzed Epoxy Eg-Shel, B73-360 series.

3.9 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

- A. Stain-Finish Woodwork with Sealer: Provide the following stain finish with sealer over new interior woodwork:
 - 1. Waterborne Satin-Varnish Finish: Two finish coats of waterborne clear satin varnish over a sanding sealer. Wipe wood filler before applying stain.

- a. Filler Coat: Minwax, Sanding Sealer – Clear, 65-7000 Series. (Optional as needed)
- b. Stain Coat: Minwax, Wood Finish Water Based Semi-Transparent Color Stain.
- c. Finish Coats: Minwax, Polycrylic Water-Based Protective Finish - Clear, Satin Finish, 133-300 Series.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Surface preparation.
 - 2. Application of high-performance coating systems for exposed exterior structural steel framing, columns and accessories.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
 - 2. Division 9 Section "Painting" for general field painting.

1.3 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.

2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

- D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost Owner.
3. Approval of mockups does not constitute approval of deviations from Contract Documents unless Architect specifically approves of such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. Basis-of-Design Manufacturer: Provide high-performance paints manufactured by Sherwin Williams Paints and Coatings, Inc. Subject to compliance with requirements, equal products by other manufacturers may be incorporated into the Work. Manufacturer's include, but are not limited to the following:
 - 1. Tnemec Company, Inc., PPG Architectural Finishes, Inc.
 - 2. Behr Process Corporation.
 - 3. Benjamin Moore & Co.
 - 4. Comex Industrial Coatings; Comex Group.
 - 5. Corotech Coatings; Benjamin Moore & Co.
 - 6. Devoe Paint Company; Akzo Nobel.
 - 7. Diamond Vogel Paints.
 - 8. Dulux (formerly ICI Paints); a brand of Akzo Nobel.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Products shall be of same manufacturer for each coat in a coating system.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 6. Pretreatment Wash Primers: 420 g/L.
 - 7. Floor Coatings: 100 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.

- D. Low-Emitting Materials: Interior coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 1. SSPC-SP 7/NACE No. 4.
 2. SSPC-SP 11.
 3. SSPC-SP 6/NACE No. 3.
 4. SSPC-SP 10/NACE No. 2.
 5. SSPC-SP 5/NACE No. 1.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for coating and substrate indicated.
- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply

additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 HIGH-PERFORMANCE COATING SCHEDULE

- A. Interior Ferrous Metals, Unprimed, 3 Coat:
 - 1. Surface preparation: Power Tool Cleaning per SSPC SP-3.
 - 2. Primer Coat: Sherwin-Williams Macropoxy 646 Fast Cure Epoxy, B58-600 Series @ 5.0 to 7.0 dry mils. Where VOC's are restricted, use Macropoxy 646-100, B58-620 Series.
 - 3. Intermediate Coat: Sherwin-Williams Acrolon 218 HS Polyurethane Semi-Gloss, B65-650 series @ 3.0 – 4.0 dry mils. Where VOC's are restricted, use Hi-Solids Polyurethane 100 Semi-Gloss, B65-630 Series.
 - 4. Top Coat: Sherwin-Williams Acrolon 218 HS Polyurethane Semi-Gloss, B65-650 series @ 3.0 – 4.0 dry mils. Where VOC's are restricted, use Hi-Solids Polyurethane 100 Semi-Gloss, B65-630 Series.
- B. Exterior Ferrous Metals, Unprimed at Exterior or Exposed Perimeter Locations, 3 Coat:
 - 1. Surface preparation: Commercial Blast Cleaning per SSPC-SP6.
 - 2. Primer Coat: Sherwin-Williams Corothane 1 Gal-Va-Pac Zinc Rich Primer, B65G10 @ 3.0 - 4.0 dry mils.
 - 3. Intermediate Coat: Sherwin-Williams Macropoxy 646 Fast Cure Epoxy, B58-600 Series @ 4.0 - 5.0 dry mils. Where VOC's are restricted, use Macropoxy 646-100, B58-620 Series.
 - 4. Top Coat: Sherwin-Williams Acrolon 218 HS Polyurethane Semi-Gloss, B65-650 series @ 3.0 – 4.0 dry mils. Where VOC's are restricted, use Hi-Solids Polyurethane 100 Semi-Gloss, B65-630 Series.
- C. Galvanized & Non-Ferrous Metals, 2 Coat:
 - 1. Surface preparation: Solvent Clean per SSPC-SP1. Apply a mock-up/test-patch after one week and test for adhesion per ASTM D3359. Document results to Architect in writing. If results are poor, additional surface prep including Brush Blasting may be required.

2. Base Coat: Sherwin-Williams Macropoxy 646 Fast Cure Epoxy, B58-600 Series @ 2.0 – 3.0 dry mils. Where VOC's are restricted, use Macropoxy 646-100, B58-620 Series.
 3. Top Coat Semi-Gloss: Sherwin-Williams Acrolon 218 HS Polyurethane Semi-Gloss, B65-650 series Series @ 3.0 – 4.0 dry mils. Where VOC's are restricted, use Hi-Solids Polyurethane 100 Semi-Gloss, B65-630 Series.
- D. Exterior - Concrete Masonry Units (CMU): Waterproof System
1. Surface Preparation: Surface must be clean and dry.
 2. Base Coat; Sherwin-Williams Loxon Block Surfacers LX01W200.
 - a. Coverage @ 50-75 sq. ft./gal
 3. Two coats; Sherwin-Williams Loxon XP High-Build Waterproofing Masonry Coating- (color) LX11-50 series. Applied at 6.5 – 8.5 mils DFT per coat.

A total dry film thickness of 13.0 – 16.8 mils of topcoat and a surface of 10 or less pinholes per sq. foot is required for a waterproofing system.

 - a. Coverage @ 90-115 sq. ft./gal
- E. Interior - Concrete Masonry Units (CMU): Natatorium/Pool Areas
1. Surface Preparation; Surface must be clean and dry.
 2. Base Coat; Sherwin-Williams Pro Industrial Heavy Duty Block Filler, B42W150
 - a. Coverage @ 75-100 sq. ft./gal
 3. Intermediate Coat: Sherwin-Williams Macropoxy 646 Fast Cure Epoxy, B58-600 Series @ 4.0 - 5.0 dry mils. Where VOC's are restricted, use Macropoxy 646-100, B58-620 Series.
 4. Top Coat: Sherwin-Williams Acrolon 218 HS Polyurethane Semi-Gloss, B65-650 series @ 3.0 – 4.0 dry mils. Where VOC's are restricted, use Hi-Solids Polyurethane 100 Semi-Gloss, B65-630 Series.

END OF SECTION 099600

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Porcelain enamel marker boards with aluminum frames.
 - 2. Vinyl-faced cork tack boards with aluminum frames.
 - 3. Wrapped vinyl-faced cork tack boards (Frameless).

