



FIRE STATION #6
Greeley, Colorado

75% Design Documents
Specification
Project Manual
VOLUME ONE

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SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Form-facing material for cast-in-place concrete.
 2. Shoring, bracing, and anchoring.

1.2 ACTION SUBMITTALS

- A. Product Data: For each of the following:
1. Exposed surface form-facing material.
 2. Concealed surface form-facing material.
 3. Form ties.
 4. Waterstops.
 5. Form-release agent.
- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.
1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
 2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of the Architect.
 3. Indicate location of waterstops.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Minutes of preinstallation conference.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and

construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
 - a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 WATERSTOPS

A. Flexible Rubber Waterstops: U.S. Army Corps of Engineers CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints, with factory fabricate corners, intersections, and directional changes.

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. Williams Products, Inc.
2. Profile: Ribbed with center bulb.

3. Dimensions: 4 inches by 3/16 inch thick; nontapered.
- B. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints, with factory fabricate corners, intersections, and directional changes.
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. Sika Corporation.
 - b. Vinylex Waterstop & Accessories.
 2. Profile: Ribbed with center bulb.
 3. Dimensions: 4 inches by 3/16 inch thick; nontapered.
- C. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
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 Coatings & Waterproofing Inc.
 - b. CETCO, a Minerals Technologies company.
 - c. Concrete Sealants Inc.
 - d. Henry Company.
 - e. JP Specialties, Inc.
 - f. Sika Corporation.
- D. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.
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. Adeka Corporation.
 - b. CETCO, a Minerals Technologies company.
 - c. GCP Applied Technologies Inc.
 - d. Kryton International Inc.
 - e. Sika Corporation.

2.4 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no 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.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
 - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.

- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips.
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
 - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF 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.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 3. Install reglets to receive 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.
 - 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
 - 5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.
 - 1. Install in longest lengths practicable.
 - 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 - 3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."
 - 4. Secure waterstops in correct position at 12 inches on center.
 - 5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.
 - a. Miter corners, intersections, and directional changes in waterstops.
 - b. Align center bulbs.
 - 6. Clean waterstops immediately prior to placement of concrete.

7. Support and protect exposed waterstops during progress of the Work.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Protect exposed waterstops during progress of the Work.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections:
1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
 2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement to Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

B. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

- a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
- 2. Mechanical splice couplers.
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Headed-Steel Reinforcing Bars: ASTM A970/A970M.
- D. Galvanized Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 - 2. Zinc Coating: ASTM A767/A767M, Class I zinc coated after fabrication and bending.
- E. Epoxy-Coated Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 - 2. Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.
- F. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- G. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- H. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.
- I. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
 - e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; dowel-bar type.
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain.
- D. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
 - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
 - 4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 JOINTS

- A. 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.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel-reinforcement placement.
 - 2. Steel-reinforcement mechanical splice couplers.
 - 3. Steel-reinforcement welding.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
7. Vapor retarders.
8. Liquid floor treatments.
9. Curing materials.
10. Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.

5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

- D. Preconstruction Test Reports: For each mix design.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 - 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I or Type I/II.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
2. Maximum Coarse-Aggregate Size:
 - a. 1/5 the narrowest dimension of concrete member; nor
 - b. 1/3 the depth of slab; nor
 - c. 3/4 the clear spacing between reinforcement bars; nor
 - d. 1-1/2 inches
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C330/C330M, 1-inch nominal maximum aggregate size.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 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. Barrier-Bac; Inteplast Group.
 - b. ISI Building Products.
 - c. Stego Industries, LLC.
 - d. Tex-Trude.
 - e. W.R. Meadows, Inc.

2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
 - 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. BASF Corporation.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. Kaufman Products, Inc.
 - d. PROSOCO, Inc.
 - e. SpecChem, LLC.
 - f. Specialty Products Group.
 - g. W.R. Meadows, Inc.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- C. Curing Paper: Eight-foot-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

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. Fortifiber Building Systems Group.
- D. Water: Potable or complying with ASTM C1602/C1602M.
- E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
 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. Euclid Chemical Company (The); an RPM company.
 - b. Kaufman Products, Inc.
 - c. SpecChem, LLC.
 - d. W.R. Meadows, Inc.
- F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 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. BASF Corporation.
 - b. Dayton Superior.
 - c. Euclid Chemical Company (The); an RPM company.
 - d. Kaufman Products, Inc.
 - e. SpecChem, LLC.
 - f. W.R. Meadows, Inc.
- G. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
 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. Concrete Sealers USA.
 - b. Dayton Superior.
 - c. Euclid Chemical Company (The); an RPM company.
 - d. Kaufman Products, Inc.
 - e. SpecChem, LLC.
 - f. W.R. Meadows, Inc.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Floor Slab Protective Covering: Eight-feet-wide cellulose fabric.
 - 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. McTech Group, Inc.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
 - 4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture 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.
 - 3. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.

2.8 CONCRETE MIXTURES

- A. Normal-weight concrete used for footings, grade beams, and tie beams.
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Maximum w/cm: 0.45.
 - 3. Air Content:
 - a. Exposure Class F1:
 - 1) 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size,

- 2) 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size,
 - 3) 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.
4. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- B. Normal-weight concrete used for foundation walls.
1. Minimum Compressive Strength: 4500 psi at 28 days.
 2. Maximum w/cm: 0.45.
 3. Air Content:
 - a. Exposure Class F1:
 - 1) 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size
 - 2) 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size
 - 3) 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.
 4. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Normal-weight concrete used for interior slabs-on-ground.
1. Minimum Compressive Strength: 4500 psi at 28 days.
 2. Maximum w/cm: 0.45.
 3. Minimum Cementitious Materials Content: 540 lb/cu. yd..
 4. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Normal-weight concrete used for concrete slabs on metal deck.
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Minimum Cementitious Materials Content: 540 lb/cu. yd..
 3. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished toppings.
- E. Class : Normal-weight concrete used for interior metal pan stairs and landings:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum w/cm: 0.53.
 3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
 4. Maximum Size Aggregate: 1/2 inch.
 5. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.

6. Air Content: 0 percent, plus or minus 0.5 percent at point of delivery.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
8. Retarding Admixture: Not allowed.
9. Accelerating Admixture: Not allowed.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF 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.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. Install reglets to receive 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.

3.2 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.

4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.3 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
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 Section 079200 "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. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces.

2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view,.

3. ACI 301 Surface Finish SF-3.0:

- a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
- b. Remove projections larger than 1/8 inch.
- c. Patch tie holes.
- d. Surface Tolerance: ACI 117 Class A.
- e. Locations: Apply to concrete surfaces exposed to public view,.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view.

7. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish to concrete stair treads, platforms, ramps as indicated on Drawings
1. Apply in accordance with manufacturer's written instructions and as follows:
 - a. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate aluminum granules over surface in one or two applications.
 - b. Tamp aggregate flush with surface, but do not force below surface.
 - c. After broadcasting and tamping, apply float finish.
 - d. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. Provide other miscellaneous concrete filling indicated or required to complete the 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:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of

supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.

3. Minimum Compressive Strength: 3000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.8 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

- 1) Recoat areas subject to heavy rainfall within three hours after initial application.
- 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
 - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with

sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

- a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
- 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
- a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Chemical Stain:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
- e. Floors to Receive Urethane Flooring:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.

- 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

g. Floors to Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.9 TOLERANCES

- A. Conform to ACI 117.

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than three days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 4. Rinse with water; remove excess material until surface is dry.
 5. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 - 2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
 - 1. Headed bolts and studs.
 - 2. Verification of use of required design mixture.
 - 3. Concrete placement, including conveying and depositing.
 - 4. Curing procedures and maintenance of curing temperature.

5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
 - b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
 - b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
 - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests:
 - a. 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.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

- A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
 2. Diaper hydraulic equipment used over concrete surfaces.
 3. Prohibit vehicles from interior concrete slabs.
 4. Prohibit use of pipe-cutting machinery over concrete surfaces.

5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polished concrete finishing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Field Sample Panels: After approval of samples, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
3. Demolish and remove field sample panels when directed.

PART 2 - PRODUCTS

2.1 STAIN MATERIALS

A. Reactive Stain: Acidic-based stain with wetting agents and high-grade, UV-stable metallic salts that react with calcium hydroxide in cured concrete to produce permanent, variegated, or translucent color effects.

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. H&C® Decorative Concrete Products; a brand of Sherwin-Williams Co.

B. Penetrating Stain: Water-based, acrylic latex, penetrating stain with colorfast pigments.

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. H&C® Decorative Concrete Products; a brand of Sherwin-Williams Co.

2.2 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
 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. PROSOCO, Inc.

PART 3 - EXECUTION

3.1 POLISHING

- A. Polish: Level 3: High sheen, 800 grit.
- B. Apply polished concrete finish system to cured and prepared slabs.
 1. Machine grind floor surfaces to receive polished finishes level and smooth.
 2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 6. Control and dispose of waste products produced by grinding and polishing operations.
 7. Neutralize and clean polished floor surfaces.

3.2 STAINING

- A. Newly placed concrete shall be at least 14 days old before staining.
- B. Prepare surfaces according to manufacturer's written instructions and as follows:

1. Clean concrete thoroughly by scraping, applying solvents or stripping agents, sweeping and pressure washing, or scrubbing with a rotary floor machine and detergents recommended by stain manufacturer. Rinse until water is clear and allow surface to dry.
 - a. Do not use acidic solutions to clean surfaces.
 2. Test surfaces with droplets of water. If water beads and does not penetrate surface, or penetrates only in some areas, profile surfaces by grinding, sanding, or abrasive blasting. Retest and continue profiling surface until water droplets immediately darken and uniformly penetrate concrete surfaces.
- C. Scoring: Score decorative jointing in concrete surfaces 1/16 inch deep with diamond blades to match pattern indicated. Rinse until water is clear. Score after staining.
1. Joint Width: 3/8 inch.
- D. Allow concrete surface to dry before applying stain. Verify readiness of concrete to receive stain according to ASTM D4263 by tightly taping 18-by-18-inch, 4-mil-thick polyethylene sheet to a representative area of concrete surface. Apply stain only if no evidence of moisture has accumulated under sheet after 16 hours.
- E. Reactive Stain: Apply reactive stain to concrete surfaces according to manufacturer's written instructions and as follows:
1. Apply stain by uncolored bristle brush, roller, or high-volume, low-pressure sprayer and immediately scrub into concrete surface with uncolored, acid-resistant nylon-bristle brushes in continuous, circular motion. Do not spread stain after fizzing stops. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup.
 2. Remove stain residue after four hours by wet scrubbing with commercial-grade detergent recommended by stain manufacturer. Rinse until water is clear. Control, collect, and legally dispose of runoff.
- F. Penetrating Stain: Apply penetrating stain to concrete surfaces according to manufacturer's written instructions and as follows:
1. Apply first coat of stain to dry, clean surfaces by airless sprayer or by high-volume, low-pressure sprayer.
 2. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup.
 3. Rinse until water is clear. Control, collect, and legally dispose of runoff.

END OF SECTION 033543

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Decorative concrete masonry units.
 - 3. Pre-faced concrete masonry units.
 - 4. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples: For each type and color of the following:
 - 1. Exposed CMUs.
 - 2. Pre-faced CMUs.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 - 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD 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. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. Integral Water Repellent: Provide units made with integral water repellent where indicated.
 - 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. [ACM Chemistries.](#)
 - b. [BASF Corporation.](#)
 - c. [Euclid Chemical Company \(The\); an RPM company.](#)
 - d. [GCP Applied Technologies Inc.](#)

- C. Insulated CMUs: Where indicated, units shall contain rigid, specially shaped, molded-polystyrene insulation units complying with ASTM C578, Type I, designed for installing in cores of masonry units.
 - 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. Concrete Block Insulating Systems.
- D. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
 - 2. Density Classification: Normal weight.
- E. Concrete Building Brick: ASTM C55.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 - 2. Density Classification: Normal weight.

2.3 CONCRETE LINTELS

- A. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
 - 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. Lafarge North America Inc.

- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 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. Solomon Colors, Inc.
- F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Colored Portland Cement-Lime Mix:
 - 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) Lafarge North America Inc.
 - 2. Colored Masonry Cement:
 - 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) Lafarge North America Inc.
- G. Aggregate for Mortar: ASTM C144.
 - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C404.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Corporation.
- J. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 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. Lock Rite.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.187-inch diameter.
 - 4. Wire Size for Cross Rods: 0.187-inch diameter.
 - 5. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized-steel wire.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized-steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch-thick steel sheet, galvanized after fabrication.

2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized-steel wire.
- D. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 4. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 5. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
- B. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.
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. **Mortar Net Solutions.**
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.9 MASONRY-CELL FILL

- A. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Lightweight-Aggregate Fill: ASTM C331/C331M.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime or masonry cement mortar.
 - 4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in 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 or Property Specification. Provide the following types of mortar for applications stated unless another type is indicated..
 - 1. For masonry below grade or in contact with earth, use Type S.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Pre-faced CMUs.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Pre-faced CMUs.
- F. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

- A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.

2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-CELL FILL

- A. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 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. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.9 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms 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 that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
- I. Prism Test: For each type of construction provided, according to ASTM C1314 at seven days and at 28 days.

3.11 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.12 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.13 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-stone trim.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast-stone units, include dimensions 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.

C. Samples:

1. For each color and texture of cast stone required.
2. For colored mortar.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364, including test for resistance to freezing and thawing.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute, the Architectural Precast Association or the Precast/Prestressed Concrete Institute for Group A, Category AT.

PART 2 - PRODUCTS

2.1 CAST-STONE UNITS

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. Sunset Stone.
 - b. Color: Natural
- B. Cast-Stone Units: Comply with ASTM C1364.
 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 C666/C666M, Procedure A, as modified by ASTM C1364.
- C. 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.
- 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. Colors and Textures: As selected by Architect from manufacturer's full range.

2.2 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A36/A36M and hot-dip galvanized to comply with ASTM A123/A123M.
- B. Dowels: 1/2-inch-diameter round bars, fabricated from steel complying with ASTM A36/A36M and hot-dip galvanized to comply with ASTM A123/A123M.

- 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.
 - 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. PROSOCO, Inc.

2.3 MORTAR

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.
 - 1. For setting mortar, use Type N.
 - 2. For pointing mortar, use Type N.
- B. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

2.4 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C1364.
 - 1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Fill dowel holes and anchor slots with mortar.
 - 2. Fill collar joints solid as units are set.
 - 3. Build concealed flashing into mortar joints as units are set.
 - 4. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 - 5. Keep joints at shelf angles open to receive sealant.
- C. 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.

- D. 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.
- E. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. 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. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Fill anchor holes with sealant.
 - 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- C. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- D. 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.

END OF SECTION 047200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference:
- Conduct conference at [**Project site**] <**Insert location**>.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Shop primer.
8. Galvanized-steel primer.
9. Etching cleaner.
10. Galvanized repair paint.
11. Shrinkage-resistant grout.

- ##### B. Shop Drawings:
- Show fabrication of structural-steel components.

- C. 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**].

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Mill test reports for structural-steel materials, including chemical and physical properties.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, [**Category ACSE**] [**Category CSE**].
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

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 360.
 - 3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - 1. Option 1: Connection designs have been completed and connections indicated on the Drawings.
 - 2. Option 2: Fabricator's experienced steel detailer shall select or complete connections in accordance with ANSI/AISC 303.
 - a. Select and complete connections using [**schematic details indicated**] [**and**] [**ANSI/AISC 360**] <Insert source>.
 - b. Use [**Load and Resistance Factor Design; data are given at factored-load level**] [**Allowable Stress Design; data are given at service-load level**].

3. Option 3 and 3A: Design connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer. Member reinforcement at connections is indicated on Drawings.
 - a. Use [**Load and Resistance Factor Design; data are given at factored-load level**] [**Allowable Stress Design; data are given at service-load level**].
 4. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use [**Load and Resistance Factor Design; data are given at factored-load level**] [**Allowable Stress Design; data are given at service-load level**].
- C. Moment Connections: [**Type PR, partially**] [**Type FR, fully**] restrained.
- D. Construction: [**Moment frame**] [**Braced frame**] [**Shear wall system**] [**Combined system of moment frame and braced frame**] [**Combined system of moment frame and shear walls**] [**Combined system of braced frame and shear walls**] [**Combined system of moment frame, braced frame, and shear walls**].

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M.
- B. Channels, Angles, M, S-Shapes: ASTM A36/A36M.
- C. Plate and Bar: ASTM A36/A36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.
- E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, 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, compressible-washer type with plain finish.
- B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, 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 490-1, compressible-washer type with plain finish.
- C. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 1. Finish: Hot-dip or mechanically deposited zinc coating.
 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 1. Finish: Plain.
- E. 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: Hooked.
 2. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.
- B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
 1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.
- C. Threaded Rods: ASTM A36/A36M.
 1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

2.5 FORGED-STEEL STRUCTURAL HARDWARE

- A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

2.6 PRIMER

- A. Steel Primer:
 1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 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] [MPI#80,] [MPI#134].
1. Etching Cleaner: MPI#25, for galvanized steel.
 2. Galvanizing Repair Paint: [MPI#18, MPI#19, or SSPC-Paint 20] [ASTM A780/A780M].

2.7 SHRINKAGE-RESISTANT GROUT

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

2.8 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.
- B. 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.

2.9 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 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.10 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.

2.11 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.
 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:
1. SSPC-SP 2.
 2. SSPC-SP 3.
 3. SSPC-SP 7 (WAB)/NACE WAB-4.
 4. SSPC-SP 6 (WAB)/NACE WAB-3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner [**or in accordance with SSPC-SP 16**].
- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.12 SOURCE QUALITY CONTROL

- A. Testing Agency: [**Owner will engage**] [**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.
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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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.
- B. Weld Connections: Comply with AWS D1.1/D1.1M 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.

3.4 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]** **[Engage]** a qualified testing agency to perform tests and inspections.
1. Bolted Connections: Inspect **[and test]** 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.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. LH- and DLH-series long-span steel joists.
4. Joist girders.
5. Joist accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Sustainable Design Submittals:

C. 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.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

D. Field quality-control reports.

1.4 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."

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."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. New Millennium Building Systems, LLC.
 2. Structures of U.S.A., Inc.
 3. Vulcraft; Nucor Vulcraft Group.

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.
- 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.

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

2.4 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specification for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.

2.5 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 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.6 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 bridging if required for stability.
- C. Bridging: Fabricate as indicated and according to 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." Furnish additional erection bridging if required for stability.
- 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 of finished wall surface unless otherwise indicated.
- E. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Plain.
- F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.7 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.
- B. Apply one coat of shop primer to joists and joist accessories.
- C. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

PART 3 - EXECUTION

3.1 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.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using 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.

3.2 FIELD QUALITY CONTROL

- A. Visually inspect field welds according to AWS D1.1/D1.1M.
- B. Visually inspect bolted connections.
- C. Prepare test and inspection reports.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Composite floor deck.
 - 3. Noncomposite form deck.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Evaluation reports.
- D. Field quality-control reports.

1.4 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."

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."

2.2 ROOF DECK

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

1. [New Millennium Building Systems, LLC.](#)
2. [Nucor Corp.](#)
3. [Verco Decking, Inc., a Nucor company.](#)

- B. 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. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
4. Deck Profile: As indicated.
5. Profile Depth: As indicated.
6. Design Uncoated-Steel Thickness: As indicated.

2.3 COMPOSITE FLOOR DECK

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

1. [Cordeck.](#)
2. [Nucor Corp.](#)

3. [Verco Decking, Inc., a Nucor company.](#)

B. 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 33 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray or white baked-on, rust-inhibitive primer.

2.4 NONCOMPOSITE FORM DECK

A. **Manufacturers:** Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

1. [Cordeck.](#)
2. [Nucor Corp.](#)
3. [Roof Deck, Inc.](#)
4. [Verco Decking, Inc., a Nucor company.](#)

2.5 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 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, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

G. Galvanizing Repair Paint: ASTM A780/A780M.

H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 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. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- G. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
- H. 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.
- I. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- J. 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.

3.2 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.

3.3 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.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.

1.2 PREINSTALLATION MEETINGS

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

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

- ##### A. Welding certificates.

- ##### B. Product certificates.

- ##### C. Product test reports.

- ##### D. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 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.
- 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. [ClarkDietrich](#).
 - 2. [MarinoWARE](#).
 - 3. [SCAFCO Steel Stud Company](#).
 - 4. [Super Stud Building Products Inc.](#)

2.2 PERFORMANCE REQUIREMENTS

- A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 - 1. Wall Studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral Design: AISI S213.
- B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

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: [**ST33H**] [**ST50H**] [**As required by structural performance**] <Insert grade>.
 - 2. Coating: G60, A60, AZ50, or GF30.
- B. Steel Sheet for [**Vertical Deflection**] [**Drift**] Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: [**33**] [**50, Class 1**] [**As required by structural performance**] <Insert grade>.
 - 2. Coating: [**G60**] [**G90**] <Insert coating designation>.

2.4 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: [0.0329 inch] [0.0428 inch] [0.0538 inch] [0.0677 inch] [0.0966 inch] <Insert dimension>.
 2. Flange Width: [1-3/8 inches] [1-5/8 inches] [2 inches] [2-1/2 inches] <Insert dimension>.
 3. Section Properties: <Insert minimum allowable calculated section modulus, moment of inertia, and allowable moment>.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching minimum base-metal thickness of steel studs.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: [0.0329 inch] [0.0428 inch] [0.0538 inch] [0.0677 inch] [0.0966 inch] <Insert dimension>.
 2. Flange Width: [1-3/8 inches] [1-5/8 inches] [2 inches] [2-1/2 inches] <Insert dimension>.
 3. Section Properties: <Insert minimum allowable calculated section modulus, moment of inertia, and allowable moment>.

2.5 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: [0.0329 inch] [0.0428 inch] [0.0538 inch] [0.0677 inch] [0.0966 inch] <Insert dimension>.
 2. Flange Width: [1-3/8 inches] [1-5/8 inches] [2 inches] [2-1/2 inches] <Insert dimension>.
 3. Section Properties: <Insert minimum allowable calculated section modulus, moment of inertia, and allowable moment>.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- 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.
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. ClarkDietrich.

- b. [MarinoWARE.](#)
 - c. [SCAFCO Steel Stud Company.](#)
 - d. [Simpson Strong-Tie Co., Inc.](#)
 - e. [Steel Construction Systems.](#)
- 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.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- 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.

2.6 INTERIOR 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: **[0.0329 inch] [0.0428 inch] [0.0538 inch] [0.0677 inch] [0.0966 inch] <Insert dimension>.**
 2. Flange Width: **[1-3/8 inches] [1-5/8 inches] [2 inches] [2-1/2 inches] <Insert dimension>.**
 3. Section Properties: **<Insert minimum allowable calculated section modulus, moment of inertia, and allowable moment>.**
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- 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.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- 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.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- 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.

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.

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. Anchor Bolts: ASTM F1554, [**Grade 36**] [**Grade 55**], threaded carbon-steel [**hex-headed bolts,**] [**headless, hooked bolts,**] [**headless bolts, with encased end threaded,**] carbon-steel nuts, and flat, hardened-steel washers; zinc coated by [**hot-dip process according to ASTM A153/A153M, Class C**] [**mechanically deposition according to ASTM B695, Class 50**].
- C. 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, based on [**ICC-ES AC01**] [**ICC-ES AC193**] [**ICC-ES AC58**] [**or**] [**ICC-ES AC308**] as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: [**Torque-controlled expansion anchor**] [**Torque-controlled adhesive anchor**] [**or**] [**adhesive anchor**].
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy [**Group 1**] [**Group 2**] stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- D. 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.
- E. 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.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: [**ASTM A780/A780M**] [**MIL-P-21035B**] [**or**] [**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 thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. 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.

3.2 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 cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

- E. 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.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. 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.
- H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: **[24 inches] [32 inches] [To match stud spacing] [As shown on Shop Drawings] <Insert dimension>**.
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: **[12 inches] [16 inches] [19.2 inches] [24 inches] [As indicated on Drawings] <Insert dimension>**.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.