1.3 SUBMITTALS

- A. Product Data: For each type of visual display board indicated.
- B. Shop Drawings: For each type of visual display board required.
 - 1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
 - 2. Include sections of typical trim members.
 - 3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
 - 4. Where occurs, Contractor shall verify the existing board dimensions to ensure new visual display boards cover extent of existing boards.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:
 - 1. Markerboards: Actual sections of porcelain enamel finish for each type of marker board required.
 - 2. Vinyl-Faced Cork Tackboards: Samples for each type of vinyl- faced cork tack board indicated.
- D. Product Certificates: Signed by manufacturers of tack boards certifying that vinyl-faced materials furnished comply with requirements specified for flame-spread ratings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of marker board manufacturer for both installation and maintenance of the type of sliding marker board units required for this Project.
- B. Source Limitations: Obtain visual display boards through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Fire-Test-Response Characteristics: Provide vinyl- and fabric-faced tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify vinyl- and fabric-faced tack boards with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 10 or less.
- E. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.5 WARRANTY

- A. Special Warranties: As follows:
 - 1. Writing Surface: Manufacturer's standard, written, material warranty agreeing at manufacturer's option to repair or replace the original boards if they do not retain their original writing and erasing qualities, gloss variance, or color consistency under normal usage and maintenance, without reducing or otherwise limiting any other rights to correction which the Owner may have under the Contract Documents. Warranty does not include the cost of removal or reinstallation.
 - a. Term of Warranty: Limited lifetime warranty.
 - 2. Workmanship and Materials: Manufacturer's standard, written, material replacement warranty agreeing at manufacturer's option to repair or replace any products which,

under normal usage and maintenance, show defects in workmanship or materials, without reducing or otherwise limiting any other rights to correction which the Owner may have under the Contract Documents. Warranty does not include the cost of removal or reinstallation.

- a. Term of Warranty: 10 years from date of Substantial Completion.

PART 1 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
 1. Basis of Design:
 - a. AARCO
 2. Approved Manufacturers:
 - a. Claridge Products and Equipment, Inc.

2.2 MATERIALS FOR MARKER BOARD PANELS

- A. Writing Surface Facing Sheet: Provide "E-3" surface.
 1. Enameling grade cold-rolled steel, manufactured from a minimum of 30 percent post-consumer and post-industrial waste, .016 inch thick for all pre-framed boards without joints. All face sheets shall be .025 inch thick for boards with spline joints and have the same content as .016 inch thick face sheets.
 2. Writing surfaces shall consist of the following characteristics:
 - a. All coatings shall contain less than a combined total of less than 0.1 percent of heavy metals cadmium, mercury, hexavalent chromium, and lead.
 - b. All coatings shall be free of arsenic and antimony as well as volatile organic compounds.
 - c. Writing surface face sheet shall be 99 percent recyclable.
 - e. Marker board 80 to 85 percent gloss (low-gloss surface), recommended for projection. Wet cleaning required if used as a marker surface.
 - f. Facing Sheet Coatings:
 1. Face Coat: 1.7 to 2.5 mils minimum thickness enameled ground coat.
 2. Cover Coat: 3.0 to 4.0 mils enameled color coat.
 3. Back Coat: 1.7 to 2.5 mils enameled minimum ground coat.
 4. Firing Temperatures: 1,475 to 1,500 deg F, minimum.

- g. Color(s): As selected by the Architect from the manufacturer's range of standard colors.

B. Writing Surface Core:

- 1. Core: Minimum 7/16 inch thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
- 2. Backing Sheet: Manufacturer's standard; moisture-blocking backing, 0.015 inch thick; recyclable; factory-laminated to core material.
- 3. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.

C. Lamination: Factory-machine-type only.

2.3 MATERIALS FOR TACK BOARD PANELS

- A. Core: Composed of 100 percent post-consumer and post-industrial waste, or 100 percent naturally-sustainable; 1/4-inch fiberboard laminated to 1/4-inch natural cork.

B. Coverings:

- 1. 100 percent naturally-sustainable.
- 2. Covering Materials: Provide the following, as indicated:

a. Framed Tack Boards:

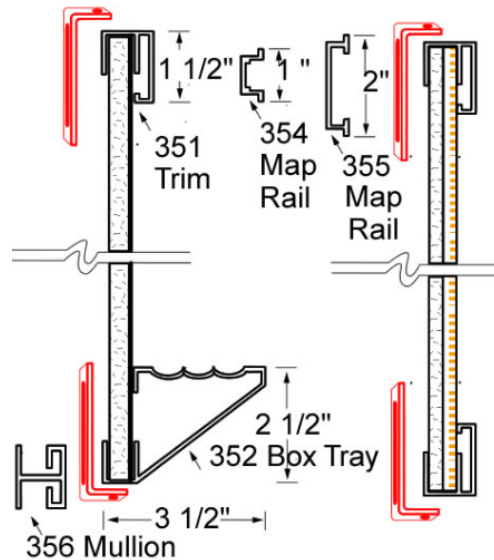
- i. Manufacturer: Koroseal or Equal
- ii. Series: Harborweave II
- iii. Fabric: 21-ounce-per-linear-yard vinyl
- iv. Backing: Woven 80/20 Type II
- v. Flammability: ASTM E84 Class A/Class 1.
- vi. Cleaning: Water/Solvent and Bleach Cleanable.
- vii. Width: 53/54 inches
- viii. Colors: As selected by the Architect from the manufacturer's range of standard colors. Provide a minimum of (21) colors.

b. Fabric-Wrapped Tack Boards (Frameless):

- i. Manufacturer: Carnegie-Xorel
- ii. Series: Meteor.
- iii. Fabric: 16-oz-per-linear-yard, 100% IRP Xorel.
- iv. Backing: X-Protect Wall microvent.
- v. Flammability: ASTM E84 Class A/Class 1.
- vi. Cleaning: Water/Solvent and Bleach Cleanable.
- vii. Width: 52 inches
- viii. Colors: As selected by the Architect from the manufacturer's range of standard colors. Provide a minimum of (80) colors.

2.5 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Miter corners to a neat, hairline closure.
1. Field-Applied Trim: Manufacturer's standard snap-on trim with no visible fasteners or exposed joints.
 - a. Location: All visual display boards unless noted otherwise.
 - b. Profile: Aarco, 10-350 RF Series.



2. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

2.5 FABRICATION

- A. Porcelain Enamel Marker Boards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- B. Vinyl-faced Cork Tack Boards: Vinyl fabric and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- C. Vinyl-Faced Wrapped Tackboards: Tackboards shall have vinyl fabric tightly wrapped around all edges and securely adhered to the back of the fiberboard. Refer to Drawings for locations.
- D. Assembly: Provide factory-assembled marker board and tack board units, unless field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
 - a. Provide marker board lengths of 16'-0" wide maximum with no seams. For boards over 16' – 0", provide butt-joint at seam locations. Refer to drawings for seam locations.
2. Provide manufacturer's standard mullion trim at joints between marker board and tack boards for field-applied trim units.