2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically [**48 inches**] [**as indicated on Drawings**] [**as indicated on Shop Drawings**] <Insert dimension>. Fasten at each stud intersection.
1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 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.
- J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

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. Space studs as follows:
1. Stud Spacing: [**12 inches**] [**16 inches**] [**19.2 inches**] [**24 inches**] [**As indicated on Drawings**] <Insert dimension>.
- 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 deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to **[bypassing]** **[infill]** 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 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]** **[18 inches]** 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 centers]** **[centers indicated]** **[centers indicated on Shop Drawings]**.
- 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 INTERIOR 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. Space studs as follows:
1. Stud Spacing: **[12 inches]** **[16 inches]** **[19.2 inches]** **[24 inches]** **[As indicated on Drawings]** **<Insert dimension>**.
- 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 deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to studs and anchor to building structure.
 4. Connect drift clips to cold-formed steel metal 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 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**] [**18 inches**] 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 centers**] [**centers indicated**] [**centers indicated on Shop Drawings**].
- 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.

3.6 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 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.

3.8 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.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Prefabricated building columns.
3. Shelf angles.
4. Metal ladders.
5. Ladder safety cages.
6. Metal floor plate and supports.
7. Elevator pit sump covers.
8. Structural-steel door frames.
9. Miscellaneous steel trim.
10. Metal bollards.
11. Vehicular barrier cable systems.
12. Pipe guards.
13. Abrasive metal thresholds.
14. Loose bearing and leveling plates.

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.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.
5. Prefabricated building columns.
6. Slotted channel framing.
7. Manufactured metal ladders.
8. Ladder safety cages.
9. Metal bollards.
10. Vehicular barrier cable systems.
11. Pipe guards.
12. Abrasive metal thresholds.

- 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.
- C. Delegated-Design Submittal: For ladders and vehicular barrier cable systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders and vehicular barrier cable systems.
- B. Structural Performance of Aluminum Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

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/A36M.
- C. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- D. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface.
- E. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- F. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- G. Steel Prestressing Strand: ASTM A416/A416M, Grade 270, low-relaxation, seven-wire, with 0.9-lb/sq. ft. zinc coating.
 - 1. Steel Prestressing Strand Fittings: Hot-dip galvanized-steel anchors and connectors with capability to sustain, without failure, a load equal to minimum breaking strength of steel prestressing strand with which they are used.
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: As indicated.
 - 2. Material: Galvanized steel, ASTM A653/A653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.
 - 3. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

- I. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- J. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- K. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- L. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- M. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).
- N. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or UNS No. C84400 (leaded semired brass).
- O. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.3 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/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- C. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099100 "Painting."
- B. 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.
- C. 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.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- 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 D1187/D1187M.
- H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches from ends and corners of units and 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. 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.
- B. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.
- C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3.
 - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 - 1. Space siderails 18 inches apart unless otherwise indicated.
 - 2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
 - 3. Rungs: 1-inch-square, 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.
 - 6. Galvanize and primeladders, including brackets.
 - 7. Prime ladders, including brackets and fasteners, with zinc-rich primer.

2.8 LADDER SAFETY CAGES

- A. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless steel fasteners.
- B. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
- C. Galvanize ladder safety cages, including brackets and fasteners.
 - 1. Prime ladder safety cages, including brackets and fasteners, with zinc-rich primer.

2.9 METAL FLOOR PLATE

- A. Fabricate from abrasive-surface floor plate of thickness indicated below:
 - 1. Thickness: 1/4 inch.
- B. Provide steel angle supports as indicated.
- C. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.

2.10 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 3/16-inch abrasive-surface floor plate with four 1-inch-diameter holes for water drainage and for lifting.

2.11 STRUCTURAL-STEEL DOOR FRAMES

- A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Reinforce frames and drill and tap as necessary to accept finish hardware.
 - 1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.
- B. Primesteel frames with zinc-rich primer.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from 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.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize miscellaneous steel trim.
- D. Prime miscellaneous steel trim with zinc-rich primer.

2.13 METAL BOLLARDS

- A. Fabricate metal bollards from 1/4-inch wall-thickness rectangular steel tubing steel shapes, as indicated.
 - 1. Cap bollards with 1/4-inch-thick steel.
- B. Fabricate bollards with 3/8-inch-thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
- C. Fabricate sleeves for bollard anchorage from steel or stainless steel tubing with 1/4-inch-thick, steel or stainless steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- D. Prime steel bollards with zinc-rich primer.

2.14 PIPE GUARDS

- A. Fabricate pipe guards from 3/8-inch-thick by 12-inch-wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.
- B. Galvanize and prime steel pipe guards.
- C. Prime steel pipe guards with zinc-rich primer.

2.15 ABRASIVE METAL THRESHOLDS

- 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.
- B. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
 - 2. Provide solid-abrasive-type units without ribs.

- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- D. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
- E. Apply bituminous paint to concealed surfaces of cast-metal units.
- F. Apply clear lacquer to concealed surfaces of extruded units.

2.16 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 bearing and leveling plates.
- C. Prime plates with zinc-rich primer.

2.17 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. Galvanize and prime loose steel lintels located in exterior walls.
- C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.18 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.

2.19 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.

2.20 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. 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 universal shop primer unless zinc-rich primer is indicated.
- C. 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 Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
- D. 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.

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.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. 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 overhead doors securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

3.3 INSTALLATION OF PREFABRICATED BUILDING COLUMNS

- A. Install prefabricated building columns to comply with ANSI/AISC 360, "Specifications for Structural Steel Buildings," and with requirements applicable to listing and labeling for fire-resistance rating indicated.

3.4 INSTALLATION OF METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete.
- C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- D. 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.
- E. Fill bollards solidly with concrete, mounding top surface to shed water.

3.5 INSTALLATION OF 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 shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 REPAIRS

- A. Touchup Painting:

- 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.
2. Steel tube railings and guards attached to metal stairs.
3. Steel tube handrails attached to walls adjacent to metal stairs.

1.2 COORDINATION

- ##### A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

1.3 ACTION SUBMITTALS

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

1. Woven-wire mesh.
2. Welded-wire mesh.
3. Prefilled metal-pan-stair treads.
4. Abrasive nosings.
5. Shop primer products.
6. Nonslip-aggregate concrete finish.
7. Precast concrete treads.
8. Handrail wall brackets.
9. Grout.

B. Sustainable Design Submittals:

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

- ##### D. Delegated-Design Submittal: For stairs railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. 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."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, railings, and guards including attachment to building construction.
- 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 and guard 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. Structural Performance of Railings and Guards: Railings and guards, 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.
- 3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Tubing for Railings and Guards: ASTM A500/A500M (cold formed) or ASTM A513/A513M.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- E. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
- F. Woven-Wire Mesh: Intermediate-crimp, square pattern, 2 1/2-inch woven-wire mesh, made from 0.162-inch-diameter, aluminum wire complying with ASTM B211, Alloy 6061-T94.

2.3 ABRASIVE NOSINGS

- A. Cast-Metal Units: Cast iron, 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. **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 Safety Tread Co., Inc.](#)
 - b. [Balco; a CSW Industrials Company.](#)
 - c. [Barry Pattern & Foundry Co., Inc.](#)
 - d. [Granite State Casting Co.](#)
 - 2. Configuration: Cross-hatched units, 3 inches wide without lip.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

- D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.4 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
 - 1. Select fasteners for type, grade, and class required.
- B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.
- C. 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 E488/E488M, 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/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Wall Brackets: Cast aluminum, center of rail 3-1/8 inches from face of wall.
 - 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. The Wagner Companies., R&B Wagner, Inc.
- B. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. 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.
- D. Zinc-Rich Primer: Comply with SSPC-Paint 20, Type II, Level 2, and compatible with topcoat.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior or exterior use;

noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, and guards, 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.
- B. Assemble stairs, railings, and guards in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. 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 Finish # 3 - Partially dressed weld with spatter removed.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 - 2. Locate joints where least conspicuous.
 - 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - 4. Provide weep holes where water may accumulate internally.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Service Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel plates.
 - a. Stringer Size: As indicated on Drawings.
 - b. Provide closures for exposed ends of channel and rectangular tube stringers.
 - c. Finish: Shop primed.
 - 2. Construct platforms of steel plate headers and miscellaneous framing members as indicated on Drawings.
 - a. Provide closures for exposed ends of channel and rectangular tube framing.
 - b. Finish: Shop primed.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
 - a. Locate hanger rods and struts where they do not encroach on required stair width and are 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.
- C. Metal Pan Stairs: Form risers, subtread 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, hot-rolled steel sheet unless otherwise indicated.
 - 2. Attach risers and subtreads 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.
 - 3. Attach abrasive nosings to risers.

2.8 FABRICATION OF STAIR RAILINGS AND GUARDS

- A. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
 - 1. Rails and Posts: 1-1/2-inch-square top and bottom rails and 1-1/2-inch-square posts.
 - 2. Mesh Infill: Woven-wire mesh crimped into 1-by-1/2-by-1/8-inch steel channel frames. Orient wire mesh with wires horizontal and vertical.
 - 3. Intermediate Rails Infill: 1-1/2-inch-square intermediate rails spaced less than 21 inches clear.

- B. Welded Connections: Fabricate railings and guards with welded connections.
1. Fabricate connections that are exposed to weather in a manner that excludes water.
 - a. Provide weep holes where water may accumulate internally.
 2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 3. Weld all around at connections, including at fittings.
 4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 5. Obtain fusion without undercut or overlap.
 6. Remove flux immediately.
 7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 - Partially dressed weld with spatter removed as shown in NAAMM AMP 521.
- C. Form changes in direction of railings and guards as follows:
1. As detailed.
 2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- D. 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.
- E. Close exposed ends of railing and guard members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- G. Connect posts to stair framing by direct welding unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 2. Provide ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 3. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
- I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.
1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.9 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. 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.

PART 3 - EXECUTION

3.1 INSTALLATION OF METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. 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.
 - 1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
 - a. Clean bottom surface of plates.
 - b. Set plates for structural members on wedges, shims, or setting nuts.
 - c. Tighten anchor bolts after supported members have been positioned and plumbed.
 - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
 - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

2. 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.
 3. Comply with requirements for welding in "Fabrication, General" Article.
- E. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
1. Install abrasive nosings with anchors fully embedded in concrete.
 2. Center nosings on tread width.
- F. Install precast concrete treads with adhesive supplied by manufacturer.

3.2 INSTALLATION OF RAILINGS AND GUARDS

- A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
1. Space posts at spacing indicated or, if not indicated, as required by design loads.
 2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
 3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
 4. Secure posts, rail ends, and guard ends to building construction as follows:
 - a. Anchor posts to steel by welding or bolting to steel supporting members.
 - b. Anchor handrail and guards ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.
- B. Attach handrails to wall with wall brackets.
1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 2. Secure wall brackets to building construction as required to comply with performance requirements.

END OF SECTION 055113

06 4116 - PLASTIC-LAMINATE ARCHITECTURAL COMPONENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Plastic-laminate-faced architectural countertops – NOT USED
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet and countertop installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including high-pressure decorative laminate and cabinet hardware and accessories.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: 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 plumbing fixtures, faucets, soap dispensers, electrical switches and outlets, and other items installed in architectural plastic-laminate cabinets and countertops.
4. Apply WI Certified Compliance Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.
3. Thermoset decorative panels.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.
2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finish.
3. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish.
4. Corner pieces as follows:

- a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.3 INFORMATION SUBMITTALS

- A. Qualification Data: For Installer
- B. Product Certificates: For each type of product
 - 1. Composite wood and agrifiber products.
 - 2. High-pressure decorative laminate.
 - 3. Chemical-resistant, high-pressure decorative laminate.
 - 4. Adhesives.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. 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. Do not deliver cabinets and countertops until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets and countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets and countertops 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. Environmental Limitations: Do not deliver or install cabinets and countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F during the remainder of the construction period.

- C. Field Measurements: Where cabinets and countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets and countertops are indicated to fit to other construction, establish dimensions for areas where cabinets and countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 7111 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets and countertops indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Premium
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Basis-of-Design: Wilsonart, Premium Laminate
 - a. Cabinets: Fawn Eucalyptus, Textured Finish with Aeon

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Type of Construction: Frameless
- B. Cabinet, Door, and Drawer Front Interface Style: Flush overlay
- C. Reveal Dimension: 1/2 inch
- D. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS
 - 4. Edges: Grade HGS
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels
- E. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- F. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners

2.3 PLASTIC-LAMINATE COUNTERTOPS – NOT USED

- A. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP, and as follows:
 - 1. Laminate has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.9.5:
 - a. Nitric Acid (30 Percent): Moderate effect.
 - b. Sulfuric Acid (77 Percent): Moderate effect.
 - c. Hydrochloric Acid (37 Percent): Moderate effect.
 - d. Phosphoric Acid (75 Percent): No effect.
 - e. Acetic Acid (98 Percent): No effect.
 - f. Formaldehyde: No effect.
 - g. Ethyl Acetate: No effect.
 - h. Ethyl Ether: No effect.
 - i. Phenol (85 Percent): Moderate effect.
 - j. Benzene: No effect.
 - k. Xylene: No effect.
 - l. Butyl Alcohol: No effect.

- m. Furfural: No effect.
- n. Methyl Ethyl Ketone: No effect.
- o. Sodium Hydroxide (25 Percent): No effect.
- p. Sodium Sulfide (15 Percent): No effect.
- q. Ammonium Hydroxide (28 Percent): No effect.
- r. Zinc Chloride: No effect.
- s. Gentian Violet: No effect.
- t. Methyl Red: No effect.

- B. Edge Treatment: Same as laminate cladding on horizontal surfaces
- C. Core Material: Particleboard or medium-density fiberboard
- D. Core Material at Sinks: medium-density fiberboard made with exterior glue
- E. Core Thickness: 3/4 inch
 - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
- F. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.
- G. Paper Backing: Provide paper backing on underside of countertop substrate.

2.4 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Composite Wood and Agrifiber Products: 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."
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.

5. Softwood Plywood: DOC PS 1, medium-density overlay.
6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1
7. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.5 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 7100 - Door Hardware.
- B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:
 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
 2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening
- D. Back-Mounted Pulls: BHMA A156.9, B02011.
- E. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- F. Catches: Magnetic catches, BHMA A156.9, B03141
- G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
- H. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- I. Drawer Slides: BHMA A156.9.
 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1
 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100
 6. For computer keyboard shelves, provide Grade 1
 7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

- J. Aluminum Slides for Sliding Glass Doors, as indicated on drawings: BHMA A156.9, B07063.
- K. Door Locks: BHMA A156.11, E07121.
- L. Drawer Locks: BHMA A156.11, E07041.
- M. Door and Drawer Silencers: BHMA A156.16, L03011.
- N. Float Glass for Cabinet Doors, as indicated on drawings: ASTM C 1036, Type I, Class 2 or 3 (tinted), Quality-Q3, 4.0 mm thick.
 - 1. Tint Color: TBD
- O. 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.
- P. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.6 COUNTERTOP ACCESSORIES – NOT USED

- A. Grommets for Cable Passage through Countertops: 1-1/4-inch molded-plastic grommets and matching plastic caps with slot for wire passage.
- B. Paper Slots: 12 inches long by 1-3/4 inches wide by 1 inch deep; molded-plastic, paper-slot liner with 1/4-inch lip.

2.7 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 metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet 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. Adhesive for Bonding Plastic Laminate and bonding edges: as recommended in writing by the manufacturer.

- F. VOC Limits for Installation Adhesives and Sealants: Use products that 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. Structural Wood Member Adhesive: 140 g/L.
 4. Architectural Sealants: 250 g/L.

2.8 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate cabinets to dimensions, profiles, and details indicated.
- C. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
- D. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Architect seven days in advance of the dates and times 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 before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets and countertops to average prevailing humidity conditions in installation areas.

- B. Before installing cabinets and countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 GENERAL INSTALLATION

- A. Grade: Install cabinets and countertops to comply with same grade as item to be installed.
- B. Assemble cabinets and countertops, and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Install cabinets and countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets and countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

3.3 CABINET INSTALLATION

- A. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- B. 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.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with screws as recommended in writing by the manufacturer.

3.4 COUNTERTOP INSTALLATION – NOT USED

- A. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches.

Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

- B. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- C. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
- D. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets and countertops, 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 cabinets and countertops on exposed and semiexposed surfaces.

END OF SECTION 064116

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SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building wrap.
 - 2. Flexible flashing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 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. Dow Chemical Company (The).
 - 2. Water-Vapor Permeance: Not less than 75 perms per ASTM E96/E96M, Desiccant Method (Procedure A).
 - 3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

- A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
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. DuPont Safety and Construction.
 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.3 DRAINAGE MATERIAL

- A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding and adhered masonry veneer.
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. DuPont Safety and Construction.
 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. 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.
- B. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
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. 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.
 - 2. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 3. Lap water-resistive barrier over flashing at heads of openings.

3.3 DRAINAGE MATERIAL INSTALLATION

- A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

END OF SECTION 072500

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphalt shingles.
 - 2. Underlayment.
 - 3. Ridge vents.
 - 4. Metal flashing and trim.
- B. Related Requirements:

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Evaluation reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Material Warranty Period: 25 years from date of Substantial Completion, prorated, with first three five years nonprorated.
 - 2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 160 mph for 15 years from date of Substantial Completion.
 - 3. Workmanship Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E108 or UL 790 by Underwriters Laboratories, Inc. or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Three-Tab-Strip Asphalt Shingles: ASTM D3462/D3462M, glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with tabs regularly spaced.
 - 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.
 - 2. XT 30 IR.
 - 3. Color: Resawn Shake
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

- A. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. CertainTeed Saint-Gobain.

2.4 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. CertainTeed Saint-Gobain.
2. Width: 7".
3. Features:
 - a. Nonwoven geotextile filter strips.
 - b. External deflector baffles.

2.5 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
 1. Shank: Barbed.
 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.
- D. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

2.6 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 1. Sheet Metal: Anodized aluminum. Color: Dark Bronze
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

- B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails.
 - 1. Install fasteners at no more than 36 inches o.c.
 - 2. Terminate felt underlayment flush against sidewalls, curbs, chimneys, and other roof projections.
 - 3. Install fasteners at no more than 36 inch o.c.

- C. Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides and ends and treat laps as recommended in writing by manufacturer. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer. Fasten according to manufacturer's written instructions. Cover underlayment within period recommended in writing by manufacturer.
 - 1. Install in single layer on roofs sloped at 4:12 and greater.
 - 2. Install in double layer on roofs sloped at less than 4:12.

- D. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
 - 1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.

3.2 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

3.3 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.

- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

- D. Fasten asphalt-shingle strips with a minimum of five roofing nails located according to manufacturer's written instructions.
 - 1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

- E. Woven Valleys: Extend succeeding asphalt-shingle courses from both sides of valley 12 inches beyond center of valley, weaving intersecting shingle-strip courses over each other. Use one-piece shingle strips without joints in valley.
 - 1. Do not nail asphalt shingles within 6 inches of valley center.

- F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

- G. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standing-seam metal roof panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.6 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. 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. Finish Warranty Period: 20 Insert number years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.
- B. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
 - 2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E1980.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..

- E. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Hail Resistance: SH.
- F. 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 STANDING-SEAM METAL ROOF PANELS

- A. Provide factory-formed metal roof panels designed to be installed 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.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
 - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
 - 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. Berridge Manufacturing Company.
 - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.022 inch.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 3. Clips: One-piece fixed to accommodate thermal movement.

- a. Material: 0.028-inch- nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - b. Material: 0.025-inch- thick, stainless-steel sheet.
4. Panel Coverage: 12 inches.
 5. Panel Height: 1.0 inch.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
 3. 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. GCP Applied Technologies Inc.
- B. Felt Underlayment: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 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, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels.
- E. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch-nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type 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; 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat.
2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- #### A. Miscellaneous Supports:
- Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION OF UNDERLAYMENT

- #### A. Self-Adhering Sheet Underlayment:
- Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
- #### B. Felt Underlayment:
- Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches.
- #### C. Slip Sheet:
- Apply slip sheet over underlayment before installing metal roof panels.
- #### D. Flashings:
- Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

- #### A. Standing-Seam Metal Roof Panel Installation:
- Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing 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: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

4. Watertight Installation:

- a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. 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.

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.

END OF SECTION 074113.16

SECTION 074213.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Foamed-insulation-core metal wall panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Samples of special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 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. 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. 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 E72:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft..
- D. 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.
- E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E119.
 - 2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
 - 3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
 - 4. Potential Heat: Acceptable level when tested according to NFPA 259.
 - 5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
 - b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D1622.
 - c. Compressive Strength: Minimum 20 psi when tested according to ASTM D1621.
 - d. Shear Strength: 26 psi when tested according to ASTM C273/C273M.
- B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
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. CENTRIA Architectural Systems.
 2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 2.5 inch.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - 1) Color: As selected by Architect from manufacturer's full range.
 3. Thermal-Resistance Value (R-Value): R-17 according to ASTM C1363.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, 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, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Backer Board: Hardboard complying with ANSI A135.4, Class 1 tempered, 1/8 inch thick unless otherwise indicated.
- D. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- F. Panel Sealants: Provide sealant type 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; 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

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 major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. 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.

2.5 FINISHES

- A. Panels and Accessories:
1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat,

- and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSULATED METAL WALL PANEL INSTALLATION

- A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
 1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
 2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
 4. 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.
 5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
 6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
 7. Where applicable, apply snap-on battens to exposed-fastener, insulated-core metal wall panel seams to conceal fasteners.
- B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
 1. Install clips to supports with self-tapping fasteners.
- C. Laminated-Insulation-Core Metal Wall Panels:
 1. Mechanically attach wall panels using manufacturer's standard procedures.
 2. Seal joints with manufacturer's standard gaskets.

- D. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- E. 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. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- 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.

END OF SECTION 074213.19

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal soffit panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

- B. Warranties: Samples of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 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. 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. Finish Warranty Period: 10 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 E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft. 6.24 lbf/sq. ft..
- C. 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. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels: Match profile shown on drawings.
 - 1. Finish: As indicated on Drawings.
 - 2. Sealant: Factory applied within interlocking joint.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, 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, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or

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

- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. 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.

2.5 FINISHES

- A. Panels and Accessories:
 - 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
 - 1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.2 INSTALLATION

- A. Metal Soffit 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.
- B. 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.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. 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.

3.3 CLEANING

- 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.

END OF SECTION 074293

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.
3. Cover board.
4. Walkways.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of SPRI's Directory of Roof Assemblies listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples: For the following products:

1. Roof membrane and flashings, of color required.
2. Roof paver in each color and texture required.
3. Walkway pads or rolls, of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.
 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- B. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- C. Research reports.
- D. Field Test Reports:
1. Concrete internal relative humidity test reports.
 2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- E. Field quality-control reports.
- F. Sample warranties.
- 1.4 CLOSEOUT SUBMITTALS
- A. Maintenance data.
 - B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.
- 1.5 QUALITY ASSURANCE
- A. 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.
- 1.6 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. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
- B. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
 - 1. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.
- C. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.
 - 1. Wind Uplift Load Capacity: 90 psf.
- D. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. 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.
- G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, TPO sheet.
 - 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. GAF
 - 2. Thickness: 60 mils, nominal.
 - 3. Exposed Face Color: White.

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: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system 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.

2.4 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 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. **GAF.**
 - 2. Size: 48 by 48 inches.
 - 3. Thickness:
 - a. Base Layer: 2-1/2 inches.
 - b. Upper Layer: 2-1/2 inches.
- B. 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 and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners with metal or plastic 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.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
- C. Cover Board: ASTM C208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch thick.
- D. Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 1/2-inch-thick polyisocyanurate, with a minimum compressive strength of 80 psi.
- E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.

2.6 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches.
 - 2. Color: Contrasting with roof membrane.

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.

3.2 PREPARATION

- A. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 - 1. Submit test result within 24 hours after 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. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- 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.

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install ½" substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Loosely lay substrate board over roof deck.

3.5 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 roof 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 24 inches in adjacent rows.
 - a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - 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 with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.

- f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 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 with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

3.6 INSTALLATION OF COVER BOARDS

- A. 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 in each direction.
- 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
- B. Install slip sheet over cover board and beneath roof membrane.

3.7 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.
- 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 to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, 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 roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF MECHANICALLY FASTENED ROOF MEMBRANE

- A. Mechanically fasten 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. For in-splice attachment, install roof membrane with long dimension perpendicular to steel roof deck flutes.
- D. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- E. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- F. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.

- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within seam, and mechanically fasten TPO sheet to roof deck.
- I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings 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 roof membrane and flashing sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.9 INSTALLATION OF LOOSELY LAID AND BALLASTED ROOF MEMBRANE

- A. Loosely lay 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. Comply with requirements in ANSI/SPRI RP-4 for System 1.
- D. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- E. Accurately align roof membrane, without stretching, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- F. Mechanically fasten or adhere perimeter of roof membrane according to requirements in ANSI/SPRI RP-4.
 - 1. At corners and perimeters, adhere a second layer of roof membrane.
- G. Apply roof membrane with side laps shingled with slope of deck where possible.
- H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings 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 roof membrane and flashing sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

- J. Install protection mat over roof membrane, overlapping a minimum of 6 inches. Install an additional protection mat layer at projections, pipes, vents, and drains, overlapping a minimum of 12 inches.

3.10 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 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.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. 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.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.11 INSTALLATION OF WALKWAYS

- A. Flexible Walkways:
 - 1. Install flexible walkways at the following locations:
 - a. Retain one or more subparagraphs below. Revise to suit Project.
 - b. Perimeter of each rooftop unit.
 - c. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - d. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - e. Top and bottom of each roof access ladder.
 - f. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - g. Locations indicated on Drawings.
 - h. As required by roof membrane manufacturer's warranty requirements.
 - 2. Provide 6-inch clearance between adjoining pads.
 - 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
- B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions.
 - 1. Install roof paver walkways at the following locations:

- a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. Top and bottom of each roof access ladder.
 - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - f. Locations indicated on Drawings.
 - g. As required by roof membrane manufacturer's warranty requirements.
2. Provide 3 inches of space between adjacent roof pavers.

3.12 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 075423

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sheet Metal Flashing
 - 2. Manufactured Flashing
 - 3. Gutters and Downspouts

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 roof edge flashing and copings capable of resisting the following forces according to recommendations in the Code, FMG Loss Prevention Data Sheet 1-49 or as indicated, whichever is more stringent.
 - 1. Wind Zone 4: For velocity pressures of 46 to 104 lbf/sq. ft: 208-lbf/sq. ft. perimeter uplift force, 312-lbf/sq. ft. corner uplift force, and 104-lbf/sq. ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 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.
 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, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 7. Details of special conditions.
 8. Details of connections to adjoining work.
 9. Detail formed flashing and trim
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 3. Accessories and Miscellaneous Materials: Full-size Sample.
 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.
- E. Qualification Data: For qualified fabricator.
- F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- G. 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. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including built-in gutter, fascia, fascia trim, and apron flashing approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, 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.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- E. Preinstallation Conference: Conduct conference at Project site
 - 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, unit skylights, 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 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 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Zinc-Tin Alloy-Coated Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead-soft, fully annealed stainless-steel sheet of minimum uncoated thickness indicated; coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin), with factory-applied gray preweathering.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 - 1. Finish: 4 (polished directional satin)
 - 2. Surface: Smooth, flat
- D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 - 2. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides
 - 3. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 4. Color: to be selected from manufacturer's standard 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 SEPARATION OF DISSIMILAR METALS

- A. When products are installed in metal panel systems, the flashing and sheet metal manufacturer shall ensure that proper separation of dissimilar metals has been installed. Manufacturer shall certify in writing that the recommended approach for this project application is appropriate.

2.3 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 or manufactured item unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 3. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder:
 - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. For Zinc-Tin Alloy-Coated Stainless Steel: ASTM B 32, 100 percent tin.
 - 3. For Zinc-Coated (Galvanized) Steel: ASTM B 32, 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, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, 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. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 THROUGH-WALL FLASHING

- A. Through-Wall Ribbed Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond. Manufacture through-wall flashing with snaplock receiver on exterior face to receive counterflashing

1. Stainless Steel: ASTM A 240/A 240M Type 304, 0.016 inch thick.
 - a. Products: Subject to compliance with requirements, provide one of the following
 - 1) Cheney Flashing Company; Cheney Flashing (Dovetail).
 - 2) Cheney Flashing Company; Cheney Flashing (Sawtooth).
 - 3) Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - 4) Keystone Flashing Company, Inc.; Keystone Three-Way Interlocking Thruwall Flashing.
 - 5) Sandell Manufacturing Company, Inc.; Pre-Formed Metal Flashing.
2. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed
3. Fabricate metal drip edges for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
4. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

2.5 REGLETS

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products Inc.
 - d. Hickman, W. P. Company.
 - e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - f. Keystone Flashing Company, Inc.
 - g. National Sheet Metal Systems, Inc.
 - h. Sandell Manufacturing Company, Inc.
 2. Material: Stainless steel, 0.019 inch thick
 3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

7. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
8. Finish: Mill

2.6 FLEXIBLE EMBEDDED FLASHING

A. Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following
 - 1) Advanced Building Products Inc.; Copper Fabric Flashing
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
 - 3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 5) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 6) York Manufacturing, Inc.; Multi-Flash 500.
2. Asphalt-Coated Copper Flashing: 7-oz./sq. ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following
 - 1) Advanced Building Products Inc.; Cop-R-Cote.
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Coated Thru-Wall Flashing.
 - 3) Hohmann & Barnard, Inc.; H & B C-Coat Flashing.
 - 4) Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
 - 5) Sandell Manufacturing Co., Inc.; Coated Copper Flashing.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS AND FLASHING

- A. Unless noted otherwise fabricate sheet metal from Pre-finished 22-gauge Galvanized steel.
- B. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide, joint cover plates.
 1. Joint Style: Lap, 4 inches wide

2. Fabricate with scuppers spaced 10 feet apart, of dimensions required with 4-inch-wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
 3. Color: TBD
- C. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, seal, and solder or weld watertight.
1. Coping Profile: As indicated on the drawings.
 2. Joint Style: Butt, with 12-inch- wide, concealed backup plate and 6-inch- wide, exposed cover plates
 3. Color: TBD
- D. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
1. Color: TBD
- E. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, built-in overflows.
1. Color: TBD

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS AND FLASHING

- A. Material: When Metal Roof Panels are specified in Section 07216 – Metal Panels and Accessories, sheet metal shall be of the same finish and material as metal roof panels.
1. When the project does not include the use of Metal Roof panels, sheet metal shall be fabricated from the following materials.
- B. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch
- C. Valley Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch
- D. Drip Edges: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch
- E. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.025 inch
- C. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.016 inch
- D. Counterflashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch
- E. Flashing Receivers: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch
- F. Roof-Penetration Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch
- G. Wall Expansion-Joint Cover: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch
- H. Roof, Roof to Wall Transition, Roof to Roof Edge Flashing (Gravel Stop) and Fascia Cap Transition Expansion-Joint Cover: Fabricate from the following materials:
1. Stainless Steel: 0.025 inch
- 2.10 PIPE FLASHING
- A. Pipe Flashings shall be pre-molded EPDM rubber with metal collar.
 - B. Pipe flashing shall be ITW Buildex; DEKTITE, or equal.
- 2.11 GUTTERS AND DOWNSPOUTS
- A. Locations: Gutters and downspouts shall be installed at locations indicated on the drawings.
 - B. When drawings indicate gutters and downspouts, gutters and downspouts shall be of the profile and configuration indicated, Kynar-coated, Pre-finished, 18-gauge Hot-dipped G90 Galvanized steel, conforming to ASTM A 653.
 - C. Colors:
 1. Color: to be selected from manufactures standard colors.
 2. Where gutters and downspouts span multiple colored materials, the portion of the gutter and downspouts shall match each adjacent color respectively.
 - D. Gutters and downspouts shall be fabricated with lines and corners of exposed units true and accurate. Exposed faces shall be formed flat and free of buckles, excessive waves and tool marks. Uniform neat seams shall be folded back to form a hem on the concealed side of exposed edges.

- E. Strainer units at the gutter outlets shall be provided from No. 4 stainless steel screen with 0.35 wires.
- F. Adequate fasteners, supports, and straps shall be provided to support the configurations and lengths indicated.
- G. Thermal expansion and contraction of items more than 10-feet continuous length shall be accommodated and watertight expansion joints shall be provided at approved locations. Expansion joints shall be fabricated of the same materials, finish, and color to match the associated gutter and/or downspout.
- H. Gutters and downspouts shall be designed, fabricated, and installed as indicated, in accordance with manufacturer's written instructions, and in compliance with SMACNA and NRCA standard practices.
- I. Flashing and penetration details shall be designed, fabricated, and installed as indicated, in accordance with manufacturer's instructions, and in compliance with SMACNA and NRCA standard roofing practices.
- J. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but 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.
 - 1. Gutter Style: E
 - 2. Expansion Joints: Lap type
 - 3. Provide Valley Baffles at Valleys.
- K. Downspouts: Fabricate rectangular and open-face downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

2.12 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 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. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Sealed Joints: Form nonexpansion 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, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- J. Do not use graphite pencils to mark metal surfaces.
- K. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, be turned down at or beyond face of wall, or is fully concealed, use metal flashing.
 - 2. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal sealant stop.
- L. Solder and Sealants for Sheet Metal Flashings:
 - 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 - 3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- M. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

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.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- 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 sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. 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 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 corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
 - 1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing 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.

- 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 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 as recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as shown and as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. 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 metallic-coated steel and aluminum sheet.
 - 2. Pre-tinning is not required for zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper
 - 3. 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.
 - 4. 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.
 - 5. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.
- G. Rivets: Rivet joints in uncoated aluminum where indicated and 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 recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.

2. Loosely lock straps to front gutter bead and anchor to roof deck.
 3. Anchor and loosely lock back edge of gutter to continuous cleat
 4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
 5. Anchor gutter with spikes and ferrules spaced not more than 24 inches 30 inches apart.
 6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
 7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
 2. Provide elbows at base of downspout to direct water away from building.
 3. Connect downspouts to underground drainage system indicated.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with roofing membrane.
- E. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
 2. Loosely lock front edge of scupper with conductor head.
 3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- F. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper or gutter discharge.
- G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

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 SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16-inch centers.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
 - 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- E. 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.
- F. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant.
- G. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric 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 SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.
- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 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.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 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 trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Copings.
 - 2. Roof-edge specialties.
 - 3. Roof-edge drainage systems.
 - 4. Reglets and counterflashings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roof specialties.
 - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
- C. Samples: For each type of roof specialty and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For tests performed by a qualified testing agency.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class.

1.6 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in roofing system warranty provisions.

- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FM Approvals' Listing: Manufacture and install copings and roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- C. Thermal Movements: 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. 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 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
 - 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. Exceptional Metals.
 - 2. Metallic-Coated Steel Sheet Coping Caps: Zinc-coated (galvanized) steel, nominal thickness as required to meet performance requirements.

- a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Formed Aluminum Sheet Coping Caps: Aluminum sheet, thickness as required to meet performance requirements.
- a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
4. Coping-Cap Attachment Method: face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.
- a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
 - b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.3 ROOF-EDGE SPECIALTIES

- A. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.
- 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. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
 - 2. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel, nominal thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 3. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 - 5. Fascia Accessories: Wall cap, Soffit trim, Downspout scuppers with integral conductor head and downspout adapters and perforated screens.

2.4 ROOF-EDGE DRAINAGE 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. Exceptional Metals.
- B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
1. Zinc-Coated Steel: Nominal 0.028-inch thickness.
 2. Aluminum Sheet: 0.032 inch thick.
 3. Gutter Profile: Style B according to SMACNA's "Architectural Sheet Metal Manual."
 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
 5. Gutter Accessories: Flat ends.
- C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Zinc-Coated Steel: Nominal 0.028-inch thickness.
 2. Formed Aluminum: 0.032 inch thick.

2.5 REGLETS AND COUNTERFLASHINGS

- 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. Exceptional Metals.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Zinc-Coated Steel: Nominal 0.022-inch thickness.
 2. Formed Aluminum: 0.024 inch thick.
 3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Stucco Type, Embedded: Provide reglets with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 5. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 6. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
 7. Multiuse Type, Embedded: For multiuse embedment in masonry mortar joints.

- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
 - 1. Zinc-Coated Steel: Nominal 0.022-inch thickness.
 - 2. Formed Aluminum: 0.024 inch thick.
- D. Accessories:
 - 1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
 - 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range.
- F. Aluminum Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.6 MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.
- B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
- D. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

2.7 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 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. Owens Corning.
 - 2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F.

3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F.
- B. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.

2.8 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
 3. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
 5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
- B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.9 FINISHES

- A. Coil-Coated Galvanized-Steel Sheet Finishes:
 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A755/A755M and coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.
 - b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat.
 - c. Two-Coat Mica Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.
 - d. Three-Coat Metallic Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat.
- B. Coil-Coated Aluminum Sheet Finishes:
 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
 1. Apply continuously under copings, roof-edge specialties, and reglets and counterflashings.
 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.2 INSTALLATION, GENERAL

- A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 4. Torch cutting of roof specialties is not permitted.
 5. Do not use graphite pencils to mark metal surfaces.
- 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 and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.
- G. 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; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. 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.

3.3 INSTALLATION OF COPING

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
 1. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.4 INSTALLATION OF ROOF-EDGE SPECIALITIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

- A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
 - 2. Install continuous leaf guards on gutters with noncorrosive fasteners, for cleaning gutters.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
 - 1. Provide elbows at base of downspouts at grade to direct water away from building.

3.6 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

- A. Embedded Reglets: See Section 042000 "Unit Masonry" for installation of reglets.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

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 and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION 077100

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof equipment curbs.

1.3 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: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
- D. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.
- E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

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.
 - 1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes

1.8 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 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 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated and mill phosphatized for field painting
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.
- C. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.
 - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coated.
 - 3. Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements in AAMA 2605, except as modified below:
 - 1) Humidity Resistance: 2000 hours.
 - 2) Salt-Spray Resistance: 2000 hours.
- D. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and mill finish. Coil-coat finish as follows:
 - 1. Factory-Prime Coating: Where painting after installation is indicated, provide pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat; with a minimum dry film thickness of 0.2 mil.
 - 2. 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 611.
 - 3. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
 - a. Color: TBD
 - 4. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

- a. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.
 - b. Color and Gloss: As selected by Architect from manufacturer's full range
- 5. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Conversion coating; Organic Coating: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer's written instructions.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range
- 6. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range
- E. Aluminum Extrusions and Tubes: ASTM B 221, alloy and temper recommended by manufacturer for type of use, mill finished.
- F. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.
- G. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.
- H. Steel Tube: ASTM A 500, round tube, baked-enamel finished.
- I. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.
- J. Galvanized Steel Pipe: ASTM A 53/A 53M.

2.3 SEPARATION OF DISSIMILAR METALS

- A. When products are installed in metal panel systems, the roof accessories manufacturer shall ensure that proper separation of dissimilar metals has been installed. Manufacturer shall certify in writing that the recommended approach for this project application is appropriate.

2.4 MISCELLANEOUS MATERIALS

- A. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Type UVA (formulated with UV absorber), Finish 1 (smooth or polished).
- B. Polycarbonate Glazing: Thermoformable, monolithic polycarbonate sheets manufactured by extrusion process, burglar-resistance rated per UL 972 with an average impact strength of 12 to 16 ft-lbf/in. of width when tested according to ASTM D 256, Method A (Izod).
- C. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, 1 inch thick.
- D. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.
- E. Polyisocyanurate Board Insulation: ASTM C 1289, 1 inch thick.
- F. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.
- G. Security Grilles: 3/4-inch- diameter, ASTM A 1011/A 1011M steel bars spaced 6 inches o.c. in 1 direction and 12 inches o.c. in the other.
 - 1. Factory Finishing:
 - a. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - b. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
 - c. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- H. 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.
- I. Polyethylene Sheet: 6-mil- thick, polyethylene sheet complying with ASTM D 4397.
- J. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.
- K. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

- L. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- M. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- N. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.
- O. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.5 ROOF CURBS

- A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 - 1. Manufacturers:
 - a. Colony Custom Curbs.
 - b. Commodity Products Company, Inc.
 - c. Conn-Fab Sales, Inc.
 - d. Curbs Plus Inc.
 - e. Custom Curb, Inc.
 - f. LM Curbs.
 - g. Loren Cook Company.
 - h. Metallic Products Corporation.
 - i. Pate Company (The).
 - j. Roof Products & Systems Corporation.
 - k. Roof Products, Inc.
 - l. Thaler Metal Industries Ltd.
 - m. ThyCurb; Div. of Thybar Corporation.
 - n. Uni-Curb, Inc.
 - o. Vent Products Company, Inc.
 - 2. Load Requirements: Refer to Mechanical Drawings and Specifications
 - 3. Material: Galvanized steel sheet, 0.052 inch
 - a. Finish: High-performance organic coating
 - 4. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 5. Factory install wood nailers at tops of curbs.

6. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
7. Factory insulate curbs with 1-1/2-inch- fiber board insulation.
8. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
9. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

PART 1 - EXECUTION

1.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 2. Verify dimensions of roof openings for roof accessories.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

1.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Coat concealed side of uncoated aluminum, or stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing exposed-to-view components of 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 underlayment.
 3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof Curb Installation:
 - 1. Set roof curb so top surface of roof curb is level.
- F. Roof Hatch Installation:
 - 1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
 - 2. Attach safety railing system to roof hatch curb.
 - 3. Attach ladder safety post according to manufacturer's written instructions.
- G. Seal joints with sealant as required and as recommended in writing by manufacturer of roof accessories.

1.3 TOUCH UP

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 09 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

1.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 077200

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pad-type, flat-mounted metal snow guards.
 - 2. Pad-type, seam-mounted cast metal snow guards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.
 - 1. Include details of rail-type snow guards.
- C. Samples:
 - 1. Pad-Type Snow Guards: Full-size unit with installation hardware.
 - a. For units with factory-applied finishes, submit manufacturer's standard color selections.
- D. Delegated-Design Submittal: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include calculation of number and location of snow guards.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the jurisdiction in which the Project is located.
- B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design snow guards, including attachment to roofing material and roof deck, applicable for attachment method, based on the following:
1. Roof snow load.
 2. Snow drifting
 3. Roof slope.
 4. Roof type.
 5. Roof dimensions.
 6. Roofing substrate type and thickness.
 7. Snow guard type.
 8. Snow guard fastening method and strength.
 9. Snow guard spacing.
 10. Coefficient of Friction Between Snow and Roof Surface: 0.
- B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 PAD-TYPE SNOW GUARDS

- A. Pad-Type, Flat-Mounted Metal Snow Guards:
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. TRA Snow and Sun, Inc.
 2. Material:
 - a. ASTM B209 aluminum sheet, not less than 0.040 inch thick.
 - 1) Finish: Powder coat finish complying with AAMA 2603, with a minimum dry film thickness of 1.5 mils.
 - a) Color: Match sheet metal roofing.
 - b. ASTM B26/B26M cast aluminum.
 - c. ASTM A653/A653M metallic-coated steel sheet with G90 coating, 0.022 inch thick.

- 1) Finish: Powder coat finish complying with AAMA 2603, with a minimum dry film thickness of 1.5 mils.
 - a) Color: Match sheet metal roofing.
 - d. ASTM A792/A792M, Class AZ50 aluminum-zinc alloy-coated steel sheet, Grade 40ot less than 0.022 inch thick.
 - 1) Finish: High-performance organic two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - a) Color: Match sheet metal roofing.
 - e. ASTM A240/A240M, Type 304 stainless steel sheet, not less than 0.0156 inch thick.
 - 1) Finish: ASTM A480/A480M, No. 2D.
3. Attachment: Manufacturer's tested system, capable of resisting design loads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
 1. Space rows as recommended by manufacturer.
- B. Attachment for Standing-Seam Metal Roofing:
 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
 2. Pad-Type, Flat-Mounted Snow Guards:
 - a. Mechanically attach to metal roofing according to manufacturer's instructions.

END OF SECTION 077253

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide sealants and caulking and appurtenant WORK, complete and in place in accordance with the Contract Documents.
- B. The CONTRACTOR shall coordinate color samples with other Sections through the submittal process, as required by the ARCHITECT.

1.2 REFERENCES

- A. Where reference is made to any of the below, the revision in effect at the time of bid opening shall apply.
- B. American Society for Testing and Materials (ASTM):
 - ASTM C 920 Elastomeric Joint Sealants
 - ASTM D 1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- C. Sealant, Waterproofing, and Restoration Institute (SWRI).

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 013300 – CONTRACTOR Submittals.
- B. Literature: Manufacturer's specifications, technical data, installation methods, and maintenance instructions, and the following:
 - 1. Joint width and depth tables.
 - 2. Manufacturer's full range color charts, indicating custom color availability, for color selection by ARCHITECT.
- C. Warranty: Submit a copy of the warranty.
- D. Certifications:
 - 1. Certification by the Manufacturer that the sealant and caulking, including compressible filler and joint backing, is suitable for, and compatible with, the required installation.

2. Certification by the Manufacturer that the sealant and caulking, including compressible filler and joint backing, is suitable for, and compatible with, the substrates and surfaces indicated.
3. Certification of Manufacturer qualifications demonstrating compliance with the qualifications requirements indicated.
4. Certification of installer qualifications demonstrating compliance with the qualifications requirements indicated. Include a list of 5 similar completed projects with addresses of the project location, date of project completion, and contact information of the consultant firm of record, general contractor and owner.
5. Certification by the Manufacturer's technical field representative that surfaces have been prepared and the products have been applied in accordance with the Manufacturer's recommendations.
6. Certification from an independent testing laboratory that the submitted materials meet the requirements of the references indicated.
7. Certification of UL approvals indicated.
8. When requested by the ARCHITECT, furnish other certifications as may be required to demonstrate compliance with the Contract Documents.

E. Application Schedule: Furnish a detailed and complete application schedule indicating location and detail of installation.

F. Samples: When requested by the ARCHITECT, submit samples of the materials proposed. Samples shall be clearly marked to show the Manufacturer's name, product identification, finish and color. New samples shall be resubmitted of each, as required, until approved by the ARCHITECT. Upon approval, the samples shall become the standard for acceptance for the project with regard to color, finish, and quality of each item. Approval of samples shall not relieve the CONTRACTOR from compliance with the Contract Documents.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Sealants and Caulking shall be provided by a single Manufacturer, each.

B. Manufacturer Qualifications:

1. Sealants and caulking Manufacturer shall have a minimum of 20 years of sealants and caulking manufacturing experience.
2. Manufacturers without these qualifications will not be accepted.

C. Installer Qualifications:

1. Installer shall have a minimum of 5 years' experience in the successful completion of at least 5 projects of similar size and scope, employing similar products, materials, applications, and performance requirements.
2. Installers without these qualifications will not be accepted.

D. Manufacturer's Technical Field Representative: The CONTRACTOR shall arrange for a Manufacturer's technical field representative to be on Site for at least 1 day, beginning at the start of surface preparation and continuing through application, to train the installers and to

supervise the WORK. The Manufacturer's technical field representative shall observe as necessary to certify in writing that the completed WORK has been performed according to the Manufacturer's instructions.

E. Sealant and caulking WORK shall comply with the following references:

1. SWRI
2. ASTM C 920
3. ASTM E 814 (for Fire Rated Applications)
4. UL 1479 (for Fire Rated Applications)

1.5 SPECIAL WARRANTY PROVISIONS

- A. Furnish Manufacturer's 5-year written warranty to cover defects in materials, products, and manufacturing workmanship.
- B. The CONTRACTOR shall furnish separate, but concurrently running, 5-year written warranty to cover labor.
- C. Warranties shall be non-prorated for the entire warranty period.
- D. The term of the warranties shall begin on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Sealant and caulking, including compressible filler and joint backing, shall be recommended by the Manufacturer for the installation indicated.
- B. Sealant and caulking, including compressible filler and joint backing, shall be suitable for, and compatible with, the required installation.
- C. Sealant and caulking, including compressible filler and joint backing, shall be suitable for, and compatible with, the substrates and surfaces indicated.
- D. Colors for sealants and caulking above grade and exposed to view shall be selected by the Architect from Manufacturer's full color range, including custom colors.

2.2 INTERIOR AND EXTERIOR SEALANTS (HORIZONTAL OR SLOPED PLANES)

- A. Manufacturer and Product, or Equal:
 1. Subject to the requirements indicated, provide Manufacturer and product listed below, or equal:

- a. Sonneborn, a Division of BASF; Sonolastic SL2, including primer as recommended by Manufacturer.
- B. Description: Two part, pour grade polyurethane base, ASTM C 920, Type M, Grade P, Class 25, Use T, NT, M, A, and I.

2.3 INTERIOR AND EXTERIOR SEALANTS (VERTICAL PLANE)

- A. Manufacturer and Product, or Equal:
 - 1. Subject to the requirements indicated, provide Manufacturer and product listed below, or equal:
 - a. Sonneborn, a Division of BASF; Sonolastic NP2, including primer as recommended by Manufacturer.
- B. Description: Multi-component, gun grade, polyurethane ASTM C 920, Type M, Grade NS Class 25, Use NT, T, M, A, G, and O.