2.7 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 2 - EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
 1. Surfaces to receive marker boards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of marker boards.
 2. Surfaces to receive tack boards shall be dry and free of substances that would impair the bond between tack boards and substrate.
 3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Field-applied Trim:
 1. Deliver factory-built visual display boards completely assembled in one piece without joints, unless noted otherwise. If dimensions exceed panel size, refer to drawings for seam locations. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
 2. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level.

Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

- B. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUSTING AND CLEANING

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units according to manufacturer's written instructions.

END OF SECTION 101100

SECTION 101112 - SPECIALTY BUILDING PRODUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Field-Applied, Vinyl-Character Signs.
 - 2. Knox Box.
 - 3. AED Cabinet.

1.3 DESCRIPTION

- A. Work Included:
 - 1. Furnish labor, materials, tools, equipment, services and supervision required to complete specialty building products work, including all incidental and complementary work shown, specified or necessary to complete work.
 - 2. All final connections for all specialty building products included in this Section shall be made by the respective equipment suppliers and installers.

1.4 QUALITY ASSURANCE

- A. Regulations, Standards and Publications:
 - 1. FS - Federal Specifications
 - 2. ASTM - American Society for Testing and Materials
 - 3. NAAMM - National Association of Architectural Metal Manufacturing
- B. Quality Control: Materials and products shall be made in strict accordance with regulations and standards listed herein.
- C. Product Handling: Deliver all materials in good condition. Store in dry place, off ground; keep dry at all times. Handle materials to prevent damage to product or structure.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's latest publications of descriptive literature and product data for each product specified..

- A. Shop Drawings:
 - 1. Contractor shall submit Shop Drawings for review in accordance with Conditions of Contract.
 - 2. Indicate locations, dimensions, anchorage, types and gauges of metals or materials being used, features included, elevations, etc.
- B. Manufacturer's full range of colors and textures, including standard and premium options where indicated.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Field-Applied, Vinyl-Character Sign: Pre-spaced characters die cut from 3-mil to 3.5-mil thick, weather-resistant, UV resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
 - 1. Size: 6-inches high.
 - 2. Substrate: Exterior Glass Doors, Exterior Hollow Metal Doors and Exterior Overhead Coiling Doors.
 - 3. Font: Helvetica.
 - 4. Text: Refer to Door Schedule.
 - 5. Installation: Apply to clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
 - 6. Quantity: (2) Sets per door, located on interior and exterior face of door. If on glass, sign shall be installed back-to-back.
- B. Knox Box: Contractor shall verify exact model requirements for Knox Box from Spring Township Fire and Rescue. Model listed below is accurate as of time of Contract Document publication.
 - 1. Model: KnoxBox 3200.
 - 2. Mounting: Recessed.
 - 3. Size: 7-inches high; 7-inches wide; 3-inches deep.
 - 4. Accessories: Include Recess Mounting Kit (RMK).
 - 5. Include Tamper Alert system - Connect to building alarm system.
 - 6. Color: Aluminum.
 - 7. Location: As indicated on drawings.
- C. AED Cabinet: Provide semi-recessed AED cabinet equal to the following:
 - 1. Model: OBC-SR-L.
 - 2. Mounting: Semi-recessed.
 - 3. Inside Cabinet Dimensions: 14-inches high; 14-inches wide; 6.75-inches deep.
 - 4. Wall sign: Include text 'DEFIBRILLATOR' conspicuously on face of cabinet.

5. Include built-in alarm.
6. Color: White.
7. Location: Provide (1) per floor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Specialty building products, build into place by appropriate trade on work. Erect work to lines and levels, plumb and true, in correct relation to adjoining work. Secure parts in rigid, substantial manner; attachment concealed wherever practicable.
- B. Install all specialty building products in accordance with manufacturers' written instructions.
- C. All items shall be complete with manufacturer-supplied or –recommended hardware and fasteners, ready to install.
- D. Make all final connections to mechanical, electrical and plumbing equipment where required and in accordance with manufacturer's written instructions.

3.2 CLEAN UP

- A. All work shall be left in clean condition, and all debris and rubbish cleaned up and removed from site by Contractor.

END OF SECTION 101112

SECTION 101115 – VINYL GRAPHICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Custom digital print die-cut vinyl graphics, and temporary negative graphics as follows:
 - a. Digitally printed vinyl media for first surface application on interior surfaces.
 - b. Overlaminates for application over underlying graphics.
- B. Related Requirements:
 - 1. Division 10 Section "Dimensional Letter Signage" for flat cut lettering applied over masonry wall surfaces.

1.3 REFERENCES

- A. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
 - 1. Digital Vinyl Media: Fire rating: Class A; fire behavior, per DIN 75200: self-extinguishing when adhered to steel.
 - 2. Window Film: Fire rating: Class A; flame spread: 25, maximum; smoke developed: 450, maximum.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Full-color replication of graphic designs and layouts indicated. Include overall dimensions and seam locations of graphics, if any, as well as special attachment requirements. Minimum scale shall be no less than 1-1/2 inches per foot.

1. Indicate specific material type based on Vinyl Graphics Schedule at the end of this Section and details on Drawings.
 2. Final design, type, size, color, text font and finish to be approved by Architect prior to fabrication.
- C. Samples: For each type of film specified representing manufacturer's film type, adhesives, colors and patterns.

1.6 QUALITY ASSURANCE

- A. Producer/Installer Qualifications: An established Producer/Installer with a minimum of ten (10) years of documented experience producing and installing vinyl graphics of the type and complexity of those required on Project. All custom graphics shall be produced by Installer and installed by Installer's direct employees.
1. Provide a commercial building reference list including a minimum of 5 projects with vinyl graphics both produced and installed by Installer using Installer's direct employees. Reference list must include the following information:
 - a. Name of direct client including contact information.
 - b. Type of substrate.
 - c. Type of product.
 - d. Amount of product installed.
 - e. Date of completion.
 2. Pre-approved Producer/Installers include the following:
 - a. Stoner Graphix, Harrisburg PA (717) 469-7716 www.stonergraphix.com
 - b. Berry and Homer, Chester, PA (215) 425-0888 www.berryandhomer.com
 - c. Subject to verifiable experience, additional Producer/Installers are acceptable upon approval by Architect.
- B. Mock-Up: Provide a mock-up of each specified material and type of installation for evaluation of surface preparation, installation techniques and application workmanship.
1. Architect will designate location of each mock-up.
 2. Do not proceed with remaining work until workmanship, color, pattern and sheen are approved by Architect.
 3. Refinish mock-up area as required to produce acceptable results.
 4. Approved mock-ups may become a part of the final installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store non-custom products in manufacturer's unopened packaging until ready for installation.

- B. Deliver and store custom fabricated products in a manner to adequately protect them from damage by jobsite activities.
- C. Damaged or otherwise compromised materials will be rejected for use on Project.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. At Project close-out, provide Owner with an executed current copy of Manufacturer's standard limited warranty against manufacturing defect outlining its terms, conditions, and exclusions from coverage.
 - 1. Provide a 1-year Installers warranty beginning at final acceptance of the work by Architect and Owner,

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide the named Basis of Design products, or subject to compliance with specified requirements, products by an established manufacturer offering equal to, or better products than those specified are also acceptable.