2.4 COMPRESSIBLE FILLER

- A. Manufacturer and Product, or Equal:
 - 1. Subject to the requirements indicated, provide Manufacturer and product listed below, or equal:
 - a. Sandell Manufacturing Co., Inc., Polyseal.
- B. Description:
 - 1. Compressible filler shall be an impregnated preformed compressible sealant, produced by combining permanently elastic, high density open cell, polyurethane foam with stabilizing acrylics. Compressible filler shall be supplied pre-compressed in a tape form with a PSA on one side.
 - 2. Compressible filler shall be compatible with sealant Manufacturer's product and shall not stain the sealant nor the materials to which applied.

2.5 JOINT BACKING (BACKER ROD)

- A. Description:
 - 1. Joint backing for joints in superstructure shall be approved, resilient, closed cell polyethylene rods of diameters to suit joint conditions. Joint backing shall comply with ASTM D 1752, Type II or III.
 - 2. Where joint depth will not allow for a rod and still provide 3/8-inch (9.5 mm) minimum depth of sealant, provide approved bond breaker tape at the bottom of the joint.

3. Joint backing shall be compatible with sealant Manufacturer's product and shall not stain the sealant nor the materials to which applied.

2.6 FIRE SAFING

- A. Description: Provide UL-approved mineral fiber fire safing material for filling void areas and for joint backing where indicated and required.

2.7 FIRE STOPPING SEALANT

- A. Description:
 1. Unless otherwise indicated, provide UL-approved two-part, silicone foam fire stopping sealant, including primer as recommended by the Manufacturer.
 - a. Two-hour fire rated sealant conforming to ASTM E 814 and UL 1479. Fire-resistant penetration sealant shall be fire-resistant foam that, when cured, retains form and stability at high temperature.
 2. Provide specific UL-approved products as required by UL assemblies indicated on the Contract Drawings.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in Manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.
- B. Store materials carefully in accordance with the Manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.
- C. Handle materials in strict accordance with Manufacturer's written instructions.

3.2 APPLICATION SCHEDULE

- A. Joints noted as "caulk," "caulking," or "sealant" shall be caulked as specified herein.
- B. Joints to be caulked or sealed include through-bolt holes, door frames, louver and ventilator frames, joints between openings where items pass through exterior walls, concrete masonry, or combination of these surfaces, and as otherwise indicated or required for watertightness, weatherproofing, or airtightness.
 1. Sealants and caulking shall be provided at both exterior and interior surfaces of exterior wall penetrations.

- C. Sealants and caulking shall be provided at exterior wall joints, between adjacent materials, joints between frames or louvers and adjacent materials, copings, caps, sills, masonry control joints, and other joints and penetrations indicated or required for the completion of the WORK.
- D. Sealants and caulking shall be provided at interior joints between frames and masonry, at tops of masonry walls, between masonry and structural concrete, floor joints in tile, joints in rooms to be airtight, and other joints and penetrations on the Contract Drawings or as required for the completion of the WORK.
- E. Sealants and caulking shall also be installed elsewhere, where indicated on the Contract Drawings.
- F. Provide fire safing between structural deck, walls, partitions and elsewhere as required, to seal fire rated decks, walls, partitions, assemblies, components, connections, and spaces.
- G. Provide fire stopping sealant at joints and penetrations in structural deck, walls, and partitions, and elsewhere as required to seal fire rated walls, partitions, floors, ceilings, decks, assemblies, components, connections, and spaces, where not otherwise fire stop-sealed under other Sections.
- H. Fire safing and fire-stopping sealants shall also be installed elsewhere, where indicated on the Contract Drawings.

3.3 PROJECT CONDITIONS

- A. Comply with Manufacturer's written instructions, and referenced standards, for environmental conditions before, during, and after installation.
- B. Protect surrounding WORK from damage that may result from operations under this Section.

3.4 INSPECTION

- A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the WORK under this Section.
- B. Systems and components shall be inspected before installation.
 - 1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.
- C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent WORK.
 - 1. Examine substrates, areas, and conditions where sealants and caulking will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed sealants and caulking.

- a. Surfaces to receive sealants and caulking, including compressible filler and joint backing, shall be dry, free of oil, dirt, dust and other contaminants and loose materials, and shall be in the proper condition as indicated by the Manufacturer prior to the application of the sealant and caulking materials.
 - b. Masonry, concrete, and cementitious products shall have been completely cured and the surface shall be dry and free from frost at the time of application.
 - c. Joint shapes and sizes shall be as indicated. Where not indicated, joint shapes and sizes shall be as necessary for job conditions, as directed by the ARCHITECT.
2. Notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected in an acceptable manner.
 3. Commencement of the installation by the CONTRACTOR shall indicate CONTRACTOR's acceptance of the substrate, areas, and conditions.

3.5 SURFACE PREPARATION

- A. Surface preparation shall be in compliance with the applicable references and with the Manufacturer's written instructions.
- B. Coatings, including curing compounds, form release agents, and other substances shall be removed as recommended by the sealant and caulking Manufacturer.
- C. Protrusions, bumps, ridges, and loose substrate surface materials shall be removed by sanding or grinding.
- D. Laitance, efflorescence, and loose mortar shall be removed from the joint cavity.
- E. Ferrous metal surfaces shall be cleaned of rust, mill scale, and other coatings by wire brush, grinding, or sandblasting.
- F. Protective coatings shall be removed from surfaces to receive sealants and caulking.
 1. Solvents used to remove protective coating shall be as recommended by the sealant and caulking Manufacturer, shall be compatible with the adjacent materials and surfaces, shall not damage adjacent finishes, and shall be non-staining.
- G. Bituminous or resinous materials shall be removed from surfaces to receive sealants and caulking.
- H. Immediately before application of sealant and caulking materials, scrape surfaces to be covered free from foreign materials and brush clean.
- I. Substrate shall be swept to remove all loose materials prior to beginning sealant and caulking installation.

3.6 PREPARATION

- A. Sequence installation properly with the installation and protection of other WORK, so that neither will be damaged by the installation of the other.

3.7 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with applicable references, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ARCHITECT.
- B. Primer, if recommended by the Manufacturer for the application, shall be applied per the Manufacturer's recommended procedures.
 - 1. Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.
- C. Multi-component sealants shall be mixed according to Manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Sealant shall be installed to the required depth without displacing the backing. Unless otherwise indicated or recommended by the Manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges, and sags. Sealer shall be applied over the sealant if recommended by the sealant Manufacturer.
- D. Sealant depth in joints shall be half of the width of joint, but not less than 1/8-inch (3.2 mm) deep and 1/4-inch (6.4 mm) wide nor more than 1/2-inch (12.7 mm) deep and one-inch wide (25.4 mm). For joints greater than 1-inch (25.4 mm) wide, provide sealant in a 2 to 1 width-to-depth ratio.
- E. Joints shall have a rigid filler material installed to proper depth prior to application of sealant.
- F. Masking film shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking shall be removed as soon as possible after joint has been filled and tooled.
- G. Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.
- H. Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.
- I. A full bead of sealant shall be applied into the joint under sufficient pressure, with the nozzle drawn across sealant, to completely fill the void space and to ensure complete wetting of contact area to obtain uniform adhesion. During application, the tip of the nozzle shall be kept at the bottom of the joint thereby forcing the sealant to fill from the bottom to the top. Sealants shall be tooled immediately after exposure with a caulking tool or soft bristled brush moistened with solvent. The finished sealant-filled joint shall be slightly concave unless otherwise indicated.

3.8 CLEANING, FINISHING, AND PROTECTION

- A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.
 - 1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.
 - 2. Residue shall not be left on any surfaces.
 - 3. The surfaces of materials adjoining caulked joints shall be cleaned free of smears of sealant or other soiling due to caulking operations.
- B. Sealants and caulking shall be protected from damage from subsequent construction operations.
- C. The CONTRACTOR shall make adjustments required until accepted.
- D. Damaged or defective items shall be removed and replaced at the direction of the ARCHITECT.
- E. When sealant and caulking WORK is completed, remove unused materials, containers, and equipment, and clean the Site of sealant and caulking debris.

END OF SECTION 079200

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
3. Division 08 Section "Door Hardware".
4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
5. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.
6. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 - 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 - 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
 - 1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
 - a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.29, R-Value 3.4, including insulated door, thermal-break frame and threshold.
 - 2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
 - a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 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. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch 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 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
 - 1. Design: Flush panel.
 - 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
 - a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
 - b. Thermal properties to rate at a fully operable minimum U-Factor 0.29 and R-Value 3.4, including insulated door, thermal-break frame and threshold.
 - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.7, including insulated door, kerf type frame, and threshold.
 - 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
 - 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 - 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
 - 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. 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. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. 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. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) – M Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - M Series.

- D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

- A. Metal Louvers: Door manufacturer's standard metal louvers unless otherwise indicated.
 - 1. Blade Type: Vision proof inverted V or inverted Y.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. 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 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

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, not less than 0.016 inches thick.

2.9 FABRICATION

- A. Fabricate hollow metal work 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Louvers: Factory cut openings in door and install louvers into prepared openings where indicated.
 - 4. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" 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.
 - 5. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.
- D. Hollow Metal Frames:

1. Shipping Limitations: 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.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. 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.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with loose wiring harness (not attached to open throat components or installed in closed mullion tubes) and standardized Molex™ plug connectors on one end to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
8. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
 - a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
 - b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
 - c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
 - d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
10. 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.
11. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
12. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 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-template, mortised and surface mounted door hardware.
 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 with Division 26 Sections.

2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

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.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. 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 square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, 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 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- 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.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of access door and frame and for each finish specified.
- C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with Specifications, products by these manufacturers may be submitted:

1. Access Doors:
 - a. Acudor Products (acudor.com).
 - b. Jensen Industries (jensen-ind.com).
 - c. J. L. Industries (jindustries.com).
 - d. Karp Associates (karpinc.com).
 - e. Larsen's (larsensmfg.com).
 - f. Milcor (milcorinc.com).
 - g. Nystrom Building Products (nystrom.com).

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
- E. Stainless Flat Bars: ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
- F. Frame Anchors: Same material as door face.
- G. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.4 FABRICATION

- A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- C. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 2. Keys: Furnish two keys per lock and key all locks alike.
 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.5 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.6 STEEL FINISHES

- A. Surface Preparation: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Apply shop primer to all exposed surfaces of metal. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.7 STAINLESS STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Polish: No. 4 finish.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

1.2 PREPARATION

- A. Advise installers of related work about requirements relating to access door installation, including sizes of openings to receive access door and frame, and locations of supports, inserts, and anchoring devices.

1.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

- C. Install access doors with trimless frames flush with adjacent finish surfaces or recessed to receive finish material.

1.4 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083613 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electrically operated sectional doors.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
 - 1. Design Wind Load: As indicated on Drawings.
 - 2. Testing: According to ASTM E330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.
- C. Windborne-Debris Impact Resistance: Provide glazed sectional doors that pass ASTM E1886 missile-impact and cyclic-pressure tests according to ASTM E1996 for Wind Zone 2 or DASMA 115 for enhanced protection.
 - 1. Large-Missile Test: For sectional doors located within 30 feet (9.1 m) of grade.
- D. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

2.2 DOOR ASSEMBLY

- A. Aluminum Full-Vision Aluminum Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
- 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. Overhead Door Corporation.
- C. Operation Cycles: Door components and operators capable of operating for not less than 100,000.
- D. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E283 or DASMA 105.
- E. R-Value: 12.0 deg F x h x sq. ft./Btu.
- F. Track Configuration: Standard-lift track.

- G. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

- H. Windows: Approximately 24 by 11 inches, with square corners, and spaced apart the approximate distance as indicated on Drawings; in two row(s) at height indicated on Drawings; installed with insulated glazing of clear polycarbonate plastic.

- I. Locking Devices: Equip door with locking device assembly and chain lock keeper.
 - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.

- J. Electric Door Operator:
 - 1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
 - 2. Operator Type: Manufacturer's standard for door requirements.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
 - 4. Motor Exposure: Interior, clean, and dry.
 - 5. Emergency Manual Operation: Chain type.
 - 6. Obstruction-Detection Device: Automatic electric sensor edge on bottom section.
 - 7. Control Station: Where indicated on Drawings.

- K. Door Finish:
 - 1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.
 - 2. Factory Prime Finish: Manufacturer's standard color.
 - 3. Finish of Interior Facing Material: Finish as selected by Architect from manufacturer's full range.

2.3 ALUMINUM DOOR SECTIONS

- A. Sections: Extruded-aluminum stile and rail members with dimensions and profiles as indicated on Drawings; members joined by welding or with concealed, aluminum or nonmagnetic stainless-steel through bolts, full height of door section; and with meeting rails shaped to provide a weather-resistant seal.
 - 1. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
 - 2. Provide reinforcement for hardware attachment.

2.4 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
 - 1. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
- B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
- C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Provide removable stops of same material as door-section frames.

2.5 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, galvanized-steel hinges at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails.
- C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Provide 3-inch-diameter roller tires for 3-inch-wide track and 2-inch-diameter roller tires for 2-inch-wide track.
- D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

2.6 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A229/A229M, mounted on torsion

shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

- B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.
- C. Cables: Galvanized-steel, multistrand, lifting cables.
- D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.
- E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
- F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.8 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. 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. Liftmaster.
 - 2. Comply with NFPA 70.
 - 3. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
 - 1. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

- E. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
 - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
 - 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.
- F. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
 - 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- G. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.
- K. Portable, Radio-Control System: Consisting of two of the following:
 - 1. Three-channel universal coaxial receiver to open, close, and stop door.
 - 2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks: Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.
- E. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- F. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613

SECTION 085113 – ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide aluminum windows and appurtenant Work, complete and in place, in accordance with the Contract Documents.
- B. The CONTRACTOR shall furnish professional design and engineering services as required for aluminum windows.
 - 1. Professional design and engineering services may be provided by the manufacturer or by an independent licensed civil engineer retained by the CONTRACTOR, either of which shall comply with the requirements indicated.
- C. CONTRACTOR shall coordinate color samples with other Sections through the submittal process.

1.2 REFERENCES

- A. Where reference is made to any of the below, the revision in effect at the time of bid opening shall apply.
- B. American Architectural Manufacturer's Association (AAMA):
 - AAMA 2605 Voluntary Specification, Performance Requirements, and Testing Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
 - AAMA 1503 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
- C. American National Standards Institute (ANSI):
 - ANSI A 117.1 Accessible and Useable Buildings and Facilities
- D. American Society for Testing and Materials (ASTM):
 - ASTM A 36 Structural Steel
 - ASTM B 209 Aluminum and Aluminum-Alloy Sheet and Plate
 - ASTM B 221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
 - ASTM B 308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded

ASTM C 509	Cellular Elastomeric Pre-formed Gasket and Sealing Material
ASTM C 864	Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers
ASTM E 283	Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen
ASTM E 330	Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 331	Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

E. American Welding Society (AWS).

F. Building Code: Refer to the Drawings to determine which Building Code applies. The applicable Building Code, defined by the Drawings, is referenced herein as the CODE.

G. Federal Specification (FS):

FS TT-P-645 Primer, Paint, Zinc Chromate, Alkyd Type

H. Society for Protective Coatings (SSPC):

SSPC Paint 12 Cold-Applied Asphalt Mastic (Extra Thick Film)

I. Flat Glass Marketing Association (FGMA) Glazing Manual.

1.3 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 013300 – Contractor Submittals.

B. Literature: Manufacturer’s specifications, technical data, installation methods, and maintenance instructions, and the following:

1. Manufacturer’s full-range color charts, indicating custom color availability for color selection by the ARCHITECT.

C. Warranty: Submit a copy of the warranty.

D. Certifications:

1. Certification by the aluminum window manufacturer that the aluminum windows provided are suitable for, and compatible with, the required installation.
2. Certification of compliance with the requirements of paragraph 2.1.A.

3. Certified copies of recent test reports of systems similar to the design for this project substantiating performance of system in lieu of re-testing. Other supportive data shall be included as necessary.
 4. Certification by the aluminum window manufacturer that the windows are suitable for, and compatible with, the glazing and accessories in Section 088100 – Glazing.
 5. Certification of manufacturer qualifications demonstrating compliance with the qualifications requirements indicated. Include a list of 5 similar completed projects with addresses of the project location, date of project completion, manufacturer's products, and contact information of the consultant firm of record, general CONTRACTOR, and owner.
 6. Certification of installer qualifications demonstrating compliance with the qualifications requirements indicated. Include a list of five (5) similar completed projects with addresses of the project location, date of project completion, and contact information of the consultant firm of record, general CONTRACTOR, and owner.
 7. When requested by the ARCHITECT, furnish other certifications as may be required to show compliance with the Contract Documents.
- E. Shop Drawings and Calculations: Complete Shop Drawings showing location and detail of installation, and design calculations.
1. Shop Drawings and Calculations shall be prepared, approved, and stamped by a professional structural engineer licensed per local engineering licensing laws.
 2. Shop Drawings shall be drawn to sufficient scale and shall include dimensions, show elevations and details of construction of each window frame type, schedule of window frames, frame elevations and details, location and installation requirements for hardware, thickness of materials, joints, provisions for expansion and contraction, connections, accessories, and trim. Shop Drawings shall show installation conditions at openings with various wall thickness and materials.
 - a. Shop Drawings shall include material descriptions, finish, color, details of construction, installation, and accessories of each aluminum window type.
 - b. Shop Drawings shall include thermal breaks, details of special shapes, location and types of exposed fasteners and joints, and joint sealant.
 - c. Shop Drawings shall indicate typical glazing details, locations of various types and thickness of glazing, and internal sealant requirements and details as recommended by the glazing sealant manufacturer.
- F. Samples: The CONTRACTOR shall submit two (2) samples of each of the following. Unless otherwise indicated, samples shall be full size and shall show gauges, configuration, construction, finish and color proposed for the various components. Samples shall be clearly marked to show the manufacturer's name, product identification, finish and color. New samples shall be resubmitted of each, as required, until approved by the ARCHITECT. Upon approval, the samples shall become the standard for acceptance for the project with regard to color, finish, and quality of each item. Approval of samples shall not relieve the CONTRACTOR from compliance with the Contract Documents.
1. Corner construction of each frame type, 6-inch (152-mm) by 6-inch (152-mm) legs, and showing glazing provisions.
 - a. Window and store front frames-Clear Anodized Coating

2. 3-inches (76 mm) by 4-inches (102 mm) color samples showing substrate, finish, and color.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Aluminum windows shall be provided by a single manufacturer.
- B. Manufacturer Qualifications:
 1. Aluminum window manufacturer shall have a minimum of 20 years of aluminum window manufacturing experience.
 2. Aluminum window manufacturer shall have a minimum of five (5) similar successful projects over the most recent 10 years, employing similar products, materials, applications, and performance requirements.
 3. Manufacturers without these qualifications will not be accepted.
- C. Installer Qualifications:
 1. Installer shall have a minimum of five (5) years' experience in the successful completion of at least five (5) projects of similar size and scope, employing similar products, materials, applications, and performance requirements.
 2. Installers without these qualifications will not be accepted.
- D. A professional engineer licensed per local engineering licensing laws shall design the aluminum windows and connections to the structure.
- E. Installation shall be in accordance with the AAMA "Metal Curtain Wall, Window, Storefront and Entrance Guide Specification Manual," the SFM-1 "Aluminum Storefront and Entrance Manual," and other applicable references and with manufacturer's written instructions.
 1. Kalwall window storefront; .23U and .29 SHGC
- F. Testing Requirements: Components shall be provided that have been previously tested by an independent testing laboratory.
- G. Welding shall be performed by AWS qualified welders.
- H. In addition to requirements indicated, CONTRACTOR shall comply with applicable provisions of the Aluminum Curtain Wall Design Guide Manual for design, materials, fabrication, and installation of component parts.

1.5 SPECIAL WARRANTY PROVISIONS

- A. Furnish manufacturer's 2-year written warranty to cover defects in materials, products, and manufacturing workmanship.
- B. Furnish manufacturer's extended 20-year warranty to cover the finish.
 1. Warranty shall include provisions for failures of the finish including, but not limited to, chalking, crazing, peeling, and fading.

- C. The CONTRACTOR shall furnish separate, but concurrently running, 5-year written warranty to cover labor.
- D. Warranties shall be non-prorated for the entire warranty period.
- E. The term of the warranties shall begin on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Structural Requirements:
 - 1. Aluminum windows, including related assemblies, components, and attachment details shall comply with the CODE and shall be designed and installed for resistance to the structural design criteria indicated in the Contract Documents in accordance with the CODE. Where a conflict occurs between the requirements of this Section and the CODE, the more stringent shall apply.
 - 2. The CONTRACTOR shall provide additional non-standard bracing, reinforcements, anchors, and heavier gauge materials in order to conform to the structural design criteria indicated and to other performance requirements indicated.
- B. Aluminum windows shall be recommended by the manufacturer for the installation indicated.
- C. Aluminum windows shall be suitable for, and compatible with, the required installation.
- D. Design Requirements:
 - 1. Supports, anchorage, and accessories shall be provided as required for complete assembly.
 - 2. Aluminum window system manufacturer shall furnish the systems herein, including necessary modifications to meet the indicated requirements and to maintain visual design concepts as approved by the ARCHITECT.
 - 3. Perimeter conditions shall allow for installation tolerances, expansion and contraction of adjacent materials, and sealant manufacturer's recommended joint design.
 - 4. CONTRACTOR shall not assume glazing, sealant and interior finishes contribute to framing member strength, stiffness, or lateral stability.
 - 5. Assemblies shall be free from vibration harmonics, rattles, wind whistles, and noise due to thermal movement, thermal movement transmitted to other building elements, and wind pressure. Assemblies shall be free from loosening, weakening, or fracturing of attachments by components.
 - 6. Attachment considerations are to take into account Site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening, or fracturing connection between units and building structure or between units themselves.
 - 7. System shall drain any water entering system to the exterior of system.
 - 8. Concealed fastening shall be provided.
 - 9. Uniform color and profile appearance shall be provided at components exposed to view.
- E. SEPARATION OF DISSIMILAR METALS

- a. When products are installed in metal panel systems, the aluminum windows manufacturer shall ensure that proper separation of dissimilar metals has been installed. Manufacturer shall certify in writing that the recommended approach for this project application is appropriate.

F. Performance Requirements:

1. Fixed Windows:

Air Infiltration (ASTM E 283)	Maximum 0.06 cfm/sq ft surface area, at differential static pressure of 6.24 psf
Water Infiltration (ASTM E 331)	No water penetration at test pressure of 8 psf
Maximum Deflection (ASTM E 330)	L/175 of span at structural design criteria indicated, allowable stress with a safety factor of 1.65

2. Operable Windows:

Air Infiltration (ASTM E 283)	Maximum 0.030 cfm/sq ft surface area, at differential static pressure of 1.57 psf
Water Infiltration (ASTM E 331)	No water penetration at test pressure of 10.0 psf
Maximum Deflection (ASTM E 330)	When closed and locked, maximum deflection of L/175 at pressure difference of 65 psf

G. Thermal Requirements:

1. Fixed Windows:

- a. Metal frame with thermal block; fixed .38 U and .4 SHGC

- H. Aluminum window systems shall accommodate expansion and contraction movement due to surface temperature differentials without causing buckling, stresses on adjacent work, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glazing, failure of joint seals, or other visual or technical detrimental effects.

2.2 ALUMINUM WINDOWS

A. Manufacturer and Product, or Equal:

- 1. Subject to the requirements indicated, provide manufacturer and product listed below, or equal.
 - a. Fixed Windows – Metal frame with thermal block; .38 U and .4 SHGC

B. Description:

- 1. ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for the finish.

2. Internal reinforcing shall be ASTM A 36 for carbon steel; or ASTM B 308 for structural aluminum.
 - a. Shapes and sizes to suit installation.
 - b. Steel shall be galvanized and apply shop-coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
 3. Inserts and anchoring devices shall be manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars, or tubes.
 - a. Steel shall be galvanized and apply shop-coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
 4. Fasteners shall be aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
 - a. Exposed fasteners shall not be used.
 - b. For concealed locations, manufacturer's standard fasteners shall be provided.
 - c. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
- C. Operable windows shall conform to the requirements of ANSI Standard A 117.1.
1. Operable Windows- Metal frame with thermal block; .45 U and .4 SHGC

2.3 ALUMINUM ENTRANCES

- A. Manufacturer and Product, or Equal:
1. Subject to the requirements indicated, provide manufacturer and product listed below, or equal.
 - a. Standard Entrances – Kawneer Co. Inc.; 350 Medium Stile
 - b. Color: Dark Bronze Anodized
- B. Description:
1. ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for the finish.
 2. Thermally Broken entrance Framing with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
 - a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
 3. Provide standard entrances at doors, transoms and side lites as indicated.
 4. Vertical stile and Top rail shall be 3-1/2"; Bottom rail shall be 6-1/2"
 - a. Door members to be 0.125" (3.2) nominal in thickness and glazing molding to be 0.05" (1.3) thick.
 - b. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
 - c. Provide adjustable glass jacks to help center the glass in the door opening.

5. Door operation shall be doubleacting with Kawneer Paneline (or equal) integrated exit device touch bar. Coordinate Door Hardware with Section 087100 – Door Hardware.
6. Provide surface-applied bottom weatherstrip with flexible blade gasket and with extruded raised lip on threshold – meeting ADA requirements – and to provide a continuous contact surface for bottom weatherstrip.
 - a. Provide thermoplastic elastomer weatherstrip complying with AAMA 701/702.
7. Fasteners shall be aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
 - a. Exposed fasteners shall not be used.
 - b. For concealed locations, manufacturer's standard fasteners shall be provided.
 - c. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.

2.4 ACCESSORIES

- A. Sill Extensions: Sill extensions shall be a one-piece extruded 0.060 aluminum.
- B. Sill extension finish shall be the same as window, custom color to match adjacent exterior wall, as approved by Architect.
- C. Expansion anchor devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- D. Shims: Non-staining, non-ferrous, type as recommended by system manufacturer.
- E. Protective Coatings: To separate dissimilar materials, provide cold applied asphalt mastic complying with the SSPC Paint 12, compounded for 30-mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.
- F. Glazing Gaskets:
 1. Compression type design, replaceable, molded or extruded neoprene, or ethylene propylene diene monomer (EPDM).
 2. Glazing gasket shall comply with ASTM C 509 or ASTM C 864
 3. Profile and hardness shall be as necessary to maintain uniform pressure for watertight seal.
 4. Provide in manufacturer's standard black color.
 5. Factory molded corners shall be required at exterior.
- G. Internal Sealant: Types recommended by sealant manufacturer to remain permanently elastic, tacky, non-drying, non-migrating and weather tight.
- H. “Anti-walk” Edge Blocking: “W” shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading. Edge blocking may be used for pressure plate systems.
- I. Weatherstripping: Extruded EPDM elastomeric conforming to ASTM C 509 or C 864.

- J. Baffles at Weepholes for Aluminum Framed Systems: Type as recommended by system manufacturer and shown in published installation instructions.

2.5 FINISH AND COLOR

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: Dark bronze.

2.6 FABRICATION

- A. The CONTRACTOR shall field verify size, location, and placement of aluminum windows, shall advise the ARCHITECT in writing of any necessary adjustments, and shall make the necessary adjustments prior to fabrication. The CONTRACTOR shall coordinate field measurements and Shop Drawings with fabrication and shop assembly to minimize field adjustments.
 - 1. Aluminum windows shall be assembled before shipment to the Site.
- B. Accurate relation of planes and angles shall be maintained, with hairline fit of contacting members.
- C. The CONTRACTOR shall make provisions in framing for minimum edge clearance, nominal edge cover, and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and the Flat Glass Marketing Association (FGMA) Glazing Manual.
 - 1. Refer to Section 088100 – Glazing.
- D. Welding shall comply with AWS recommendations.
 - 1. Recommended electrodes and methods shall be used to avoid distortion and discoloration.
 - 2. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.
- E. Holes or slots, deflector plates, water deflectors, and sealant shall be provided to accommodate internal weep and drainage to the exterior.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.
- B. Store materials carefully in accordance with the manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.

- C. Handle materials in strict accordance with manufacturer's written instructions.

3.2 PROJECT CONDITIONS

- A. Comply with manufacturer's written instructions for environmental conditions before, during, and after installation.
- B. Protect surrounding Work from damage that may result from operations under this Section.

3.3 INSPECTION

- A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the Work under this Section.
- B. Systems and components shall be inspected before installation.
 - 1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.
 - 2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.
- C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent Work.
 - 1. Examine substrates, areas, and conditions where aluminum windows and appurtenances will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed aluminum windows.
 - a. Provide inserts, backing, blocking, anchoring devices, and reinforcements that must be built into other work for the installation of aluminum windows. Coordinate delivery with other work to avoid delay.
 - 2. Notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.
 - 3. Commencement of the installation by the CONTRACTOR shall indicate the CONTRACTOR'S acceptance of the substrate, areas, and conditions.

3.4 PREPARATION

- A. Sequence installation properly with the installation and protection of other Work, so that neither will be damaged by the installation of the other.

3.5 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with applicable references, with the requirements of the CODE, and with manufacturer's written instructions.

Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ARCHITECT.

- B. The CONTRACTOR shall provide corrosion resistant fasteners, anchors, and shims required for a complete installation, and shall be secure, plumb, level, straight, and true to line, allowing for required movement, including expansion and contraction.
- C. The CONTRACTOR shall provide separation of dissimilar materials to ensure no galvanic action occurs.
- D. The CONTRACTOR shall block and reinforce walls as required to support the aluminum windows and appurtenances.
- E. Horizontal lines shall be level, and vertical lines shall be plumb.
- F. Sill extensions shall be provided at exterior aluminum window installations.
- G. Tolerances:
 - 1. Limit variations from plumb and level:
 - a. $\frac{1}{8}$ inch (3.2 mm) in 20 feet (6.1 m) vertically and horizontally.
 - b. $\frac{1}{4}$ inch (6.4 mm) in 40 feet (12.2 m) either direction.
 - 2. Limit offsets in theoretical end-to-end and edge-to-edge alignment:
 - a. Allow $\frac{1}{16}$ inch (1.6 mm) where surfaces are flush or less than $\frac{1}{2}$ inch (13 mm) out of flush and separated by not more than 2 inches (51 mm).
 - b. $\frac{1}{8}$ inch for surfaces separated by more than 2 inches (51 mm).
 - 3. Step in Face: $\frac{1}{16}$ inch (1.6 mm) maximum.
 - 4. Jog in Alignment: $\frac{1}{16}$ inch (1.6 mm) maximum.
 - 5. Location: $\frac{1}{4}$ inch (6.4 mm) maximum deviation of any member at any location.
 - 6. Tolerances are not accumulative.
- H. Sealants:
 - 1. Internal metal-to-metal joints shall be caulked, where required to provide the required performance as components are installed.
 - 2. Perimeter members shall be sealed per manufacturer's installation instructions or as required for unique job conditions. Set other members with internal sealant and baffles as required by manufacturer's installation instructions. Use ultraviolet resistant sealant as recommended in writing by sealant manufacturer.
 - 3. CONTRACTOR shall coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 079213 – Sealants and Caulking.
 - 4. Seal locations necessary to create and secure continuous enclosure even though Drawings may not indicate locations to be sealed.
 - 5. Seal joints to prevent migration of water vapor or air to interior of building.
- I. Glazing:

1. Glazing gaskets and sealant shall be installed in accordance with manufacturer written instructions without exception, including surface preparations.
2. "Anti-walk" edge blocking shall be utilized on vertical edges of glazing.
3. Refer to Section 088100 – Glazing for additional requirements.

3.6 CLEANING, FINISHING, AND PROTECTION

- A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.
 1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.
 2. Residue shall not be left on any surfaces.
- B. Upon completion of the installation, aluminum windows and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ARCHITECT.
 1. Cleaning shall be performed again immediately prior to acceptance of the Work, when directed by the ARCHITECT.
 2. Cleaning shall be performed in accordance with the manufacturer's written instructions.
- C. Aluminum windows shall be protected from damage from subsequent construction operations.
- D. The CONTRACTOR shall make adjustments required and retest until accepted.
- E. The CONTRACTOR shall remove scratches and blemishes to the satisfaction of the ARCHITECT.
- F. Damaged or defective items shall be removed and replaced at the direction of the ARCHITECT.
- G. When aluminum window Work is completed, remove unused materials, containers, and equipment, and clean the Site of aluminum window debris.

END OF SECTION 085113

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SECTION 086200 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish double-insulated square domed unit skylights, self-flashing with integral curbs, for installation in the low-slope roofs of the fire apparatus bays.
- B. Installation of same, unless arranged for otherwise.

1.02 QUALITY ASSURANCE

- A. Reference Standards: Conform to the current requirements of applicable portions of standards, codes and specifications, except where more stringent requirements are shown or specified.
 - 1. ASTM A653: Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM E283: Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
 - 3. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
 - 4. Applicable provisions of the codes referenced in Section 01 41 00, or as adopted by any jurisdiction with authority over this Project.
- B. Manufacturer: Manufacturer shall have minimum five (5) years experience fabricating modular skylight units for projects of similar scale and complexity.
- C. Sustainability Compliance: Refer to Section 01 35 66 for submittal and documentation requirements.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and/or shop drawings indicating materials, unit sizes and assembly and installation details.
- B. Sustainability Submittals:

1. Product data for adhesives and sealants inside the weatherproofing system indicating VOC content of each product used does not exceed the limits listed in Division 1 LEED Requirements or the requirements of individual specification sections.
2. Product Data or other documentation from material manufacturer indicating percentages, by weight, of post-consumer and pre-consumer recycled content. Include statement of material costs for each product having recycled content, excluding labor costs for installation.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver prefabricated skylight glazing units and integral frames to site in unbroken factory cartons.
- B. Store in a secure location and protect finishes and glazing from damage until installation.

1.05 WARRANTIES

- A. Provide manufacturer's standard written five-year warranty covering defects in materials and workmanship and unit leakage.

PART 2 PRODUCTS

2.01 SELF-FLASHING DOMED UNIT SKYLIGHTS

- A. General: Factory-fabricated double-domed skylight units consisting of one-piece acrylic plastic domes, thermally-broken extruded aluminum retaining frame, with integral self-flashing curb and sloping condensation gutter.
- B. Retaining Frame: Extruded aluminum, 6063-T5 alloy, minimum thickness of .72", thermally broken.
- C. Glazing: Factory-installed acrylic plastic, double insulated, HeatBlock 365 by AIA Industries, as the basis of design.
- D. Self-Flashing Curb: Extruded aluminum, 6063-T5 alloy, minimum thickness of 0.40" or manufacturer's standard.
 1. Curb Height: 12" minimum. Coordinate height with thickness of roof deck insulation.
- E. Size: 24" x 24" square, unless otherwise shown on the Drawings. Intent is to utilize manufacturer's standard sizes. Notify Architect of curb opening size discrepancies for

approval prior to fabrication. Contractor to coordinate framing of curb opening accordingly.

F. Aluminum Finish: Manufacturer's standard mill finish.

G. Sustainability Design Criteria:

1. Recycled Content: No minimum requirement, but Contractor to provide information on recycled content.

H. Approved Models and Manufacturers:

1. HeatBlock 365 Skylights by AIA Industries, Inc., Denver, CO, (800) 748-2036, as basis of design.
2. Inter-Sky Skylight Specialties, Santa Ana, CA, (800) 972-9112.
3. Skylights USA, Fort Lauderdale, FL, (800) 346-6991.
4. Bristolite Skylights, Santa Ana, CA, (800) 854-8618.
5. Manufacturers providing products of same design, function and performance are acceptable.

2.02 SKYLIGHT FABRICATION

- A. General: Skylight units shall be factory-fabricated using the manufacturer's standard extruded aluminum frame and self-flashing curb.
- B. Fabricate self-flashing curb in height required for roof deck insulation shown on the Drawings.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Installer shall inspect the framed openings, surfaces and conditions of the substrates to receive the prefabricated skylight units and notify Contractor of any condition that will be detrimental to the successful installation, performance or weathertightness of the finished installation. Do not proceed with installation until such conditions have been corrected to the satisfaction of the Installer.
- B. Field verify all dimensions affecting the work of this Section.

- C. Prepare mounting substrate as per manufacturer's requirements.
- D. Ensure that structural framing and edge angles for new curb openings have been properly installed, in accordance with manufacturer's requirements.

3.02 INSTALLATION OF SKYLIGHT UNITS

- A. General: Install prefabricated skylight units in accordance with manufacturer's written instructions and recommendations.
- B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner and Contractor. Make corrections in installation methods if needed prior to proceeding with installation of subsequent units.
- C. Protect installed skylights and glazing from damage by adjacent construction. Units with marred surfaces or scratched glazing shall be replaced at no additional cost to the Owner.

END OF SECTION

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 commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 06 Section “Rough Carpentry”.
 - 2. Division 06 Section “Finish Carpentry”.
 - 3. Division 08 Section “Operations and Maintenance”.
 - 4. Division 08 Section “Hollow Metal Doors and Frames”.
 - 5. Division 28 Section “Access Control”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. 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. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 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 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. Warranty information for each product.
 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.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified 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.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. 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. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
 - 3. Five years for exit hardware.
 - 4. Fifteen years for manual surface door closer bodies.
 - 5. Five years for motorized electric latch retraction exit devices.
 - 6. Two years for electromechanical door hardware.

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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets 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 requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable 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 all out-swinging lockable doors.
5. Manufacturers:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - TA Series.

B. Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Manufacturers:
 - a. Rixson Door Controls (RF).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.

B. Electrified Quick Connect Intermediate Transfer Pivots: Provide electrified offset intermediate transfer pivot hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

- a. Rixson Door Controls (RF) - E-M19-QC (# wires).
- C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 - 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
 - 2. Manufacturers:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
- D. Provide mortar guard enclosure on steel frames installed at masonry openings for each electrical hinge specified.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 5. Manufacturers:
 - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.

2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Manufacturers:
 - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU).
 - b. Sargent Manufacturing (SA).
 - c. Schlage (SC).
- C. Cylinders: Original manufacturer cylinders complying with the following:
 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Manufacturer's Standard.
- 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 cylinder and door hardware. Provide removable core (small or large format) as specified in Hardware Sets.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. New System: Key locks to a new key system as directed by the Owner.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Mortise locks to be certified Security Grade 1.
2. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 10 million cycles.
3. Manufacturers:
 - a. Corbin Russwin Hardware (RU) – ML2000 Series.
 - b. Sargent Manufacturing (SA) – 8200 Series.
 - c. Schlage (SC) – L9000 Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
2. Locks are to be non-handed and fully field reversible.
3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) – CL3300 Series.
 - b. Sargent Manufacturing (SA) – 10 Line.
 - c. Schlage (SC) – ND Series.

2.7 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.
 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
 2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.
 4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML20900 Series.
 - b. Sargent Manufacturing (SA) - 8200 Series.
 - c. Schlage (SC) - L9000 EL/EU/RX Series.
- B. Electromechanical Cylindrical Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical cylindrical locksets, electrified locksets to be of type and design as specified below.
 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - CL33900 Series.
 - b. Sargent Manufacturing (SA) - 10G70/71 Series.
 - c. Schlage (SC) - ND DEL/DEU Series.

2.8 LOCK AND LATCH STRIKES

- A. 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 latchbolts, 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.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

6. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 11. Extended cycle test: Devices to have been cycle tested in ordinance with ANSI/BHMA 156.3 requirements to 9 million cycles.
 12. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 13. Through Bolt Installation: For exit devices and trim to be installed on wood doors.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.
- C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
1. Provide keyed removable feature where specified in the Hardware Sets.
 2. Provide stabilizers and mounting brackets as required.
 3. Provide electrical quick connection wiring options as specified in the hardware sets.
 4. Manufacturers:

- a. Corbin Russwin Hardware (RU) - 700/900 Series.
- b. Sargent Manufacturing (SA) - 980S Series.
- c. Von Duprin (VD) - 9954 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt type fasteners for closers to be installed on wood doors.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) - DC6000 Series.
- b. LCN Closers (LC) - 4040 Series.
- c. Sargent Manufacturing (SA) - 351 Series.
- d. Norton Door Controls (NO) - 7500 Series.

- C. Door Closers, Surface Mounted (Utility Grade): ANSI/BHMA 156.4, Grade 1 certified surface mounted, utility grade door closers with complete spring power adjustment, sizes 1 thru 6. Closers to be rack and pinion type, cast aluminum case construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide closer standard packed for regular, top-jamb, and parallel arm type mounting applications.

1. Manufacturers:

- a. LCN Closers (LC) - 1250 Series.
- b. Norton Door Controls (NO) - 1601 Series.
- c. Sargent Manufacturing (SA) - 1131 Series.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.12 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Rixson Door Controls (RF).

b. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. 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 perimeter gasketing at all smoke labeled openings.

C. 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-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.14 ELECTRONIC ACCESSORIES

- A. Switching Power Supplies: Provide switching power supplies that are dual voltage, UL listed, supervised units. Units shall be field selectable with a dedicated battery charging circuit that provide 4 Amp at 12VDC or 24VDC continuous, with up to 16 independently controlled power limited outputs. Units shall tolerate brownout or overvoltage input $\pm 15\%$ of nominal voltage and have thermal shutdown protection with auto restart. Circuit breaker shall protect against overcurrent and reverse battery faults and units shall be available with a single relay fire trigger or individually triggered relayed outputs. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Manufacturers:

- a. Securitron (SU) - AQ Series.

2.15 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, 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. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. 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. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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.

- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating 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.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set

should be scheduled with the appropriate additional hardware required for proper application and functionality.

- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Manufacturer's Abbreviations:

- 1. MK - McKinney
- 2. RF - Rixson
- 3. RO - Rockwood
- 4. SA - SARGENT
- 5. NO - Norton
- 6. PE - Pemko
- 7. OT - OTHER
- 8. SU - Securitron
- 9. HS - HES

Hardware Sets

Set: 1.0

Doors: 101

2 Pivot Set	147	626	RF
2 Side Pivot	M19	626	RF
2 Electric Side Pivot	EM19 QC	626	RF ↗
1 Removable Mullion	L980	PC	SA
1 Mortise Cylinder	63 64 41 @ Mullion	US32D	SA
1 Electrified Exit Device	16 56 63 64 8810 862	US32D	SA ↗
1 Electrified Exit Device	16 56 63 64 8804 862	US32D	SA ↗
2 Door Closer	CPS7500	689	NO
2 Drop Plate	7788 (as required)	689	NO
1 Threshold	273x3AFG X L.A.R.		PE
1 Weatherstrip	2893AV @ Head		PE
2 Weatherstrip	2903AV @ Jamb		PE
2 Door Bottom	216BDCFG X L.A.R.		PE
2 Split Astragal	305CN X L.A.R.		PE
1 Card Reader/Keypad	By security contractor		OT
2 Door Position Switch	By security contractor		OT

1 Power Supply	AQD as required	SU	↘
2 ElectroLynx Harness	QC-CXXXP (size as required)	MK	↘
2 ElectroLynx Harness	QC-C1500P	MK	↘

Set: 2.0

Doors: 105A

1 Pivot Set	147	626	RF
1 Side Pivot	M19	626	RF
1 Electric Side Pivot	EM19 QC	626	RF
1 Electrified Exit Device	16 56 63 64 8804 862	US32D	SA
1 Door Closer	CPS7500	689	NO
1 Drop Plate	7788 (as required)	689	NO
1 Threshold	273x3AFG X L.A.R.		PE
1 Weatherstrip	2893AV @ Head		PE
1 Weatherstrip	2903AV @ Jambs		PE
1 Door Bottom	216BDCFG X L.A.R.		PE

Set: 3.0

Doors: 161, 162C

3 Hinge (heavy weight)	T4A3386 (NRP)	US32D	MK
1 Exit Device (storeroom)	63 64 8804 PSB	US32D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	273x3AFG X L.A.R.		PE
1 Weatherstrip	2893AV @ Head		PE
1 Weatherstrip	2903AV @ Jambs		PE
1 Door Bottom	216BDCFG X L.A.R.		PE

Set: 4.0

Doors: 151

3 Hinge (heavy weight)	T4A3386 (NRP)	US32D	MK
1 Entry Lock	63 64 8225 LNL	US32D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	273x3AFG X L.A.R.		PE
1 Weatherstrip	2893AV @ Head		PE
1 Weatherstrip	2903AV @ Jambs		PE
1 Door Bottom	216BDCFG X L.A.R.		PE
1 Latch Protector	320C	US32D	RO

Set: 5.0

Doors: 203

3 Hinge (heavy weight)	T4A3386 (NRP)	US32D	MK
1 Classroom Lock	63 64 8237 LNL	US32D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	273x3AFG X L.A.R.		PE
1 Weatherstrip	2893AV @ Head		PE
1 Weatherstrip	2903AV @ Jambs		PE
1 Door Bottom	216BDCFG X L.A.R.		PE
1 Latch Protector	320C	US32D	RO

Set: 6.0

Doors: 159

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Exit Device (storeroom)	LD 63 64 8804 ETL	US32D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	271A X L.A.R.		PE
2 Gasketing	S88D @ Head & Jambs		PE
1 Auto Door Bottom	411ARL/420APKL X L.A.R.		PE

Set: 7.0

Doors: 106

6 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Exit Device (exit only)	NB MD8610	US32D	SA
1 Exit Device (classroom)	NB 63 64 MD8613 ETL	US32D	SA
2 Door Closer	(P) 7500	689	NO
2 Kick Plate	K1050 12" CSK BEV	US32D	RO
2 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE
2 Split Astragal	305CN X L.A.R.		PE

Set: 8.0

Doors: 111A, 118A

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Exit Device (passage)	12 8815 ETL	US32D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	271A X L.A.R.		PE
2 Gasketing	S88D @ Head & Jambs		PE
1 Auto Door Bottom	411ARL/420APKL X L.A.R.		PE

Set: 9.0

Doors: 120, 152

2 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Electric Hinge (heavy weight)	T4A3786-QC	US26D	MK ✗
1 Fail Secure Lock	RX 28 63 64 10G71-24V LL	US26D	SA ✗
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE
1 Card Reader/Keypad	By security contractor		OT
1 Door Position Switch	By security contractor		OT
1 Power Supply	AQD as required		SU ✗
1 SMART Pac Bridge Rectifier	2005M3		HS ✗
1 ElectroLynx Harness	QC-CXXXXP (size as required)		MK ✗
1 ElectroLynx Harness	QC-C1500P		MK ✗

Set: 10.0

Doors: 153

6 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
2 Manual Flush Bolt	555/557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock (3/4" latch)	28 41 63 64 10G04 LL	US26D	SA
1 Door Closer	CPS7500 (active leaf)	689	NO
2 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Surface Overhead Stop	9-X36 (size as required)	630	RF
1 Threshold	271A X L.A.R.		PE
1 Gasketing	S88D @ Head & Jambs		PE
2 Sweep	315CN X L.A.R.		PE
1 Astragal	357SP X S88D X L.A.R.		PE

Set: 11.0

Doors: 149

3 Hinge	TA2714 (NRP)	US26D	MK
1 Storeroom Lock	28 63 64 10G04 LL	US26D	SA
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE

Set: 12.0

Doors: 158

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Storeroom Lock	28 63 64 10G04 LL	US26D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	271A X L.A.R.		PE
2 Gasketing	S88D @ Head & Jambs		PE
1 Auto Door Bottom	411ARL/420APKL X L.A.R.		PE

Set: 13.0

Doors: 108, 109, 110, 119

3 Hinge	TA2714 (NRP)	US26D	MK
1 Office Lock	28 63 64 10G05 LL	US26D	SA
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D @ Head & Jambs		PE

Set: 14.0

Doors: 107, 156

6 Hinge	TA2714 (NRP)	US26D	MK
2 Manual Flush Bolt	555/557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock (3/4" latch)	28 41 63 64 10G37 LL	US26D	SA
2 Kick Plate	K1050 12" CSK BEV	US32D	RO
2 Overhead Stop/Holder	9-X26 (size as required)	630	RF
1 Gasketing	S88D @ Head & Jambs		PE
1 Astragal	357SP X S88D X L.A.R.		PE

Set: 15.0

Doors: 155

6 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
2 Manual Flush Bolt	555/557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock (3/4" latch)	28 41 63 64 10G37 LL	US26D	SA
1 Door Closer	CPS7500 (active leaf)	689	NO
2 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Surface Overhead Stop	9-X36 (size as required)	630	RF
1 Threshold	271A X L.A.R.		PE
2 Gasketing	S88D @ Head & Jambs		PE
2 Sweep	315CN X L.A.R.		PE
1 Astragal	357SP X S88D X L.A.R.		PE