2.2 CUSTOM VINYL GRAPHICS

- A. General: Digital graphics shall be printed on high-performance vinyl graphic media of the type indicated and capable of permanently and accurately printing images indicated on Drawings. Provide raw materials in the greatest available dimensions to minimize seams. Printing equipment, inks and printing software shall be fully compatible with vinyl graphic media and shall be approved by media manufacturer.
- B. **Vinyl Type 1:** Digitally Printed Vinyl Media for Application on Interior Surfaces: Basis of Design Product; Oracal Orajet 3551 RA High Performance Polymeric PVC.
 - 1. Application: First surface application on painted gypsum wallboard, painted gypsum veneer plaster and glass.
 - 2. Color: Arctic White gloss finish.
 - 3. Adhesive: Gray, solvent based repositionable adhesive.
 - 4. Thickness: 2.75 mils.

5. Release liner: 88# PE-coated silicone paper.
6. Dimensional Stability: Comply with FINAT TM-14.
7. Fire-Resistance Rating: Comply with ASTM E84-07, Class A.
8. Tensile Strength: Min. 19 MPa along and across in accordance with DIN EN ISO-527.
9. Elongation to Break: Min 130% along and 150% across.
10. Width: 60-inches.

C. **Vinyl Type 2:** Overlamine: Basis of Design Product; Briteline WrapCAST Overlamine, protective overlamine.

1. Application: First surface application over opaque, digitally printed underlying graphics installed on painted gypsum wallboard, painted gypsum veneer plaster and glass.
2. Color: Optically clear, satin.
3. Adhesive: Permanent solvent, low initial tack adhesive to allow easy repositioning.
4. Thickness: 2 mils.
5. Width: 60-inches.
6. Minimum Application Temperature: 50 deg. F.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine application surfaces and substrates. If preparation of surfaces or substrates is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- B. Do not proceed with installation until surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the Project conditions.
- C. Proceed with installation upon acceptable conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the Project conditions.
- C. Vinyl Graphics Substrate Preparation: Freshly painted surfaces must be permitted to stand for a minimum of three weeks after complete curing prior to application of film, unless otherwise directed by manufacturer.
 1. Test compatibility of lacquers and paints prior to vinyl graphic installation; only proceed when substrates are determined to be compatible. Report any deficiencies to Architect.

2. Clean substrate surfaces of which vinyl graphic materials will be applied to be free of dust, grease or other contaminants.

3.3 VINYL GRAPHICS FABRICATION

- A. Stock Material Storage: Carefully follow digital print vinyl graphic media manufacturer's written instructions for storing and processing printing media.
 1. Store rolls of media by suspending or standing on end using roll blocks; do not store material lying on its side. Store media in cool, dry location, following manufacturer's guidelines for temperature and relative humidity. Do not store near direct sunlight or adjacent to heat sources, including radiators or space heaters.
- B. Printing: Handle printing media with extreme care and caution, following manufacturer's published instructions. Handlers shall wear lint-free gloves to prevent oils and other contaminants from damaging printing surfaces. Ensure the proper printing devices, inks and software profiles are being used, depending on media type. Do not proceed with printing until all required criteria are verified.
- C. Printed Material Curing: To avoid the risk of delamination, edge curling or adhesive failure, allow printed film to dry/cure for a period of 48 to 72 hours at a temperature of 70 deg. F.
 1. To allow for proper outgassing; prints that are heavily saturated with ink shall dry for the maximum amount of time recommended by manufacturer. Store materials on a flat surface or lightly rolled, as directed by manufacturer to ensure solvent gases of the ink properly escape and do not affect the adhesive layer.

3.4 VINYL GRAPHICS INSTALLATION – GYPSUM WALL BOARD

- A. Install custom digital print vinyl graphics in accordance with media manufacturer's written instructions.
- B. Lay the graphic onto a flat surface with image side down. Pull back the adhesive liner approximately 3-inches. Sharply crease the liner while holding it away from the adhesive. Align the graphic on the wall and use finger pressure to tack into place onto the wall substrate. Greater lengths of material shall be temporarily tacked to surface with masking tape; verify the tape adhesives will not mar the film surface or adjoining material surfaces.
- C. Using a squeegee, work from the center to the edge, and then return to the center and work to the opposite edge. Use overlapping strokes while applying a small portion of the graphic at a time. Keep material taught as tooling progresses to avoid creasing the graphic surface; work short horizontal and vertical increments to ensure precise alignment along corners and material

transitions. Ensure adequate pressure is applied over graphic to guarantee appropriate bonding to substrate. Work material surface to ensure air bubbles are removed.

- D. If graphic consists of multiple panels, avoid using horizontal seams whenever possible. Whenever horizontal seams cannot be avoided, carefully align edges so that seams appear as inconspicuous as possible.
- E. When the entire graphic has been applied to the wall, re-squeegee the edges of the surface to ensure a strong bond. Carefully trim off excess material from edges and corners.

3.5 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30-days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

3.6 GRAPHIC SCHEDULE

- A. 'The SOLANCO School District' Graphic at Corridor 119:
 - 1. Vinyl Type 1, digitally printed vinyl media with Vinyl Type 2 overlamine.
 - a. Substrate: Painted gypsum wallboard, first surface application.

END OF SECTION 101115

SECTION 101419 - DIMENSIONAL SIGNAGE **(ADDENDUM 4)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Flat Cut dimensional letters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: Full-size Sample each type of dimensional character.
 - 2. Exposed Accessories: Full-size Sample of each accessory type.
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL SIGNAGE MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.2 DIMENSIONAL LETTER SIGNAGE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ASI Sign Systems, Inc.
 - 2. Gemini Incorporated.

3. InPro Corporation.
4. Metal Arts; Division of L & H Mfg. Co.
5. Metallic Arts.
6. Nelson-Harkins Industries.

B. Flat Cut Aluminum Letters – Exterior Site Wall Mounted Signs: Flat cut characters with uniform faces; square-cut, smooth, edges; precisely formed lines and profiles; and as follows:

1. Character Material: Plate aluminum.
2. Character Height: As indicated on drawings.
3. Thickness: 0.25 inch minimum or as noted on drawings.
4. Finish: As indicated on drawings
 - a. Painted Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1) Color as selected by Architect from manufacturer's full range.
5. Mounting: **Concealed fasteners with projecting studs. Mounted to canopy edge with concealed fasteners.**
 - a. Hold characters 1/2 inch from face of wall.
6. Typeface: As noted on drawings, verify final font with Owner prior to fabrication.
7. Location: Exterior building letter signs and site entrance marquee letter signs.