Set: 16.0

Doors: 105B

3 Hinge	TA2714 (NRP)	US26D	MK
1 Classroom Lock	28 63 64 10G37 LL	US26D	SA
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE

Set: 17.0

Doors: 102, 117, 125, 133, 141, 143, 145, 147

3 Hinge	TA2714 (NRP)	US26D	MK
1 Classroom Lock	28 63 64 10G37 LL	US26D	SA
1 Door Closer	(P)7500 X 2018S	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Surface Overhead Stop	9-X36 (size as required)	630	RF
1 Gasketing	S88D @ Head & Jambs		PE

Set: 18.0

Doors: 121

3 Hinge	TA2714 (NRP)	US26D	MK
1 Privacy Lock	28 10U65 LL	US26D	SA
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Mop Plate	K1050 6" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
3 Silencer	608-RKW		RO

Set: 19.0

Doors: 123, 136, 140, 142, 144, 146, 202

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Indicator Privacy Lock	49 8266 LNL	US26D	SA
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Mop Plate	K1050 6" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D @ Head & Jambs		PE

Set: 20.0

Doors: 115

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Indicator Privacy Lock	49 8266 LNL	US26D	SA
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Mop Plate	K1050 6" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Threshold	271A X L.A.R.		PE
2 Gasketing	S88D @ Head & Jambs		PE
1 Auto Door Bottom	411ARL/420APKL X L.A.R.		PE

Set: 21.0

Doors: 122, 124, 126, 127, 128, 129, 130, 131, 132, 134, 135, 137, 138

3 Hinge	TA2714 (NRP)	US26D	MK
1 Indicator Privacy Lock	49 8266 LNL	US26D	SA
1 Surface Closer	1601	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D @ Head & Jambs		PE

Set: 22.0

Doors: 103

3 Hinge	TA2714 (NRP)	US26D	MK
1 Passage Latch	28 10U15 LL	US26D	SA
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D @ Head & Jambs		PE

Set: 23.0

Doors: 114

3 Hinge	TA2714 (NRP)	US26D	MK
1 Passage Latch	28 10U15 LL	US26D	SA
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Overhead Stop	1-X36 (size as required)	630	RF
1 Gasketing	S88D @ Head & Jambs		PE

Set: 24.0

Doors: 154, 157, 160

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
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1 Passage Latch	28 10U15 LL	US26D	SA
1 Door Closer	CPS7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Threshold	271A X L.A.R.		PE
2 Gasketing	S88D @ Head & Jambs		PE
1 Auto Door Bottom	411ARL/420APKL X L.A.R.		PE

Set: 25.0

Doors: 116

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Passage Latch	28 10U15 LL	US26D	SA
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Mop Plate	K1050 6" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE

Set: 26.0

Doors: 201

6 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
2 Push Plate	70F 8" x 16"	US32D	RO
2 Pull Plate	BF 111x70C 4" x 16"	US32D	RO
2 Door Closer	CPS7500	689	NO
2 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Gasketing	S88D @ Head & Jambs		PE
2 Split Astragal	305CN X L.A.R.		PE

Set: 27.0

Doors: 139, 150

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Push Plate	70F 8" x 16"	US32D	RO
1 Pull Plate	BF 111x70C 4" x 16"	US32D	RO
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE

Set: 28.0

Doors: 111B, 118B

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
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1 Push Plate	70F 8" x 16"	US32D	RO
1 Pull Plate	BF 111x70C 4" x 16"	US32D	RO
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE
1 Sweep	315CN X L.A.R.		PE

Set: 29.0

Doors: 112, 113

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1 Push Plate	70F 8" x 16"	US32D	RO
1 Pull Plate	BF 111x70C 4" x 16"	US32D	RO
1 Door Closer	(P) 7500	689	NO
1 Kick Plate	K1050 12" CSK BEV	US32D	RO
1 Mop Plate	K1050 6" CSK BEV	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S88D @ Head & Jambs		PE

Set: 30.0

Doors: 162A, 162B, 163A, 163B, 164A, 164B, 165A, 165B

1 Cylinder	Cylinder as Required	US32D	SA
1 Misc	Balance by Door Manufacturer		OT

END OF SECTION 087100

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

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.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 - 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.

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. MRI Steel Framing, LLC.
 2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 2-inch minimum vertical movement.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) ClarkDietrich.
 2. 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.
 3. 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.
 4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
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. MRI Steel Framing, LLC.
 2. Minimum Base-Steel Thickness: As indicated on Drawings.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C645.
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. MRI Steel Framing, LLC.
 2. Minimum Base-Steel Thickness: As indicated on Drawings.
 3. Depth: As indicated on Drawings.
- G. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
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. MRI Steel Framing, LLC.
 2. Configuration: hat shaped.
- H. 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.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
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. MRI Steel Framing, LLC.

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, in size indicated on Drawings.
- 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: As indicated on Drawings.
- 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. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
 - a. Minimum Base-Steel Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
 - a. Minimum Base-Steel Thickness: As indicated on Drawings.
4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
 - a. Configuration: hat shaped.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide 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 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
 4. 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.

3.2 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.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

6. Curved Partitions:

- a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
- b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 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.
- 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. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. 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 092400 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior vertical plasterwork (stucco).
2. Exterior horizontal and nonvertical plasterwork (stucco).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of factory-prepared finish coat and for each color and texture specified.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.

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. ClarkDietrich.

2. Diamond-Mesh Lath: Self-furring, 2.5 lb/sq. yd..

B. Wire-Fabric Lath:

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. Davis Wire; a Heico Wire Group company.

2. Welded-Wire Lath: ASTM C933; self-furring, 1.4 lb/sq. yd..

3. Woven-Wire Lath: ASTM C1032; self-furring, with stiffener wire backing, 1.4 lb/sq. yd..

2.2 ACCESSORIES

- A. General: Comply with ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 - 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. ClarkDietrich.
 - 2. Foundation Weep Screenshot: Fabricated from hot-dip galvanized-steel sheet, ASTM A653/A653M, G60 zinc coating.
 - 3. Cornerite: Fabricated from metal lath with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.
 - 4. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.
 - 5. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
 - a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
 - 6. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
 - 7. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 - 8. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
 - 9. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges.
- C. Plastic Accessories: Manufactured from high-impact PVC.
 - 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. Phillips Manufacturing Co.
 - 2. Cornerbeads: With perforated flanges.
 - a. Smallnose cornerbead; use unless otherwise indicated.
 - b. Bullnose cornerbead, radius 3/4-inch minimum; use at locations indicated on Drawings.

3. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
 - a. Square-edge style; use unless otherwise indicated.
 - b. Bullnose style, radius 3/4-inch minimum; use at locations indicated on Drawings.
4. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
5. Expansion Joints: Two-piece type, formed to produce slip-joint and square-edged 1/2-inch-wide reveal; with perforated concealed flanges.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C932.
- D. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.
- E. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.
- F. 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.

2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I.
 1. Color for Finish Coats: Gray.
- B. Masonry Cement: ASTM C91, Type N.
 1. Color for Finish Coats: Gray.
- C. Plastic Cement: ASTM C1328.
- D. Lime: ASTM C206, Type S; or ASTM C207, Type S.
- E. Sand Aggregate: ASTM C897.

1. Color for Job-Mixed Finish Coats: In color matching Architect's sample.
- F. Perlite Aggregate: ASTM C35.
- G. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
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. El Rey Stucco Solutions; a Parex USA, Inc. brand.
 2. Color: As selected by Architect from manufacturer's full range.
- H. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
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. Dryvit Systems, Inc.
 2. Color: As selected by Architect from manufacturer's full range.

2.5 PLASTER MIXES

- A. General: Comply with ASTM C926 for applications indicated.
1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
1. Portland Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
 2. Masonry Cement Mixes:
 - a. Scratch Coat: Mix 1 part masonry cement and 2-1/2 to 4 parts aggregate.

- b. Brown Coat: Mix 1 part masonry cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.
- 3. Portland and Masonry Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- 4. Plastic Cement Mixes:
 - a. Scratch Coat: Mix 1 part plastic cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: Mix 1 part plastic cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.
- 5. Portland and Plastic Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Base-Coat Mixes for Use over Unit Masonry: Single base (scratch) coat for two-coat plasterwork on low-absorption plaster bases as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 0 to 3/4 part lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 2. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
- D. Base-Coat Mixes for Use over Unit Masonry: Single base (scratch) coat for two-coat plasterwork on high-absorption plaster bases as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - 3. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 4. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
- E. Job-Mixed Finish-Coat Mixes:
 - 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

2. Masonry Cement Mix: Use 1 part masonry cement and 1-1/2 to 3 parts aggregate.
 3. Portland and Masonry Cement Mix: For cementitious materials, mix 1 part portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
 4. Plastic Cement Mix: Use 1 part plastic cement and 1-1/2 to 3 parts aggregate.
- F. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prepare smooth, solid substrates for plaster according to ASTM C926.

3.2 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C1063.

3.3 INSTALLING ACCESSORIES

- A. Install according to ASTM C1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
1. Install cornerbead at exterior locations.
- C. Control Joints: Locate as indicated on Drawings.

3.4 PLASTER APPLICATION

- A. General: Comply with ASTM C926.
- B. Bonding Compound: Apply on unit masonry substrates for direct application of plaster.
- C. Walls; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 3/4-inch total thickness, as follows:
1. Portland cement mixes.
- D. Ceilings; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork and having 1/2-inch total thickness, as follows:
1. Portland cement mixes.

- E. Walls; Base-Coat Mix: For base (scratch) coat, for two-coat plasterwork and having 3/8-inch thickness on masonry and 1/4-inch thickness on concrete, as follows:
 - 1. Portland cement mix.
- F. Ceilings; Base-Coat Mix: For base (scratch) coat, for two-coat plasterwork and having 1/4-inch thickness on concrete, as follows:
 - 1. Portland cement mix.
- G. Plaster Finish Coats: Apply to provide float finish to match Architect's sample.
- H. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.
- I. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

3.5 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION 092400

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Exterior gypsum board for ceilings and soffits.
 - 3. Tile backing panels.
 - 4. Cornerguards.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 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 E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:

- a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
2. Apply or install final decoration indicated, including painting and wall coverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are 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 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.

- b. BPB America Inc.
- c. G-P Gypsum.
- d. Lafarge North America Inc.
- e. National Gypsum Company.
- f. USG Corporation.

B. Regular Type:

- 1. Thickness: 1/2 inch
- 2. Long Edges: Tapered

C. Type X:

- 1. Thickness: 5/8 inch
- 2. Long Edges: Tapered

D. Type C:

- 1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
- 2. Long Edges: Tapered.

E. Flexible Type: 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.

F. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

- 1. Thickness: 1/2 inch
- 2. Long Edges: Tapered.

G. Foil-Backed Type:

- 1. Core: 5/8 inch, Type X
- 2. Long Edges: Tapered

H. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.

- 1. Core: 5/8 inch, Type X
- 2. Long Edges: Tapered.

I. High-Impact Type: Manufactured with Type X core, plastic film laminated to back side for greater resistance to through-penetration (impact resistance).

- 1. Core: 5/8 inch thick
- 2. Plastic-Film Thickness: 0.020 inch

- J. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.

2.3 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Exterior Gypsum Soffit Board: ASTM C 931/C 931M or ASTM C 1396/C 1396M, with manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. G-P Gypsum.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. USG Corporation.
 - 2. Core: 5/8 inch, Type X
- B. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
 - 1. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by G-P Gypsum.
 - 2. Core: 5/8 inch, Type X

2.4 TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. G-P Gypsum.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. USG Corporation.
 - 2. Core: 5/8 inch, Type X
- B. Glass-Mat, Water-Resistant Backing Board (for use in wet-areas and behind tile applications)
 - 1. Complying with ASTM C 1178/C 1178M, ASTM D6329 and ASTM D3273.

- a. Product: Subject to compliance with requirements, provide "DensShield Tile Backer Board" by G-P Gypsum, or equal.
- 2. Core: 5/8 inch
- C. Cementitious Backer Units (for use with an approved waterproofing membrane) – NOT USED
- D. Complying with ANSI A118.9.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. USG Corporation; DUROCK Cement Board.
 - 2. Thickness: 5/8 inch

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C 1047.
 - 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. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Available 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.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: 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 Wallboard: 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 taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of finish, use setting-type, sandable topping 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. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 FRAMING MEMBERS (FURRING AND NON-LOADBEARING MEMBERS)

A. Description:

1. Galvanize all steel components to ASTM A 653, G60 Standards, unless otherwise indicated.
2. Studs – ASTM C 645, 20-gauge, C-shape, 3-5/8-inch (92 mm) and 6-inch depth as indicated, or required.
 - a. Stud System Accessories – Provide stud Manufacturer's standard clips, shoes, ties, reinforcements, fasteners, and other accessories as required for a complete stud system.
3. Runners – ASTM C 645 to match studs; type recommended by stud Manufacturer for floor and head support of studs, and for vertical abutment of gypsum board at other WORK.
 - a. Provide slip-type deflection track detail to allow for deck and/or structural member deflection at connections to underside of structure.
 - b. Provide UL listed “Fire Track® System” in required sizes, profiles, and configuration and with necessary accessories (including Fire Track Posi-Clips® if required) by Fire Track Corp., 1-800-394-9875, or equal, for deflection track at fire rated partitions as required. System to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
4. Furring Channels – ASTM C 645, 25-gauge, 2-inch (51 mm) web and flanges – Z-shaped furring channels to receive insulation board; 2-inch (51 mm) hat channels may be used for furred substrates not receiving insulation board.
5. Tie wire or clips used for securing cross-furring to primary members shall be galvanized, soft annealed steel wire. The weight of galvanizing shall be not less than Class 1 as set forth in Federal Specifications QQ-W-461H. Tie wire gauge shall be as set forth in the CODE.
6. Wire hangers supporting main runners in suspended ceilings shall be galvanized steel and the weight of galvanizing shall be not less than Class 1 as set forth in Federal Specifications QQ-W-461H. The gauge of galvanized steel hanger wire shall be as required by the CODE.
7. Provide auxiliary materials that comply with referenced installation standards.
 - a. Fasteners for Metal 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 D 226, 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.

2.8 ACCESSORIES

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
 - 1. For Metal accessories: Except as otherwise indicated, provide Manufacturer's standard galvanized steel beaded units with face flanges for concealment in joint compound, including corner beads, casing beads, control joints, and edge trim.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Cornerguards: Provide 1 ½" x 1 ½" x 4'-0" Stainless Steel Cornerguards at locations indicated on the drawings.
 - 1. When drawings do not show cornerguards, provide cornerguards at all interior outside corners of gypsum board walls.
 - 2. Provide cornerguards at outside corners of gypsum board walls entering janitor closets, when applicable.
- E. Sealant:
 - 1. Acoustical Sealant: For use at furred insulated walls and when noted otherwise.
 - a. Acoustical sealant shall be recommended in writing by the manufacturer.
 - 2. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Concealed sealant shall be mastic type, non-shrinking, non-drying, non-migrating, and non-staining, approved for use by the gypsum board Manufacturer.
- F. Thermal Insulation and Sound Attenuation Blankets: Refer to Section 072100 – Thermal Insulation, unless noted otherwise.
- G. Vapor Retarder: Refer to Section 07200 - Thermal Insulation, unless noted otherwise.

2.9 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.

- B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E 84.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. G-P Gypsum; Georgia-Pacific Regency Ceiling Textures/Polystyrene.
 - b. National Gypsum Company; Perfect Spray.
 - c. USG Corporation; SHEETROCK Ceiling Spray Texture, QT.
 3. Texture: Fine
- C. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. G-P Gypsum; Georgia-Pacific Ceiling Textures/Vermiculite.
 - b. USG Corporation; SHEETROCK Wall and Ceiling Spray Texture (Aggregated).
 3. Texture: Light spatter
- D. Finish: All interior exposed gypsum board shall receive a Level 4 finish per ASTM C840.
1. For rooms or spaces with increased lighting and display functions, a Level 5 finish is required. Provide Level 5 finish in the following spaces:
 - a. Display Lobby 103
 - b. Lobby 102
- E. Acoustical Finish: Water-based, chemical-setting or drying-type, job-mixed texture finish for spray application.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. International Cellulose Corp.; SonaSpray "fc."
 - b. USG Corporation; USG Acoustical Plaster Finish.
 3. Application Thickness: 1/2 inch
 4. Fire-Test-Response Characteristics: Indices when tested according to ASTM E 84 as follows:
 - a. Flame Spread: Less than 25
 - b. Smoke Developed: Less than 450

5. NRC: 0.55 according to ASTM C 423.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- 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 C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. 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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.
- J. 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 C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. 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 as indicated on the 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 vertically (parallel 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 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer

- joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations 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 (400 mm) 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 FOR CEILINGS AND SOFFITS

- 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. Water-Resistant Gypsum Backing Board: Install at showers, tubs, and where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Glass-Mat, Water-Resistant Backing Panel: 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.
- C. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- D. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
- E. 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 according to ASTM C 840 and in specific locations approved by Architect.
- C. Interior Trim: Install in the following locations, unless otherwise indicated:
 - 1. Cornerbead: Use at outside corners
 - 2. Bullnose Bead: Use at outside corners
 - 3. LC-Bead: Use at exposed panel edges
 - 4. L-Bead: Use where indicated
 - 5. U-Bead: Use at exposed panel edges
 - 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges

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 those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile
 - 3. Level 3: Where indicated on Drawings
 - 4. Level 4: At panel surfaces that will be exposed to view
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture, matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.9 INSTALLATION – FRAMING (FURRING AND NON-LOADBEARING PARTITIONS)

- A. Partition framing and gypsum board shall extend to underside of structure, unless otherwise indicated.
- B. Installation of framing shall be in accordance with ASTM C 754 and the CODE.
- C. Provide slip-type deflection track at all head connections to underside of structure. Provide for deflection allowance of 1 1/2-inches (38 mm) minimum, unless otherwise indicated.
- D. Align runner tracks to the partition layout at both floors and ceilings. Secure tracks to floor and overhead structure 16-inches (406 mm) on center, maximum. Provide fasteners at all corners and ends of runner tracks.
- E. Full-length studs shall be provided to span the height between runner tracks. Spliced units shall not be allowed. Friction fit studs to runner tracks by positioning and rotating into place. Provide positive attachment to runner tracks for studs located at partition corners and intersections and adjacent to openings, using 3/8-inch (9.5 mm) self-drilling screws at both flanges and studs.
 - 1. Space studs at 16-inches (406 mm) on center, unless otherwise indicated.
- F. Provide additional studs to support corners at partition intersections and corners, and to support outside corners, terminations of partitions, and both sides of control joints. Provide any additional bracing and reinforcing members as recommended by the system Manufacturer to provide complete rigidity at partitions.
- G. At openings and doorframes, install two full height studs at all jambs. Fasten the first stud at each jamb with two self-drilling screws to all frame joint anchors. Place second stud in tandem with and against first stud.

- H. Above openings and heads of frames, a cut-to-length section of track shall be installed. Flanges shall overlap jamb studs and shall be securely attached to jamb studs.
- I. Between frames and ceiling, install cut-to-length jack studs, extending from doorframe header track to ceiling track. Where control joint is called for at jamb line above frame, install jack stud approximately 1-inch (25 mm) from first jamb stud. At all other locations keep jack studs at least 6-inches (152 mm) from jambs to avoid gypsum board joints at jamb line.
- J. Install reinforcing for applied items, such as supplementary framing, runners, furring, blocking, and bracing at openings and terminations in the WORK, and at locations required to support fixtures, accessories, equipment, services, heavy trim, furnishings, and similar WORK that cannot be adequately supported directly on gypsum board alone.
 - 1. Attention is directed to electrical equipment, toilet partitions, lockers, and toilet and shower accessories requiring additional support. Coordinate these requirements with the respective trade sections for exact locations.
- K. At furred masonry walls, install rigid insulation board between furring strips, friction fit, butt joints tight with foil facing CMU. Install multiple layers with staggered joints as required to achieve thickness indicated. Seal all joints prior to installation of gypsum board.
- L. Tolerances: Provide framing such that tolerances are 1/16-inch (1.6 mm) maximum offset between planes of gypsum board faces and 1/8-inch (3.2 mm) in 8-feet (2.4 m) for plumb, level, warp, and bow, unless otherwise indicated.

3.10 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. 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 Tile
 - 2. Thresholds.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
 - 5. Tile backing panels.
 - 6. Metal edge strips.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, 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 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 for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

E. Qualification Data: For qualified Installer.

F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

G. Product Certificates: For each type of product, signed by product manufacturer.

H. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.5 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. Stone thresholds.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Joint sealants.
5. Cementitious backer units.
6. Metal edge strips.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- 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.

1.7 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.

1.8 EXTRA MATERIALS

- 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.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

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.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Tile Type: FLOOR and WALL Factory-mounted porcelain tile (FT1).
 1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 12"x24"
 4. Thickness: 10.5mm
 5. Surface: UPS (Unpolished)
 6. Tile Color and Pattern:
 - a. Color: Industrial park – Chestnut Brown
 - b. Coursing pattern: 1/3 offset
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable.
- B. Tile Type: FLOOR and WALL Factory-mounted porcelain tile (FT2).
 1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 12"x24"
 4. Thickness: 10.5mm
 5. Surface: UPS (Unpolished)
 6. Tile Color and Pattern:
 - a. Color: Industrial park – Natural Beige
 - b. Coursing pattern: 1/3 offset
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable.
- C. Tile Type: FLOOR and WALL Factory-mounted porcelain tile (FT3).
 1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.

3. Module Size:
 - a. 12"x24"
 4. Thickness: 10.5mm
 5. Surface: UPS (Unpolished)
 6. Tile Color and Pattern:
 - a. Color: Haut Monde – Leisure beige
 - b. Coursing pattern: 1/3 offset
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable.
- D. Tile Type: WALL Ceramic (WT1)
1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 4"x24" and 12"x24"
 4. Thickness: 1/4"
 5. Tile Color and Pattern:
 - a. Color: EC1- Docks J103
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide the following units in colors to match ceramic tile.
 - a. Cove Base
 - b. Bullnose at top of wainscot, typical
- E. Tile Type: WALL Ceramic (WT2)
1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 6 1/2"x20" or 13" x 20"
 4. Thickness: 1/4"
 5. Tile Color and Pattern:
 - a. Color: Concrete Connection – Boulevard Beige
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide the following units in colors to match ceramic tile.
 - a. Cove Base
 - b. Bullnose at top of wainscot, typical
- F. Tile Type: WALL Ceramic (WT3)
1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 2"x6"
 4. Thickness: 1/4"
 5. Tile Color and Pattern:
 - a. Color: Concrete Connection – Eastside Brown
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide the following units in colors to match ceramic tile.
 - a. Cove Base
 - b. Bullnose at top of wainscot, typical
- G. Tile Type: WALL Ceramic (WT4)
1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 2"x12" and 3"x6"
 4. Thickness: 1/4"
 5. Tile Color and Pattern:
 - a. Color: Colorwave - Mink
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide the following units in colors to match ceramic tile.
 - a. Cove Base
 - b. Bullnose at top of wainscot, typical
- H. Tile Type: WALL Ceramic (WT5)
1. Basis-of-Design Product: Subject to compliance with requirements, provide as noted below or approved equal.
 - a. Daltile
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Module Size:
 - a. 6"x24"
 4. Thickness: 1/4"
 5. Tile Color and Pattern:
 - a. Color: Spark – Toasted luster
 6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide the following units in colors to match ceramic tile.
 - a. Cove Base
 - b. Bullnose at top of wainscot, typical

2.3 TILE BACKING PANELS

- A. Refer to Section 092900 Gypsum Board.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. For use with cementitious backer board as specified in Section 092900 – Gypsum Board.

2.5 THRESHOLDS – RESTROOMS

- 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. Thresholds:
 - 1. At tile to tile transitions, provide porcelain tile cut to fit door jamb width.
 - a. Daltile: Haut Monde – Leisure beige – cut to 6”x24”
 - 2. ADA-compliant

2.6 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended in writing by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.7 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 - 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 - 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.