~~C. Flat Cut Acrylic Letters – Interior Signs: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:~~

- ~~1. Character Material: Sheet acrylic.~~
- ~~2. Character Height: As indicated on Drawings.~~
- ~~3. Thickness: 0.25 inch.~~
- ~~4. Finishes:~~
 - ~~a. Integral Acrylic Color: As selected by Architect from full range of industry colors.~~
- ~~5. Mounting: Adhesive capable of holding size and weight of character.~~
- ~~6. Typeface: As noted on Drawings.~~

Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors.
2. Sign Mounting Fasteners:

- a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- b. Hold characters at 1-inch distance from wall surface.
- c. Material: Stainless steel or aluminum.

2.3 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
- B. Dimensional flat cut graphic signage: Where fabrication must occur in multiple sections, spot weld aluminum plates to rear of graphic to create a single uniform graphic sign.

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate individual characters without irregularities between backs of individual characters and support surfaces unless otherwise indicated.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 – PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes:
 - 1. Interior and Exterior Panel Signs.
- B. Related Requirements:
 - 1. Division 1 Section "Temporary Facilities & Controls" for temporary Project identification signs.
 - 2. Division 10 Section "Dimensional Signage" for cut metal letters.
 - 3. Division 10 Section "Plaques" for cast aluminum building dedication plaque.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: For panel signs, showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, layout, reinforcement, accessories, and installation details.
 - 1. Details: Provide message list for each type of sign required, including typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size. Include large-scale details of nomenclature, including layout of room names, room numbers and graphic symbols, as indicated. Elevation details shall be consistent with sign type number on Drawings.
 - 2. **Floor Plans: Provide floor plans showing locations of each sign, indicating original room name, room number, and sign type.**
 - 3. Signage Schedule: Provide signage schedule in an editable version of Microsoft® Excel® format (.xlsx or .xls) or similar, compatible software. Arrange per building, building floor and building area, in a sequential manner that is consistent with the Drawings. Each room shall consist of a horizontal line of information, which shall intersect with vertical columns, in which applicable information may be input into each cell. Provide the following column heading information, which may be abbreviated as needed, formatted from left to right:
 - a. Original Room Number: As indicated on Contract Drawings.
 - b. Original Room Name: As indicated on Contract Drawings.
 - c. Revised Room Number: Final information to be fabricated; any revisions shall be input by the Architect.

- d. Revised Room Name: Final information to be fabricated; any revisions shall be input by the Architect.
- e. Sign Type: To cross-reference Shop Drawing elevation details.
- f. Sign Size: To indicate overall sign width and height.
- g. Accessibility: To include International Symbol of Access (ISA).
- h. Female: To include International Symbol for Female Gender.
- i. Male: To include International Symbol for Male Gender.
- j. Neutral: To include International Symbol for Gender-Neutral.
- k. Family: To include International Symbol for Family.
- l. Miscellaneous: To include, and make reference to, additional graphic symbols, including, but not limited to, directional arrows, stairs, and fire, as well as other signage features, such as paper inserts and sliding vacant/in use types.
- m. Quantity: Indicate number of same panel sign design required for specific room; provide additional lines for rooms that are to have more than one sign, but require different design or sign type.
- n. Remarks: For providing additional notes or remarks; by manufacturer (in black font color), Contractor (in green font color) or Architect (in red font color).

- 4. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

- 1. Cast Acrylic Sheet: Manufacturer's color Samples consisting of actual sections or chips of material, including the full range of standard colors, patterns and textures available.
- 2. Panel Signs: (1) Full-size sample with frame, not less than 12 inches square, including corners, for verification of basic design.
- 3. Exposed Accessories: Full-size Sample of each accessory type.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient

production capacity to produce sign units required without causing delay in the Work.

- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Design Concept: The Drawings indicate profile and dimensional requirements of panel signs. Slight deviations in profiles and dimensions may be approved, as long as such deviations do not drastically change the design concept, as judged by the Architect. The burden of proof of equality is on the Bidder.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Whenever possible, and if necessary, take field measurements prior to the preparation of Shop Drawings and fabrication to ensure proper fitting. Show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.8 WARRANTY

- A. When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.
 - 1. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - a. Failures include, but are not limited to, the following:
 - 1) Deterioration of finishes beyond normal weathering.
 - 2) Deterioration of embedded graphic image.
 - 3) Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering panel signage products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. 4Sign Solutions.
 - 2. iSigns Inc.
 - 3. Best Manufacturing.
 - 4. Bayuk Graphics.
 - 5. HES Sign.

2.2 VANDAL-RESISTANT FRAMED PANEL SIGNS

- A. Cast Acrylic Sheet: ASTM D 4802; non-extruded, non-continuous-cast polymethyl methacrylate monomer (PMMA) or extruded polyvinyl chloride (PVC)-acrylic alloy sheet, Type UVF (UV filtering); in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F, and of the following general types:
 - 1. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored, solid acrylic sheet in colors and finishes as selected from the manufacturer's full range of standard colors and textures.
 - 2. Colored Coatings: Use colored coatings, including inks and paints for copy and background colors that are recommended by acrylic manufacturer for optimum adherence to acrylic surface and are non-fading for the application intended.
- B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to and compatible with the sign material and mounting surface.
- C. Vandal-Resistant Framed Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Construction: Fabricate smooth, flush panel surfaces, capable of remaining flat with no noticeable distortions, while subjected to installed environmental conditions, within a tolerance of plus or minus 1/16 inch, measured diagonally.
 - 2. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
 - 3. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply-formed edges.
 - a. Copy Depth: Character, graphic and Braille copy shall be raised 1/32 inch, unless otherwise indicated.
 - b. Lettering Style: Upper- and lower-case letters; as selected by Architect from manufacturer's full range of standard typefaces.
 - 4. Characters and Graphics: Unless otherwise indicated, fabricate signs with 1-inch-high room numbers and 3/4-inch-high room identification lettering. Standard grade Braille shall be located 1/2 inch below copy.
 - c. Accessibility Standards: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs. All signage shall comply with accessibility requirements, including International Symbol of Access, Braille, and provisions for mounting.
 - d. Final room numbering and verbiage designations for all signs shall be approved by Owner prior to fabrication.

5. Edge Condition: Square, non-beveled.
6. Edge Color: Same as background.
7. Frame Material: Plastic
8. Corner Condition: Square, non-rounded.
9. Sign Types: Refer to drawings.
10. Extra Signs: Provide an additional quantity of (5) 8"x8" signs.

- D. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
- E. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
 1. Signs shall consist of internationally-adopted graphic silhouette symbols indicating entrances to male, female, gender-neutral, and family restrooms, as well as handicapped-accessibility, where occurs.
 2. Provide signs at the entrances of all non-accessible restrooms that graphically indicate the directions to the nearest handicapped-accessible restrooms.
- F. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert.

2.3 FRAMELESS EXTERIOR METAL PANEL SIGNS

- A. Solid-Sheet Sign: Aluminum sign panel with Aluminum raised graphics.
 1. Aluminum Sheet to meet ASTM B 209.
 2. Thickness: 0.25 inch.
 3. Finish: Brushed.
 4. Sign shall be etched and receive filled graphics: Sign face etched or routed to receive enamel-paint infill.
 5. Sign Types: Refer to drawings.