- b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self furring.
 - e. Weight: 2.5 lb/sq. yd.
 - 4. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following,
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.
 - 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

2.8 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
 - 1. Use grout as recommended in writing by tile manufacturer.
- B. Colors: Provide colors of grout from manufacturer's full range of standard colors as indicated on the drawings.
- C. Standard Cement Grout: ANSI A118.6.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product as noted below or approved equal.
 - a. Laticrete International, Inc.
 - 2. Grout Color: TBD

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
 - 1. Metal edge strips shall be used when tile transitions to a different material, unless noted otherwise. Strips shall provide a smooth, consistent transition, flush with both adjacent materials, and ADA-compliant.
- C. Edge-Protection Profiles: At tiled outside corners, provide Schluter strip by Schluter Systems, or equal.
 - 1. Profile of Schluter strip to be selected by Architect.
- D. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- F. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Grout and Tile Sealer.
 - e. Jamo Inc.; Penetrating Sealer.
 - f. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile
 - g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - i. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

2.10 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 A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 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 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 A108.1A and is sloped 1/4 inch per foot toward drains.

- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA 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. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors composed of tiles 8 by 8 inches or larger.
 - f. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch.
 2. Floor Tile: 1/4 inch
 3. Wall Tile: 1/16 inch.
 4. Decorative Thin Wall Tile: 1/16 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 2. Do not extend waterproofing or crack isolation membrane under thresholds set in portland cement mortar. Fill joints between such thresholds and adjoining tile set on membrane with elastomeric sealant.
- I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile and adjacent material.
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in writing by manufacturer

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 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 grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. 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.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000

SECTION 095113 – SUSPENDED ACOUSTICAL TILES

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 acoustical panels and exposed suspension systems for ceilings, lips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/4 inch = 1 foot
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- E. Qualification Data: For testing agency.
- F. Field quality-control test reports.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- H. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- I. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory"
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class [A] [B] [C] materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
 3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
 4. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
 5. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- E. 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.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 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 a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. 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 reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. 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.
- 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. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- E. Structural Requirements:
 - 1. Suspended Acoustical Tile, including related assemblies, components, and attachment details, shall comply with the CODE and shall be designed and installed for resistance to the structural design criteria indicated on the Drawings in accordance with the CODE.

Where a conflict occurs between the requirements of this Section and the CODE, the more stringent shall apply.

2. Suspended acoustical tile ceiling system shall be engineered by the Manufacturer to carry the applied dead and live loads and shall have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories indicated with a deflection of less than 1/360 of the span, and shall be level to within 1/8-inch (3.2mm) in 12-feet (3.7 m). The ceiling system shall conform to ASTM C 635 (heavy duty classification) with a minimum load carrying capacity of the main runner of 16 lb/linear foot (16 L/linear meter) of span of 4-feet (1.2 m).
3. CONTRACTOR shall provide additional non-standard bracing, reinforcements, anchors, and heavier gauge materials if required to conform to the structural design criteria indicated and to other performance requirements herein.

F. Design Requirements: System Manufacturer shall furnish the systems herein, including necessary modifications to meet the indicated requirements and to maintain visual design concepts as approved by the ARCHITECT.

2.2 ACOUSTICAL PANEL CEILING – TYPE A

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. d, Inc.; Cirrus Angled Tegular;
2. BPB USA;
3. Chicago Metallic Corporation;
4. Ecophon CertainTeed, Inc.;
5. Tectum Inc.;
6. USG Interiors, Inc.;
7. Or equal

C. Description:

1. Ceramic and mineral fiber composite tile.
2. When not indicated on the drawings, provide: 24-inches (61 cm) by 24-inches (61 cm) by 5/8-inches (16 mm), square edge, medium texture.
3. Sag-resistant formulation, Armstrong HumiGuard Max, or equal.
4. Scrubbable, factory applied, white vinyl plastic paint finish.
5. Mold/Mildew Inhibitor: Surfaces shall be treated with a paint that contains a special biocide that inhibits or retards the growth of mildew, ASTM D 3273, Armstrong Bioblock, or equal.
6. Texture: Medium
7. Performance Requirements:

ASTM C 423 (UL Label)	Noise Reduction Coefficient (NRC): 0.55
ASTM C 1414 (UL Label)	Ceiling Attenuation Class (CAC): 38
ASTM E 84; ASTM E 1264 (UL Label)	Class A; Flame Spread 25 or less; Smoke Developed 50 or less, Type XX, Pattern C-E

ASTM E 1477	0.82
Recycled content	38%

2.1 ACOUSTICAL PANEL CEILING – TYPE B (for Kitchens and Humidity-prone areas)

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.; Fine Fissured Ceramaguard – Unperforated (607); or equal

C. Description:

1. Ceramic and mineral fiber composite tile.
2. When not indicated on the drawings, provide: 24-inches (61 cm) by 24-inches by 5/8-inches (16 mm), square edge, medium texture.
3. Sag-resistant formulation, Armstrong HumiGuard Max, or equal.
4. Scrubbable, factory applied, white vinyl plastic paint finish.
5. Mold/Mildew Inhibitor: Surfaces shall be treated with a paint that contains a special biocide that inhibits or retards the growth of mildew, ASTM D 3273, Armstrong Bioblock, or equal.
6. Performance Requirements:

ASTM C 423 (UL Label)	Noise Reduction Coefficient (NRC): 0.55
ASTM C 1414 (UL Label)	Ceiling Attenuation Class (CAC): 38
ASTM E 84; ASTM E 1264 (UL Label)	Class A; Flame Spread 25 or less; Smoke Developed 50 or less, Type XX, Pattern C-E
ASTM E 1477	0.82
Recycled content	38%

2.2 ACOUSTICAL PANEL CEILING TYPE C – NOT USED

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.; Ultima Beveled Tegular (1911);
2. BPB USA;
3. Chicago Metallic Corporation;
4. Ecophon CertainTeed, Inc.;
5. Tectum Inc.;
6. USG Interiors, Inc.;
7. Or equal

C. Description:

1. Wet-formed, mineral fiber tile with DuraBrite acoustically transparent membrane.
2. When not indicated on the drawings, provide: 24-inches (61 cm) by 24-inches (61 cm) by 3/4-inches (16 mm), beveled tegular edge tile, fine texture, non-directional.
3. Sag-resistant formulation, Armstrong HumiGuard Plus, or equal.
4. Factory applied, white acrylic latex paint finish.
5. Mold/Mildew Inhibitor: Surfaces shall be treated with a paint that contains a special biocide that inhibits or retards the growth of mildew, ASTM D 3273, Armstrong Bioblock, or equal.
6. Texture: Fine
7. Performance Requirements:

ASTM C 423 (UL Label)	Noise Reduction Coefficient (NRC): 0.70
ASTM C 1414 (UL Label)	Ceiling Attenuation Class (CAC): 35
ASTM E 84; ASTM E 1264 (UL Label)	Class A; Flame Spread 25 or less; Smoke Developed 50 or less, Type IV, Form 2, Pattern E
ASTM E 1477	0.90
Recycled content	60% to 80%

2.3 SUSPENSION SYSTEM – EXPOSED GRID

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
1. Armstrong World Industries, Inc.; Prelude XL Exposed Tee;
 2. Chicago Metallic Corporation;
 3. USG Interiors, Inc.;
 4. Or equal
- C. Description:
1. Hot dipped galvanized steel main tees, cross tees, and wall moldings
 2. All steel roll formed parts shall be chemically cleaned, electro-galvanized in accordance with ASTM C 635 and bonderized to resist corrosion and shall form a chemical affinity for paint.
 3. Steel stamped parts shall be chemically cleaned, electro-galvanized, and treated with a chromate conversion coating.
- D. Exposed surfaces shall have factory applied, low sheen, satin finish, white baked polyester paint.
- E. Main beams and cross tees shall be double web steel construction with a 15/16-inch (24 mm) flange surface with rotary stitching and peak form design.
- F. All components shall conform to the intermediate structural classification of ASTM C 635 for heavy-duty systems.

- G. Suspension system shall be made of 25% recycled content
- H. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Cast-in-place anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
 - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- I. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 4. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.
- J. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- K. 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/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- L. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- M. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

- N. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- O. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- P. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- Q. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.4 ACCESSORIES

A. Description

1. Provide accessory items as required to achieve satisfactory ceiling installation and performance.
2. Wall molding shall match the suspension system in material and finish, and shall have a flange of not less than 2-inches (51 mm). Inside and outside corner caps shall be provided.
3. Hanger and diagonal bracing wires shall be minimum 12 gauge, and shall conform to ASTM A 580/A 580M, annealed type 304 stainless steel.
4. Hangers and attachment shall support a minimum 300-pound ultimate vertical load without failure of supporting material or attachment.
5. Straps shall be 1-inch (25 mm) by 3/16-inch (4.8 mm) galvanized steel conforming to ASTM A 653/A 653M, with a light commercial zinc coating or ASTM A 1008/A 1008M with an electrodeposited zinc coating conforming to ASTM B 633, Type RS.
6. Rods shall be 3/16-inch (4.8 mm) diameter threaded steel rods, zinc or cadmium coated.
7. Spacers shall be tempered spring steel and shall be fitted into wall molding to provide tension on the ceiling system.
8. Provide security hold down clips to suspended acoustical tiles in all public spaces, other spaces as indicated on the drawings, and any spaces where detainees will be escorted and/or present.

2.5 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical Sealant for Concealed Joints:
 - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
 - b. Pecora Corporation; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- C. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less, complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- D. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less recommended for sealing interior concealed joints to reduce airborne sound transmission.

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.
 1. 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, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 1. Fire-Rated Assembly: 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 to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 4. 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.
 5. 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.
 6. 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 structure to which hangers are attached and 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.
 7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 8. 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.
 9. Do not attach hangers to steel deck tabs.
 10. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 11. 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.
 12. 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 postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
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 follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to long axis of space.
 - c. Install panels in a basket-weave pattern.
 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; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 6. Install hold-down clips in areas indicated, 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. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
 8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections and prepare reports:
 1. Suspended ceiling system.
 2. Hangers, anchors and fasteners.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent

and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every 2 postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

3.5 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 09511

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 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. Samples: Full-size units of each color and pattern of floor tile required.

1.2 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.3 SPECIAL WARRANTY PROVISIONS

- A. Furnish Manufacturer's 5 year written warranty to cover defects in materials, products, and manufacturing workmanship.
 - 1. The term of the warranty shall begin on the date of Substantial Completion.

1.4 EXTRA MATERIALS

- A. 5 percent overage of calculated coverage for each type of tile and six 4-foot (1.2 m) lengths of resilient base being furnished for the WORK shall be provided for future maintenance and replacement, separately packaged, identified, and left with the COMPANY.
- B. Extra materials shall be provided from the same production run as the materials installed.

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. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.

2.2 LUXURY VINYL FLOOR TILE (LVT)

- A. Manufacturer and Product, or Equal:
 - 1. Subject to the requirements indicated, provide products from the Manufacturer listed below, or equal
 - a. Mannington; Amtico
- B. Coefficient of Friction (COF) ASTM C 1028 shall be greater than or equal 0.60, per ADAAG and ATBCB.
- C. Wearing Surface: Smooth
- D. Thickness: 0.100 inch
- E. Size: 12 by 12 inches
- F. Provide LVT Tiles with Polish-free, no-buff topseal coating.
- G. Performance Requirements:

ASTM E 648/NFPA 253	Passes Class I
ASTM E 662/NFPA 258	Less than 450-passes
ASTM F 970	Static Load Limit, 750 psi
ASTM F 1066	Class II, Through pattern, asbestos-free

2.3 VINYL COMPOSITION FLOOR TILE (VCT-1) - NOT USED

- A. Manufacturer and Product, or Equal:
 - 1. Subject to the requirements indicated, provide products from one of the Manufacturer's listed below, or equal
 - a. Mannington; Essentials.
 - b. Mohawk
 - c. Crossville Studios
- B. Tile shall be a composed of polyvinyl chloride resin binder, plasticizers, fillers, and pigments with colors and texture dispersed uniformly through its thickness.
- C. Coefficient of Friction (COF) ASTM C 1028 shall be greater than or equal 0.60, per ADAAG and ATBCB.

- D. Wearing Surface: Smooth
- E. Thickness: 0.125 inch
- F. Size: 12 by 12 inches
- G. Performance Requirements:

ASTM E 648/NFPA 253	Greater than or equal to 0.45 watts/sq cm, Passes Class I
ASTM E 662/NFPA 258	Less than 450-passes
ASTM F 970	Static Load Limit, 125 psi
ASTM F 1066	Class II, Through pattern, asbestos-free

2.4 RESILIENT BASE (RB-1, RB-2, RB-3)

A. Manufacturer and Product, or Equal:

- 1. Subject to the requirements indicated, provide products from one of the Manufacturer's listed below, or equal
 - a. Armstrong; Color-Integrated Wall Base.
 - b. Johnsonite; Traditional Rubber Wall Base
 - c. Roppe; 700 Series Wall Base

B. Description:

- 1. Base shall be Type TP thermoplastic extruded resilient, smooth and free from imperfections.
- 2. Unless otherwise indicated, base shall be 1/8-inch (3.2 mm) thick by 4-inches (102 mm) high, matte finish.
- 3. Profile: Straight, toeless, unless otherwise indicated.
- 4. Performance Standards:

ASTM E 84	Flame Spread 150, Class C
ASTM E 648/NFPA 253	Greater than or equal to 0.45 watts/sq cm, Passes Class I
ASTM E 662/NFPA 258	Less than 450 – passes
ASTM F 1861	Type TP, Group 1 or Group 2

- 5. Provide in rolls to be cut in lengths required.

2.5 COLORS AND PATTERNS

- A. Color of tile, base, and edging shall be selected and approved by the Architect from the Manufacturer's full color range.
- B. Tentative color selection: as indicated on the drawings

1. Tile: VCT-1 TBD
2. Base RB-1: To be selected by Architect from manufacture's full range
3. Tile: LVT-1: TBD

- C. The Owner reserves the option of changing this tentative color selection during the submittal process at no additional cost to the Owner.
- D. Final colors, pattern, and appearance shall be selected and approved by the Owner prior to installation.

2.6 ADHESIVES, SEALANTS, AND SEALANT PRIMERS

- A. Subject to the requirements herein, adhesives, sealants, and sealant primers shall be as recommended by the tile and base Manufacturer, respectively, as applicable to the project conditions.
- B. Adhesives, sealants, and sealant primers shall be low VOC per SCAQMD Rule No. 1168.
- C. Adhesives, sealants, and sealant primers shall be resistant to alkalis and moisture and shall be capable of securely holding the materials in place, sealing and bonding the joints.
- D. Aerosol adhesives shall comply with GS-36 VOC limits.

2.7 PATCHING AND LEVELING COMPOUNDS, FILLERS AND SURFACERS

- A. Floor surface preparation materials shall be as recommended by the Manufacturer as applicable to the project conditions.
- B. Floor surface preparation materials shall be low VOC per SCAQMD Rule No. 1168.

PART 3 - EXECUTION

3.1 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 9 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. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 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 square with room axis
- 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
- 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.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
- C. Cover floor tile until Substantial Completion.

END OF SECTION 096519

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. This Section includes modular, tufted carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. 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. Existing flooring materials to be removed.
 - 3. Existing flooring materials to remain.
 - 4. Carpet tile type, color, and dye lot.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern of installation.
 - 8. Pattern type, location, and direction.
 - 9. Pile direction.
 - 10. Type, color, and location of insets and borders.
 - 11. Type, color, and location of edge, transition, and other accessory strips.
 - 12. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.

- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. 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.
- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Mockups: Before installing carpet tile, 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 undamaged at time of Substantial Completion.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. 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.
- C. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.6 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which 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 loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, 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 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE – CPT1

- A. Manufacturer and Product, or Equal:
 1. Subject to the requirements herein, provide products from the Manufacturer listed below, or equal.
 - a. Tarkett USA
- B. Description:
 1. All yarn and other carpet materials shall be Manufacturer's first quality. Carpet shall have no secondary backing post applied in manufacturing process that could eventually delaminate through installed application. Carpet shall have multi-layer tufting foundation and shall be imperious to moisture.
 2. Carpet shall be constructed as follows:
 - a. Construction: Patterned loop
 - b. Size: 18"x36"
 - c. Surface Appearance: Textured Patterned Loop.
 - d. Fiber Type: Dynex SD Nylon
 - e. Pitch/Gauge: 5/64
 - f. Face Weight: 18-oz/sq. yd.
 - g. Pile Thickness .187-inches
 - h. Stitches/Rows per Inch: 9.6
 - i. Dye Method: 90% Solution Dyed. 10% yarn dyed
 - j. Backing Foundation: non-woven synthetic fiber

3. Carpet Performance Requirements shall be as follows:

- a. ASTM E 648/NFPA 253: Class 1.
- b. ASTM E 662: <450 Flaming Mode
- c. Static Generation AATCC 134: <3.5 KV

4. Color CPT1

- a. Style: Halftone #04313
- b. Color: Woodcut #18906
- c. Pattern: Herringbone

2.2 CARPET TILE – CPT2

A. Manufacturer and Product, or Equal:

- 1. Subject to the requirements herein, provide products from the Manufacturer listed below, or equal.
 - a. Tarkett USA

B. Description:

- 1. All yarn and other carpet materials shall be Manufacturer's first quality. Carpet shall have no secondary backing post applied in manufacturing process that could eventually delaminate through installed application. Carpet shall have multi-layer tufting foundation and shall be imperious to moisture.
- 2. Carpet shall be constructed as follows:
 - a. Construction: Patterned loop
 - b. Size: 24"x24"
 - c. Surface Appearance: Textured Patterned Loop.
 - d. Fiber Type: Dynex SD Nylon
 - e. Pitch/Gauge: 5/64
 - f. Face Weight: 20-oz/sq. yd.
 - g. Pile Thickness .187-inches
 - h. Stitches/Rows per Inch: 10.0
 - i. Dye Method: 100% Solution Dyed.
- 3. Carpet Performance Requirements shall be as follows:
 - a. ASTM E 648/NFPA 253: Class 1.
 - b. ASTM E 662: <450 Flaming Mode
 - c. Static Generation AATCC 134: <3.5 KV

4. Color CPT2

- a. Style: Lineweave #04846
- b. Color: Earthquake
- c. Pattern: Vertical Ashlar

2.3 CARPET TILE – CPT3

A. Manufacturer and Product, or Equal:

- 1. Subject to the requirements herein, provide products from the Manufacturer listed below, or equal.
 - a. Tarkett USA

B. Description:

- 1. All yarn and other carpet materials shall be Manufacturer's first quality. Carpet shall have no secondary backing post applied in manufacturing process that could eventually delaminate through installed application. Carpet shall have multi-layer tufting foundation and shall be imperious to moisture.
- 2. Carpet shall be constructed as follows:
 - a. Construction: Patterned loop
 - b. Size: 24"x24"
 - c. Surface Appearance: Textured Patterned Loop.
 - d. Fiber Type: Dynex SD Nylon
 - e. Pitch/Gauge: 5/64
 - f. Face Weight: 20-oz/sq. yd.
 - g. Pile Thickness .187-inches
 - h. Stitches/Rows per Inch: 10.0
 - i. Dye Method: 100% Solution Dyed.
- 3. Carpet Performance Requirements shall be as follows:
 - a. ASTM E 648/NFPA 253: Class 1.
 - b. ASTM E 662: <450 Flaming Mode
 - c. Static Generation AATCC 134: <3.5 KV
- 4. Color CPT3
 - a. Style: Lineweave #04846
 - b. Color: Seismograph #21301
 - c. Pattern: Vertical Ashlar

2.4 RUBBER BASE AND EDGING

- A. Refer to Section 096500 Resilient Flooring for Rubber Base and Edging at Carpet locations.

2.5 ADHESIVES AND PRIMERS

- A. Subject to the requirements herein, adhesives and primers shall be as recommended by the carpet and base Manufacturer, respectively, as applicable to the project conditions.
- B. Multipurpose adhesive shall be Low VOC NuBroadlok, or equal premium multipurpose adhesive or NuSprayLok, or equal adhesive, as recommended by carpet Manufacturer for direct glue down of carpeting.
- C. Adhesives and primers shall be resistant to alkalis and moisture and shall be capable of securely holding the materials in place, sealing and bonding the joints.
- D. Adhesives and primers shall comply with CRI Green Label Certification Program.
- E. Adhesives and primers shall be low VOC per SCAQMD Rule No. 1168.

2.6 PATCHING AND LEVELING COMPOUNDS, FILLERS AND SURFACERS

- A. Subject to the requirements herein, floor surface preparation materials shall be as recommended by the Manufacturer as applicable to the project conditions.
- B. Leveling compound shall be latex type as recommended by carpet Manufacturer; compatible with carpet adhesive and curling/sealing compound used on concrete.
- C. Floor surface preparation materials shall be low VOC per SCAQMD Rule No. 1168.

2.7 MISCELLANEOUS

- A. Subject to the requirements herein, miscellaneous materials, cushion, and other carpet products shall be provided in compliance with the requirements herein and as recommended by carpet Manufacturer; as required to complete installation.

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. Examine carpet tile for type, color, pattern, and potential defects.
- B. 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 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For metal subfloors, verify the following:
1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. For raised access flooring systems, verify the following:
1. Access floor complies with requirements specified in Division 09 Section "Access Flooring."
 2. Access floor substrate is compatible with carpet tile and adhesive if any.
 3. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch protrusions more than 1/32 inch, 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
- 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.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

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, "Protection of 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

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SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide Architectural Coatings and appurtenant Work, complete and in place, in accordance with the Contract Documents.
- B. Materials not to be coated from systems in this Section include the following:
 - 1. Products requiring factory applied finishes and or coatings, other than prime coat.
 - 2. Surfaces whose coatings are for the specific purpose of protection from abrasion, wear and tear, or from corrosion, oxidation, decomposition, or other effects of exposure.
 - 3. Stainless steel, aluminum brass, bronze, and plated finished metals (not zinc or cadmium).
 - 4. Finish hardware except prime-coated items, and fusible links, UL labels, nameplates, numbers, and identifying data.
 - 5. Walking surfaces.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 –Submittal Requirements.
- B. Literature: Manufacturer’s specifications, technical data, installation methods, and maintenance instructions.
 - 1. Manufacturer's data sheet for each product proposed, including statements on the suitability of the material for the intended use.
 - 2. Technical and performance information that demonstrates compliance with the system performance and material requirements.
 - 3. Paint manufacturer's instructions and recommendations on surface preparation and application.
 - 4. Colors available for each product (where applicable).
 - 5. Compatibility of shop and field applied coatings (where applicable).
 - 6. Material Safety Data Sheet for each product proposed.
- C. Warranty: Submit a copy of the warranty.
- D. Certifications
 - 1. Certification by the Architectural Coatings manufacturer that the Architectural Coatings provided are suitable for, and compatible with, the required installation.
 - 2. Certification of manufacturer qualifications demonstrating compliance with the qualifications requirements indicated. Include a list of 5 similar completed projects with addresses of the project location, date of project completion, manufacturer’s products, and contact information of the consultant firm of record, general contractor, and owner.

3. Certification of installer qualifications demonstrating compliance with the qualifications requirements indicated. Include a list of 5 similar completed projects with addresses of the project location, date of project completion, and contact information of the consultant firm of record, general contractor, and owner.
 4. Certification by the manufacturer's field representative that surfaces have been prepared and the products have been applied in accordance with the manufacturer's recommendations.
- E. Application Schedule: Furnish a detailed and complete application schedule indicating location and detail of installation.
- F. Samples: When requested by the ARCHITECT submit samples of the materials proposed. Samples shall be clearly marked to show the manufacturer's name, product identification, finish and color. New samples shall be resubmitted of each, as required, until approved by the ARCHITECT. Upon approval, the samples shall become the standard for acceptance for the project with regard to color, finish and quality of each item. Approval of samples shall not relieve the CONTRACTOR from compliance with the Contract Documents.
1. Color samples and stain samples shall be submitted as required by the ARCHITECT. Stain samples shall be provided on the same substrate as the stain will be applied in the final installation.
 2. Samples of paint, finishes, and other coating materials shall be submitted on 8-1/2 inch by 11-inch sheet metal. Each sheet shall be completely coated over its entire surface with one protective coating material, type, and color.
 3. Two sets of color samples to match each color selected by the ARCHITECT from the manufacturer's standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples furnished by the ARCHITECT. The color formula shall be shown on the back of each color sample.
 4. One 5 pound sample of each abrasive proposed to be used for surface preparation for submerged and severe service coating systems.
- G. Upon completion of the project, the CONTRACTOR shall furnish one gallon or quart of each type and color of paint, depending on quantity used on the project.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility
1. Types or system of Architectural Coatings shall be provided by a single manufacturer, each.
- B. Manufacturer Qualifications
1. Architectural Coatings manufacturer shall have a minimum of 10 years of manufacturing experience.
 2. Architectural Coatings manufacturer shall have a minimum of 10 similar successful projects over the most recent 10 years, employing similar products, materials, applications, and performance requirements.