2.4 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide colors as selected by the Architect from the manufacturer's full range of standard colors and textures.
 1. Manufacturer shall offer no less than (25) colors.

- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined. Use concealed fasteners and anchors unless indicated to be exposed.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance. All signs shall be mounted per accessibility standards, as required by the authorities having jurisdiction.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

- B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods: Attach panel signs to surfaces, as follows:
 - 1. Interior Surfaces: Use one of the following methods, as applicable:
 - a. Vinyl-covered or Rough Surfaces: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of high-bond adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - b. Smooth Surfaces: Clean bond-breaking materials from substrate surface and remove loose debris. Apply two-face tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Add silicone sealant as needed. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 - 2. Exterior Surfaces: Use one of the following methods, as applicable:
 - a. Use through fasteners mounting; Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.2 CLEANING AND PROTECTION

- A. Remove protective coverings and strippable films as signs are installed. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until substantial completion.
- B. Touch up minor nicks and abrasions; otherwise, remove and replaced damaged or deformed signs that do not comply with requirements.

END OF SECTION 101423

SECTION 102113 – TOILET AND DRESSING COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-polymer Floor mounted overhead-braced toilet compartments.
 - 2. Privacy screens.
 - 3. Dressing compartments (Make-Up/Changing A144)
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for blocking.
 - 2. Division 10 Section "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, disposals and similar accessories required to be mounted to toilet compartment panels.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
 - 1. Submit two (2) complete sets of color chip Samples of manufacturer's full range of standard solid polymer partition colors and patterns, in manufacturer's standard size, but not less than 2-inches-square.

1.4 QUALITY ASSURANCE

- A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 75 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Style: Floor mounted overhead-braced toilet compartments.
 - 1. Santana Products, Inc.
 - 2. Comtec Industries/Capitol Partitions.
 - 3. General Partitions Mfg. Corp.
 - 4. Bradley Corporation; Mills Partitions.
- B. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Door and Panel Height: 66 inches high (1676 mm) (requires a modular panel).
 - 2. Door and Panel Height: 72 inches extra high (1829 mm) (requires a modular panel).
~~(Alternate Bid Only in all Group toilet rooms and Make-Up Changing Room A144)~~
(ADDENDUM 2)
 - 3. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
 - 4. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns. (From all panel colors with Orange Peel texture).

- C. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- D. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum or stainless steel. Provide at all locations, unless uneven wall finishes or other substrates prevent the ability to adequately install continuous brackets. Refer to Drawings to determine bracket requirements.
 - 2. Stirrup Type: Manufacturer's standard design; chrome-plated Zamac steel. Provide only at locations in which uneven wall finishes or other substrates prevent the ability to install continuous brackets. Refer to Drawings to determine bracket requirements.
 - 3. Headrail shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with anti-grip design. The headrail shall have a clear anodized finish and shall be fastened to the headrail bracket by a stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.

2.2 SOLID PLASTIC PRIVACY SCREENS

- A. Provide plastic privacy screens in urinal applications as indicated on drawings.
 - 1. Panels, and pilasters, if required, shall be 1 inch (25 mm) thick with all edges rounded to a radius. Screens shall be mounted at 12 inches (356 mm) above the finished floor. Color to match toilet stall compartments.
 - 2. Screen: Urinal screens shall be 24 inches wide by 55 inches high.

2.3 SOLID PLASTIC DRESSING COMPARTMENTS

- A. Provide plastic privacy screens in shower room applications as indicated or scheduled.
 - 1. Panels and pilasters shall be 1 inch (25 mm) thick with all edges rounded to a radius. Screens shall be mounted at 14 inches (356 mm) above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.
- B. Type: Floor mounted pilaster supported screen.
 - 1. Panels: Panel screens shall be 76 inches (1930 mm) high.
 - 2. Pilaster: Pilaster screens shall be 82 inches (2083 mm) high.
 - 3. Headrail: Headrail shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with anti-grip design and integrated curtain track. The headrail shall have a clear anodized finish and shall be fastened to the headrail bracket by a stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
 - 4. Headrail brackets shall be 20 gauge stainless steel with a satin finish and secured to the wall with a stainless steel tamper resistant Torx head screws.
 - 5. Pilaster sleeves shall be 3 inches (76 mm) high. Pilaster sleeves shall be stainless steel (type 304, 20 gauge) secured to the pilaster with a stainless steel tamper resistant Torx head sex bolt.
 - 6. Wall brackets shall be continuous made of heavy-duty aluminum (6463-T5 alloy) with a bright dip anodized finish. Brackets shall be fastened to panel/pilaster with stainless steel tamper resistant Torx head sex bolts.

2.4 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 - 1. Material: Chrome-plated Zamac or clear-anodized aluminum.
 - 2. Hinges: Manufacturer's standard wrap-around paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.5 FABRICATION

- A. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- B. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:

- a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (50 mm) into structural floor, unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Childcare accessories.
 - 4. Mirrors.
 - 5. Custodial Accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.

2.3 CHILDCARE ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Diaper Deck & Company, Inc.
4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
5. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.

2.4 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
 1. Nominal Thickness: 6.0 mm.
 2. Frame: Stainless-steel angle, 0.05 inch thick.
 - a. Corners: Welded and ground smooth.

2.5 CUSTODIAL ACCESSORIES

- A. Install stainless steel shelf above all mop sinks. Coordinate installation height with Owner.
- B. Mop and Broom Holder:
 1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 2. Length: 36 inches.
 3. Hooks: Four.

4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
 - b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.6 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

~~2.7 PASS-THROUGH CABINET~~

~~A. Basis of Design:~~

- ~~1. Bobrick Recessed Pass-Through Cabinet B-505~~
- ~~2. OR Equal product~~

- ~~a. Size: 10-9/16" x 11-1/4"~~
- ~~b. Material: Type 304 Stainless Steel~~
- ~~c. Finish: Exposed Surfaces shall have satin finish (ADDEDNUM 4)~~

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET ACCESSORY SCHEDULE

- A. A Toilet Accessory Schedule on the drawings lists the types of accessories required. The schedule includes model numbers of specified items, and identify those items to be supplied by the Owner. The inclusion of these model numbers is to provide a guide as to quality,

function, size, and materials; they are not meant to be exclusionary or proprietary. Equal products by other manufacturers listed above are will be considered.

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Semi-recessed fire extinguisher cabinets for portable fire extinguishers.
- B. Related Sections include the following:
 - 1. Division 10 Section "Fire Extinguishers" for portable fire extinguishers installed in fire extinguisher cabinets.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher cabinets.
 - 1. Fire Extinguisher Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire extinguisher cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire extinguisher cabinets. Coordinate final fire extinguisher cabinet schedule with fire extinguisher schedule to ensure proper fit and function.
- D. Maintenance Data: For fire extinguisher cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings".
 - 1. Review methods and procedures related to fire extinguisher cabinets including, but not limited to, schedules and coordination requirements.

1.5 COORDINATION

- A. Coordinate size of fire extinguisher cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire extinguisher cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B.
- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B209.
 - 2. Extruded Shapes: ASTM B221.
- C. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm or 6 mm thick, with Finish 1 (smooth or polished).
- D. Acrylic Bubble: One piece.

2.2 FIRE EXTINGUISHER CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. J. L. Industries, Inc., a division of Activar Construction Products Group.
 - b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
 - c. Larsen's Manufacturing Company.
 - d. Potter Roemer LLC.
 - e. Watrous Division, American Specialties, Inc.
- B. Cabinet Construction: Non-rated type, to only be installed in nonrated walls.
- C. Cabinet Material: Aluminum sheet on exterior, aluminum or steel sheet on interior.
- D. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.

1. Edge Trim: Either square-edge trim with 1-1/4- to 1-1/2-inch backbend depth, or rolled-edge trim with 2-1/2-inch to 4-1/2-inch backbend depth.
- E. Cabinet Trim and Door Material: Aluminum sheet.
- F. Door Style: Full bubble with frame.
- G. Door Glazing: Molded acrylic bubble.
 1. Acrylic Bubble Color: Clear transparent acrylic sheet.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide projecting lever handle with cam-action or friction latch.
 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- I. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire extinguisher cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire extinguisher cabinet with the words "FIRE EXTINGUISHER" applied to cabinet glazing.
 - 1) Application Process: Silk-screened or pressure-sensitive vinyl letters.
 - 2) Lettering Color: Red.
 - 3) Orientation: Vertical.
- J. Finishes:
 1. Manufacturer's standard baked-enamel paint for the interior of cabinet.
 2. Aluminum Trim and Doors: Clear anodic.

2.3 FABRICATION

- A. Fire Extinguisher Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.

- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - 2. Fabricate door frames of one-piece construction with edges flanged.
 - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire extinguisher cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire extinguisher cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semi-recessed fire extinguisher cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire extinguisher cabinets in locations and at mounting heights indicated, in compliance with requirements of authorities having jurisdiction.
- B. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire extinguisher cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire extinguisher cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire extinguisher cabinets, square and plumb.
- C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire extinguisher cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire extinguisher cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire extinguisher cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace fire extinguisher cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire extinguisher cabinet and mounting bracket manufacturers.
- E. Replace fire extinguisher cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 – FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Sections include the following:
 - 1. Division 10 Section "Fire Extinguisher Cabinets" for semi-recessed fire extinguisher cabinets.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- C. Warranty: Sample of special warranty.
- D. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE FIRE EXTINGUISHERS

- A. Fire Extinguishers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. JL Industries
 - b. Amerex Corporation
 - c. Badger Fire Protection.
 - d. Kidde – A UTC Fire & Security Company
 - 2. Valves, Handles and Levers: Manufacturer's standard.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. **Type FE-1/FEC-1** Multipurpose Dry-Chemical Type: UL-rated 2A–10B:C, 5 lb. nominal capacity, with a specially fluidized and siliconized mono ammonium phosphate-based dry chemical in manufacturer's standard enameled container.
 - 1. All locations except as noted otherwise.
 - 2. FE-1 refers to a hook hung extinguisher. FEC-1 refers to an extinguisher in a semi-recessed cabinet.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard "J-type" galvanized steel hook, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red black baked-enamel finish. Mobile-style clamp brackets are prohibited.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction and the latest version of NFPA 10 and ADAAG.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.3 INSPECTION

- A. New fire extinguisher units shall be inspected and/or serviced by a certified (NAFED) extinguisher contractor prior to installation. An inspection tag, displaying the current year, shall be attached to the unit before installation.

END OF SECTION 104416

SECTION 105000 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Knocked-down wardrobe lockers.
 - 2. Knocked-down athletic lockers.
 - 3. Locker benches.
- B. Related Sections:
 - 1. Division 4 Section "Cast-in-Place Concrete" for concrete locker bases.
 - 2. Division 6 Section "Rough Carpentry" for wood blocking, grounds and nailers.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings".

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system.
 - a. Numbering will be determined by Architect during Shop Drawing review.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

- D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

1.11 ACCESSIBILITY

- A. A minimum of 5% of the lockers shall be accessible (as required to comply with ADA). This applies to both the corridor lockers and kitchen lockers. The detailed descriptions of each locker type below are for standard, non-accessible, lockers. The accessible lockers shall be modified to be fully ADA compliant (including, but not necessarily limited to: the locks type and mounting height, shelves, hooks, etc.). Accessible lockers should be distributed equitably throughout.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.
- B. Basis-of-Design Manufacturer: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Republic Storage Systems, LLC.
 - 2. List Industries, Inc.
 - 3. Lyon Workspace Products, LLC.
 - 4. Penco Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 KNOCKED-DOWN WARDROBE LOCKERS

- A. Basis-of-Design Product: Republic Storage Systems, LLC "Standard Locker."
- B. Doors: One piece; fabricated from 14-gauge nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
 - 1. Doors shall be fabricated from 14-gauge nominal-thickness steel sheet.
 - 2. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 16-gauge nominal-thickness steel sheet; welded to inner face of doors.
 - 3. Door Style: Manufacturer's standard vented panel, using the following:
 - a. Concealed Vents: Slotted perforations in top/bottom horizontal return flanges.

- C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops, Bottoms, and Intermediate Dividers: 20-gauge nominal thickness, with single bend at sides.
 - 2. Backs and Sides: 24-gauge nominal thickness, with full-height, double-flanged connections.
 - 3. Shelves 24-gauge nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 16-gauge nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 - 1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Multipoint Latching: Finger-lift latch control designed for use with padlocks; positive automatic latching and pre-locking.
 - a. Latch Hooks: Equip doors 48 inches and lower with two latch hooks; fabricated from 12-gauge nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a pre-locking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
- H. Hooks: Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.
- A. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: Vertical-end type.
- B. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

- C. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
- D. Finish: Baked enamel or powder coat.
 - 1. Color:
 - a. As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Double-Tier Units: One double-prong ceiling hook, and two single-prong wall hooks.
- D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site or preassembly at plant prior to shipping.
- E. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- F. Boxed End Panels: Fabricated with 1-inch-wide edge dimension and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.

2.5 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of all walls for corrosion resistance.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 2. Anchor single rows of metal lockers to walls near top and bottom of lockers; where installed on concrete bases, anchor to walls near top of lockers and to floor.
- B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment:
 1. Attach hooks with at least two fasteners.
 2. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 2. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

3.5 LOCKER SCHEDULE

- A. Type A Lockers:
 - 1. Style: Knocked-Down Wardrobe Lockers
 - 2. Size: 12 inches wide by 12 inches deep by 72 inches high.
 - 3. Arrangement: Single-tier.
 - 4. Locations: Locker Room (Alternate)
 - 5. Base: Concrete.
 - 6. Sloping Tops: Yes.

END OF SECTION 105000

SECTION 107300 – ALUMINUM CANOPY

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Helios Canopy.
- B. Related Requirements: Division 1 – General Requirements

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Welding Society (AWS):
 - i. Standard D1.2 – Structural Welding Code – Aluminum
- C. American Architectural Manufacturers Association (AAMA):
 - i. Aluminum finishes AAMA 2603 Powder Coat
 - ii. Aluminum finishes AAMA 2605 Kynar
 - iii. Aluminum finishes AAMA 611 Anodize

1.3.1 SUBMITTALS

- A. Shop Drawings: Indicate size, material and finish. Include plan elevation pages to clearly outline canopy locations. Include installation procedures, details of joints, attachments and clearances. Provide lead time for product and note possible conflicts with standard line.
- B. Color charts showing manufacturer's full range of colors from standard line.

1.3.2 Warranty

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal canopies that fail in materials or workmanship within specified warranty period.
 - i. Warranty Period: One year from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Specifications are based on Architectural Fabrication, Inc. – Helios Canopy. Architectural Fabrication, Inc. – Manufacturer and Installer is located at 2100 E. Richmond Avenue, Fort Worth, TX 76104. 800.962.8027. www.arch-fab.com

- B. Substitutions are acceptable assuming they comply with these specifications, are submitted based on Section 012500 – Substitution Requirements and have a minimum 10 years' experience.

2.2 MATERIALS

- A. Framing: Gutter fascia, tube, angles: 6063-T5 alloy extruded aluminum
- B. Decking: Interlocking panels, extruded aluminum or sheet metal
- C. Hanger Rods: Zinc plated steel and powder coat (Prime and paint are not acceptable)
- D. Connections: Wall plates and canopy mounting brackets are to be aluminum.
- E. Hardware and Fasteners: Nuts, bolts, washers, clevis pins, screws, anchors and pipe spacers to be zinc plated or galvanized steel required to suit application.
- F. Flashing: Shall be minimum 0.040-inch aluminum, fabricated to prevent leakage and sealed with Novaflex metal roof sealant in clear or color match. Other equivalent sealant is acceptable.
- G. Finish: Powder coat finish per ASTM D 3451, complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking and minimum dry film thickness. Color to be selected from standard color line.

PART 3 – EXECUTION

3.1.1 FABRICATION

- A. Fabricate and preassemble canopies in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

3.2 INSTALLATION

- A. Install canopies per manufacturer's written instructions and as indicated on drawings.
- B. Locate and place canopies level, plumb and at indicated alignment with adjacent work.
- C. Use concealed anchors where possible.
- D. Repair damaged finishes so no evidence remains of corrective work. Return items to the factory that cannot be refinished in the field. Make required alterations and refinish entire unit or provide new units.
- E. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a coating of bituminous paint or elastomeric coating on surfaces that will be in contact with concrete, masonry or dissimilar metals.

END OF SECTION 107300

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Manually operated roller shades with single rollers.
- 2. Motor-operated roller shades with single rollers.

- B. Related Requirements:

- 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
- 2. Division 7 Section "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
- 3. Division 26 Section "Electrical" for electrical supply, conduit, and wiring for motorized window shades.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

- 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

- C. Samples for Initial Selection: For each type and color of shadeband material.

- 1. Include Samples of accessories involving color selection.

- D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material, signed by product manufacturer.
- C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basic of Design:

- a. Draper Inc., Manual Flexshade.
 - b. Draper Inc., Motorized Flexshade.
- 2. Approved Manufacturers:
 - a. Jacksons Window Shoppe.
 - b. Hunter Douglas Contract.
 - c. Levelor Commercial.
 - d. MechoShade Systems, Inc.
 - e. SWF Contract.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY-OPERATED, SINGLE-ROLLER SHADES

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated. Manufacturer's standard which must comply with ANSI/WCMA A100.1, American National Standard for Safety of Corded Window Covering Products.
 - 1. Bead Chains: Stainless steel.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: Right side of inside face of shade
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join inline rollers that are operated by one roller drive-end assembly no more than (3) panels of 96-inches wide x 120-inches.
 - 1. Lift assist mechanism required to maintain a pull force of no more than 10 pounds.
- E. Shadebands:
 - 1. Shadeband Material: Light-filtering Series.

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material
 - b. Color and Finish: As selected by Architect from manufacturer's full range of colors.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches.
2. Endcap Covers: To cover exposed endcaps.
3. Back Covers for Roller Shades at Interior Windows: Provide and install back cover for all interior shades.
4. Hold Down Clips:
5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

G. Location: Shades to be applied to exterior applications as indicated on the Drawings; refer to reflected ceiling plans.

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES

- A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include line-wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
 - a. Electrical Characteristics: 120-V AC.
 3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
 - a. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
 - b. Color: As selected by Architect from manufacturer's full range.
 4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
 5. Operating Features:

- a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: Right side of interior face of shade.
 - 2. Direction of Shadeband Roll: [Regular, from back (exterior face) of roller.
 - 3. Shadeband-to-Roller Attachment: Adhesive strip.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join inline rollers into a multiband shade that is operated by one roller drive-end assembly up to maximum motor capability.
- E. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
- F. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 3 inches.
 - 2. Endcap Covers: To cover exposed endcaps.
 - 3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701 Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: Mermet, T-Screen.
 - 2. Type: PVC Coated polyester.

3. Weight: 13.83 oz per yard.
4. Openness Factor: 1 percent.
5. Color: As selected by Architect from manufacturer's full range of colors.

2.5 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F.
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 1. Hardware shall be mounted to jamb or head of window opening. Mounting to the frame is NOT approved.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123661 - SIMULATED STONE FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-surface-material window stools.
- B. Related Requirements:
 - 1. Division 6 Section "Interior Architectural Woodwork" for custom cabinets.
 - 2. Division 7 Section "Joint Sealants" for sealants installed with solid surface materials.
 - 3. Division 22 Section "Plumbing Fixtures" for non-integral sinks and plumbing fittings.

1.3 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment, provisions and coordination requirements with adjacent work.
- B. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- C. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.
- D. Samples: Contractor shall provide manufacturer's color pdf images of solid-surface-material for review & approval. Actual samples are NOT required unless specifically requested by the architect/interior designer.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL FABRICATION

- A. Window Stools: 1/2-inch thick, solid surface material, adhesively joined with inconspicuous seams with built-up edge with slight radius. Refer to drawings for details.

2.2 MATERIALS

- A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Adhesives: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 - 1. Manufacturers: Subject to compliance with requirements, provide the following
 - a. Dupont, Corian Solid Surface.
 - 2. Colors: As selected from Group 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install solid-surface-materials level to a tolerance of 1/8 inch in 8 feet.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with

manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface. Refer to drawings for additional details.

1. Seal edges of cutouts in plywood subtops by saturating with varnish.
- C. Apply sealant to gaps at walls; comply with Division 7 Section "Joint Sealants."
- D. Install all solid-surface-materials to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

END OF SECTION 123661