3. Manufacturers without these qualifications will not be accepted.

C. Installer Qualifications

1. Installer shall have a minimum of 5 years experience in the successful completion of at least 5 projects of similar size and scope, employing similar products, materials, applications, and performance requirements.
2. Installer shall be trained, certified, and authorized by the manufacturer to install the manufacturer's product, when applicable.
3. Installers without these qualifications will not be accepted.

D. Manufacturer's Technical Field Representative: The CONTRACTOR shall arrange for a manufacturer's technical field representative to be on Site for at least 1 day, beginning at the start of surface preparation and continuing through application, to train the installers and to supervise the Work. The manufacturer's technical field representative shall observe as necessary to certify in writing that the completed Work has been performed according to the manufacturer's instructions.

E. Field Sample

1. Coordinate field sample with other field samples required in other Sections.
2. Prior to installation, erect sample wall panel mock-up on-site using materials and joint details required for final Work. Provide special features as directed.
3. Field sample shall not exhibit any deterioration of color or finish of the substrate, including but not limited to darkening, staining, streaking, and fading.
4. Apply material in accordance with the requirements in Part 3 – Execution, below.
5. Manufacturer's technical field representative shall be present to review technical aspects of the field sample installation.
6. Obtain the ARCHITECT'S acceptance of qualities of field sample before installation. Modify and/or reconstruct field sample at the direction of ARCHITECT until acceptance. Retain field sample during construction as a standard for judging completed Work. Do not alter, move, or destroy field sample until directed by the ARCHITECT.
7. Acceptance of field sample shall not relieve the CONTRACTOR from compliance with the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Suitability: The CONTRACTOR shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the Site.
- B. Compatibility: In any coating system only compatible materials from a single manufacturer shall be used in the WORK. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

- C. Containers: Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, and name of manufacturer, all of which shall be plainly legible at the time of use.
- D. Colors: Colors and shades of colors of coatings shall be as indicated or selected by the ARCHITECT. Each coat shall be of a slightly different shade to facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the ARCHITECT.
- E. To the maximum extent practicable and, unless otherwise approved by the ARCHITECT, each paint shall be factory-mixed to the specified color, gloss, and consistency required for application.
- F. All mil thicknesses provided in this Section are to be confirmed and shall comply with Coating Manufacturer's written recommendations.
- G. Finish hardware shall be removed prior to painting and finishing and reinstalled upon completion.
- H. In no case shall paint application exceed the paint manufacturer's published coverage rate based upon unthinned material. In the event that paint has been extended beyond the recommended coverage, or the "hide" produced is inadequate, as determined by the ARCHITECT, the CONTRACTOR shall apply one or more additional coats as determined by the ARCHITECT. The manufacturer's recommended amount of thinner shall not be exceeded. Unless otherwise approved, finish coat material shall be applied as taken from manufacturer's container.
- I. Paint finishes shall be even, of uniform color, and free from cloudy or mottled appearance in surfaces and evident thinness of coatings.
- J. Metal items in partitions and ceilings such as registers, grilles, and similar items shall be painted to match finish of room or area in which they occur, unless directed otherwise by the ARCHITECT.
- K. Painted doors opening into rooms or spaces having different finishes or colors shall have the edges finished as directed by the ARCHITECT. Closet and storage room doors shall be finished on both sides to match the room into which they open.
- L. Mechanical and Electrical Work:
 - 1. Areas behind grilles, baffles, ventilators, and louvers: exposed surfaces, not factory finished, visible from inside and outside of the building shall be painted with appropriate primers and one coat of black semi-gloss (low sheen) enamel paint far enough to conceal such areas and spaces when looking towards them from the floor and ground levels.
 - 2. All conduit and piping shall be painted to match the adjacent substrate or equipment to which the are installed.

2.2 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
1. Solvent Cleaning (SSPC SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
 2. Hand Tool Cleaning (SSPC SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.
 3. Power Tool Cleaning (SSPC SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
 4. White Metal Blast Cleaning (SSPC SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.
 5. Commercial Blast Cleaning (SSPC SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.
 6. Brush-Off Blast Cleaning (SSPC SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.
 7. Near-White Blast Cleaning (SSPC SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.
 8. Surface Preparation of Concrete (SSPC-SP13): Removal of protrusions, laitance and efflorescence, existing coatings, form-release agents, and surface contamination by detergent or steam cleaning, abrasive blasting, water jetting, or impact or power tool methods as appropriate for the condition of the surface and the requirements of the coating system.
- B. Ferrous Metal: Galvanized. Galvanized metal surfaces shall be cleaned to remove grease, oil, and other deleterious matter per SSPC-SP1. Non hydrocarbon based solvents, mildly acidic, should be used according to the manufacturer's directions for removal of oils greases. Hydrocarbon based solvents are not acceptable. Shop painted ferrous metal surfaces that show rusting when initially installed shall be touched up with a rust inhibitor. Rust inhibitor shall meet the requirements of MIL-M-10578B for Phosphoric Acid rust inhibitor, and shall be applied only after wire brushing to a sound surface, and then coated with a compatible universal primer.
1. Remove any sharp, protruding defects in the galvanized surface such as that commonly found on edges and holes with suitable tools. Remove all protruding defects that can lead to coating holidays
 2. Remove deposits of zinc reaction by-products, such as wet storage stain, by hand and power tool cleaning as specified in SSPC SP 2 or 3.
 3. Sweep-blast (brush-blast) galvanized surfaces in accordance with 5.4.1 of ASTM D6386 and the applicable portions of SSPC-SP7.
 - a. The sweep-blast shall be relatively light (relative to sweep-blasting of steel) so as not remove excessive amounts of zinc from the galvanized surface.
 - b. The sweep-blast shall remove zinc oxides, passivation layers or treatments, and other surface contaminants from the galvanizing as well as profile the surface

- c. The sweep-blast shall impart to the galvanized surface an anchor profile of 1.0 to 1.5 mils and the peak density should be sufficiently dense to provide a uniform appearance and so that none of the original galvanized surface remains unprofiled. Perform the sweep-blast in a manner that does not result in disbonding and flaking (leafing) of the galvanizing. To achieve the desired profile with minimal galvanizing loss and to mitigate damage to galvanized surface, reduce blast pressures (relative to abrasive blasting of steel), angle the blast (30 to 45 degrees to the surface), increase blast distances, and/or select suitable abrasive.
- d. Remove all abrasive, dust, and paint residue from galvanized steel surfaces. Control environmental conditions and apply primer after Inspector's examination, and before oxidation of the surface that could limit adhesion occurs. Only prepare enough surface area that can meet the surface preparation requirements and be coated in the same 8 - 10 hour shift.
- e. Pretreatment coatings of surfaces shall be in accordance with the printed recommendatiosn of the coating manufacturer.

C. Ferrous Metal: Ungalvanized

- 1. The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included at the end of this Section. Where there is a conflict between these requirements and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.
- 2. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast-cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.
- 3. Oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 - Solvent Cleaning prior to blast cleaning.
- 4. Sharp edges shall be rounded or chamfered, and burrs and surface defects and weld splatter shall be ground smooth prior to blast cleaning.
- 5. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular product and service conditions. Abrasives for submerged and severe service coating systems shall be clean, hard, sharp cutting crushed slag. Automated blasting systems shall not be used for surfaces that will be in submerged service. Metal shot or grit shall not be used for surfaces that will be in submerged service, even if subsequent abrasive blasting will use hard, sharp cutting crushed slag.
- 6. Abrasive shall not be reused unless an automated blasting system is used for surfaces that will be in non-submerged service. For automated blasting systems, clean oil-free abrasives shall be maintained. The abrasive mix shall include at least 50 percent grit.
- 7. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.
- 8. Compressed air for air blast cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil and moisture separators that remove at least 95 percent of the contaminants.
- 9. Surfaces shall be cleaned of dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.

10. Enclosed areas and other areas where dust settling is a problem shall be vacuum-cleaned and wiped with a tack cloth.
11. Damaged or defective coating shall be removed by the blast cleaning to meet the clean surface requirements before recoating.
12. If the required abrasive blast cleaning will damage adjacent WORK, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC SP2 or SSPC SP3 may be used.
13. Shop-applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC SP1 before the abrasive blast cleaning has been started.
14. Shop primed equipment shall be solvent-cleaned in the field before finish coats are applied.

D. Masonry and Concrete to be Painted: Surfaces of masonry and concrete to be painted shall be dry and free of dust, dirt, grease, oil, and other foreign matter such as loose or granular material. Holes, cracks, joints, and any surface defects shall be repaired and filled out flush and smooth with appropriate products, except where a priming coat may be recommended first by the manufacturer of the paint. Glaze and loose particles shall be removed by wire brushing. No evidence of curing compounds, release agents and the like will be acceptable.

1. Surface preparation shall not begin until at least 30 Days after the concrete or masonry has been placed.
2. Oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC SP1 before abrasive blast cleaning.
3. Concrete, cured in place concrete, previously coated concrete or concrete block, and deteriorated concrete surfaces to be coated shall be abrasive or shot blast cleaned per SSPC SP13/NACE 6 to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface. Reference ICRI 310.2 for acceptable "Concrete Surface Profile."
 - a. Thin Film (0-15 mils): CSP 1-2
 - b. Medium Film (15-40 mils): CSP 3-5
 - c. Thick Film (40 mils – 1/8"): CSP 4-6
4. Concrete block surfaces, exposed, with no previously placed coatings shall have all loose mortar, surface contaminants, and any foreign materials which would inhibit the adhesion of applied coatings, removed by mechanical means or pressure wash cleaning. Surfaces shall be allowed to dry. Moisture content of the substrate shall not exceed manufacturer's specified requirements.
5. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8. Acid etching shall only be used on horizontal surfaces where the specified coating system is 15 mils dft or less.
 - a. Acid etching process shall conform to ASTM D4260.
 - b. Acid etched surfaces shall be properly neutralized per ASTM D4262 prior to the application of specified thin film coating system.

6. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.
7. Repair all surface irregularities including bugholes, fins, protrusions, cracks, deteriorated concrete using manufacturer's recommended repair materials.
8. Unless required for proper adhesion, surfaces shall be dry prior to coating. Refer to manufacturer acceptable levels of moisture. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal. Moisture content of the substrate shall not exceed manufacturer's specified moisture content for applied coatings.

E. Plastic, Fiberglass and Nonferrous Metals

1. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.
2. Non-ferrous metal surfaces shall be solvent-cleaned SSPC SP1 followed by sanding or brush-off blast cleaning SSPC SP7.
3. Surfaces shall be clean and dry prior to coating application.

F. Backpainting: Prior to installation, back surfaces of wood trim and finish that will be concealed after installation, including trims, exposed grounds, and paneling shall be painted. On painted and enameled WORK, the CONTRACTOR shall use the same primer as for exposed surfaces. Work to receive a natural finish shall be backpainted with one coat of spar varnish. Backpainting shall be omitted on casework and cabinets that are completely factory finished under other sections.

2.3 SYSTEMS

A. System 1 - Epoxy/Polyurethane

1. Materials

Primer type	rust-inhibitive, 2 component epoxy
VOC Content, max	250g/L
Finish type	2 component aliphatic polyurethane
VOC Content	250 g/L, max
Demonstrated suitable for	ferrous surfaces, superior color and gloss retention, exceptional resistance to weathering, chemical fumes, and splash; Steel Doors and Frames, Exposed Steel Beams/Joists/Trusses, Exposed Secondary Framing members, Exposed Metal Deck, Steel Lintels, and Associated Connections. All exposed HVAC Ducts and associated components.

2. Application and manufacturers

Surface Preparation	Prime Coat	Finish Coat (DFT=2-5 mils per coat)	Total System DFT
SSPC SP 2, SP 3	Tnemec Hi-Build Epoxoline II Series L69	Tnemec Endura-Shield Series 1075	6 - 10 mils plus primer
	Carboline Carbomastic 94	Carboline Carbothane 133 MC	
	Sherwin-Williams B58 Series Macropoxy 646	Sherwin-Williams B65 Series Hi-Solids Polyurethane	
	PPG/PMC Amerlock 2/400GFK	PPG/PMC Amershield VOC	

- a. Color exposed Structural elements: To be selected
- b. Color for Hollow Metal Door and Frames: To be selected
- c. Color for repainting of all existing to remain metal siding: To be selected from manufacturer's full range including color matching to adjacent new metal siding

B. System 2 - Acrylic, Gypsum Board

1. Materials

Primer type	as recommended by manufacturer
VOC content, max, g/L	200g/L
Finish type	single component, water based, acrylic, fungicide added
VOC content, max, g/L	200g/L
Demonstrated suitable for	Interior gypsum board

2. Application and manufacturers

Surface Preparation	Prime Coat (1.0 to 2.0 mils per coat)	Finish Coat (1.5 to 5 mils per coat)	Total System DFT
Clean, dry, smooth, sand	Tnemec Elasto-Grip 151-1051	Tneme-cryl Series 6	

joint compound smooth and feather edge	Carboline Sanitile 120	Carboline Carbocrylic 3359 DTMC	4-12 mils
	Sherwin-Williams ProMar 200 Interior Latex Primer B28W8200	For Flat Finish: Sherwin-Williams ProMar 400 Latex Flat B30W400 For Semi-Gloss: Sherwin-Williams ProMar 200 Latex Semi Gloss B31W02251	
	PPG Speedhide Interior Latex Sealer/Primer 6-2	For Flat Finish: PPG Speedhide Interior Latex 6-70 For Semi-Gloss: PPG Speedhide Interior Enamel Latex Semi-Gloss 6-500	

3. Color: PTD-1 TBD

a. PTD-2 TBD

b. PTD-3 TBD

4. Application and manufacturers, or equal

Surface Preparation	Prime Coat (3 to 3.5 mils per coat)	Finish Coat (0.8 to 1 mils per coat)	Total System DFT
Surfaces must be clean, dry, and free of oil, grease and other contaminants	Sherwin Williams Minwax 250 Interior Stain	Sherwin Williams Minwax Waterbourne Polyurethane Varnish	4 mils (varies based on recommended coats)
	PPG Olympic Premium Interior Oil Based Wood Stain 44500	PPG Olympic Interior Water based Polyurethane Clear 42786	

5. Color: TBD

C. System 4 – Acrylic Latex/Epoxy, Interior Concrete Block Masonry

1. Materials

Filler-Sealer Type	Acrylic Latex Block Filler for filling surface voids in porous concrete and masonry block on interior, dry, above-grade masonry surfaces
Primer	as recommended by manufacturer
VOC Content, g/L, max	250g/L

Finish Type	Waterborne Epoxy, non-yellowing, stain-, abrasion-, chemical-, and moisture-resistant
VOC Content, g/L, max	250g/L
Demonstrated suitable for	Interior concrete block masonry

2. Application and manufacturers

Surface Preparation	Prime Coat (Filler-Sealer)	Finish Coat (DFT = 2 - 6 mils per coat)	Total System DFT
SSPC SP13, Surfaces must be clean, dry, and free of oil, grease and other contaminants	Tnemec Series 130	Tnemec Series 113	6-12 mils plus primer
	Carboline Sanitile 100	Carboline Sanitile 255	
	Sherwin-Williams B25 Series Preprite Block Filler	Sherwin-Williams B73 Series Waterbased Tile-Clad Epoxy	
	PPG/PMC Pitt Glaze 16-90	PPG/PMC Pitt Glaze 16-551	

3. Color: TBD

A. System 5 – Acrylic Concrete Sealer

1. Materials

Finish Type	100% clear acrylic, single-component, solvent-free sealer
VOC Content, g/L, max	100g/L
Demonstrated suitable for	New and existing concrete surfaces
Primer	Cleaner/Degreaser As recommended by the manufacturer

2. Application and manufacturers

Surface Preparation	Prime Coat (Cleaner)	Finish Coat (1-2 coats)
SSPC SP13, Surfaces must be clean, dry, and free of oil, grease and other contaminants	Sherwin-Williams Cleaner/ Degreaser	Sherwin-Williams Concrete Sealer Wet Look, or equal

3. Color: Clear

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.
- B. Store materials carefully in accordance with the manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.
- C. Handle materials in strict accordance with manufacturer's written instructions.
- D. A list of all batch numbers shall be furnished to the ARCHITECT prior to the start of work.
- E. Stored paints and liquids shall be kept covered, and precautions shall be taken for the prevention of fire. Empty containers and paint-soiled or oily rags shall be removed from the Site at the end of each day's work. Paint thinner shall not be stored in a room scheduled to receive resilient flooring.

3.2 APPLICATION SCHEDULE

- A. The product shall be applied to areas indicated on the Finish Schedule.
- B. The product shall also be applied elsewhere, where indicated on the Contract Drawings.

3.3 PROJECT CONDITIONS

- A. Comply with manufacturer's written instructions for environmental conditions before, during, and after installation.
- B. Protect surrounding Work from damage that may result from operations under this Section.

- C. Protect against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial.
- D. No coating shall be applied in contradiction to manufacturer's written instructions.

3.4 INSPECTION

- A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the Work under this Section.
- B. Systems and components shall be inspected before installation.
 - 1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.
 - 2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.
- C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent Work.
 - 1. Examine substrates, areas, and conditions where the product will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed the product
 - 2. Surfaces to receive the product shall be dry, free of oil, dirt, dust and other contaminants and loose materials, and shall be in the proper condition as indicated by the manufacturer prior to the application of the surface applied water repellents materials.
 - a. Masonry, concrete, and cementitious products shall have been completely cured and the surface shall be dry and free from frost at the time of application.
 - 3. Notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.
 - 4. Commencement of the installation shall indicate acceptance by the CONTRACTOR of the substrate, areas, and conditions.

3.5 SURFACE PREPARATION

- A. Surface preparation shall be in compliance with the applicable references and with the manufacturer's written instructions.
- B. Coatings, including curing compounds, form release agents, and other substances shall be removed as recommended by the manufacturer.
- C. Substrate shall be swept to remove all loose materials prior to beginning application.

3.6 PREPARATION

- A. Sequence installation properly with the installation and protection of other Work, so that neither will be damaged by the installation of the other.

3.7 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with applicable references, and with manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ARCHITECT.
- B. Surfaces shall receive complete coats and rates as recommended in writing by the manufacturer.
- C. Paint shall not be applied in extreme heat, nor in dust or smoke laden air, nor in damp or humid weather.
- D. Drying times shall be not less than called for in manufacturer's printed instructions.
- E. Drop cloths shall be placed where required to protect floors and equipment from splatter and droppings.
- F. The CONTRACTOR shall apply complete paint system required for exposed surfaces behind permanent cabinets, cases, counters, and similar work before such items are installed.
- G. Unless otherwise indicated, paint materials shall be applied in strict accordance with the manufacturer's printed instructions. Spray painting is not allowed without specific approval in each case. Each coat shall be applied at proper consistency, and shall be free of brush or roller marks, sags, runs, or any other evidence of poor workmanship.
- H. The splattering of paint on glass, hardware, tile, trim, and other surfaces not to be painted will not be accepted. Masking shall be applied as required.
- I. The CONTRACTOR shall sand between all enamel coats.

3.8 CLEANING, FINISHING, AND PROTECTION

- A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.
 - 1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.
 - 2. Residue shall not be left on any surfaces.
 - 3. The surfaces of materials adjoining the product shall be cleaned free of overspray and smears of the product or other soiling due to the product operations.
 - 4. The CONTRACTOR shall carefully touch-up all abraded, stained, or otherwise disfigured painting work.

5. The CONTRACTOR shall maintain barricades and wet paint signs for duration of time needed.
- B. Upon completion of the application, the product and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ARCHITECT.
 1. Cleaning shall be performed again immediately prior to acceptance of the Work, when directed by the ARCHITECT.
 2. Cleaning shall be performed in accordance with the manufacturers written instructions.
 - C. The CONTRACTOR shall make adjustments required and retest until accepted by the ARCHITECT.
 - D. The product shall be protected from damage from subsequent construction operations.
 - E. Damaged or defective items shall be removed and replaced at the direction of the ARCHITECT, at no additional cost to the OWNER.
 1. Remove and replace defective Work, including the product that are warped, bowed, or otherwise unacceptable.
 - F. When the product Work is completed, remove unused materials, containers, and equipment, and clean the Site of surface applied water repellent debris.

3.9 COATING SCHEDULE

- A. Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated except for the following items which shall be coated only if required by other Sections: (1) Floor gratings and frames, (2) Handrails, (3) Stair treads, (4) Chain link fencing and appurtenances.
- B. Where isolated non-ferrous parts are associated with equipment or piping, the CONTRACTOR shall use the coating system for the adjacent connected surfaces. Do not coat handrails, gratings, frames or hatches. Only primers recommended by the coating manufacturer shall be used.

	Item	Surface Prep.	System No.
SYS 1	New Steel Doors and Frames, and All new Exposed Steel Beams/Joists/Trusses, Secondary Framing members, Metal Deck, Steel Lintels, and Associated Connections. All exposed HVAC Ducts and associated components.	Solvent cleaning SSPC SP1 followed by brush-off grade blast cleaning SSPC SP7	(1) Epoxy/ Polyurethane
SYS 2	All Interior Gypsum Board	Per manufacturer's printed instructions	(2) Acrylic
SYS	New Interior Wood Surfaces to be Stained	Per manufacturer's printed	(3) Stain/Varnish

3		instructions	
SYS 4	New Interior Concrete Masonry to be Painted	Per manufacturer's printed instructions	(4) Acrylic Latex/Epoxy
SYS 5	New Interior Concrete Floors to be sealed	Per manufacturer's printed instructions	(5) Acrylic Concrete Sealer

END OF SECTION 099100

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Section 101400 – BUILDING SIGNAGE

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide building signage and appurtenant WORK, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCES

- A. Where reference is made to any of the below, the revision in effect at the time of bid opening shall apply.
- B. Americans with Disabilities Act (ADA): ADA Accessibility Guidelines (ADAAG).
- C. Building Code: Refer to the Drawings to determine which Building Code applies. The applicable Building Code, defined by the Drawings, is referred to herein as “the CODE.”
- D. National Fire Protection Association (NFPA):
 - NFPA 704 Identification of the Hazards of Materials for Emergency Response
- E. Occupational Safety and Health Administration (OSHA).

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 013300 – CONTRACTOR Submittals.
- B. Literature: Manufacturer’s specifications, technical data, installation methods, and maintenance instructions, and the following:
 - 1. Manufacturer’s full range color charts, indicating custom color availability for color selection by ARCHITECT.
- C. Warranty: Submit a copy of the warranty.
- D. Certifications:
 - 1. Certification by the building signage Manufacturer that the building signage provided is suitable for, and compatible with, the required installation.
 - 2. Certification by the building signage Manufacturer that the building signage provided is suitable for, and compatible with, the substrates and surfaces indicated.
 - 3. Certification of Manufacturer qualifications demonstrating compliance with the qualifications requirements indicated.
 - 4. When requested by the ARCHITECT, furnish other certifications as may be required to demonstrate compliance with the Contract Documents.

- E. Shop Drawings: Complete Shop Drawings showing location and detail of installation.
 - 1. Shop Drawings shall be drawn to sufficient scale and shall include dimensions, show elevations and details of construction of each building signage type, schedule of building signage, mounting details, location and installation requirements, thickness of materials, joints, provisions for expansion and contraction, connections, accessories, and trim.
- F. Samples: The CONTRACTOR shall submit 2 samples of each of the following. Unless otherwise indicated, samples shall be full size and shall show gauges, configuration, construction, finish and color proposed for the various components. Samples shall be clearly marked to show the Manufacturer's name, product identification, finish and color. New samples shall be resubmitted of each, as required, until approved by the ARCHITECT. Upon approval, the samples shall become the standard for acceptance for the project with regard to color, finish, and quality of each item. Approval of samples shall not relieve the CONTRACTOR from compliance with the Contract Documents.
 - 1. Full-size sample of each typical building signage type.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Building signage Manufacturer shall have a minimum of 10 years of building signage manufacturing experience.
 - 2. Building signage Manufacturers shall have the ability to print signs in Spanish.
 - 3. Manufacturers without these qualifications will not be accepted.

1.5 SPECIAL WARRANTY PROVISIONS

- A. Furnish Manufacturer's 15-year written warranty to cover defects in materials, products, and manufacturing workmanship.
 - 1. Warranty shall include coverage against chipping, fading, rusting, shattering, or peeling.
- B. Warranties shall be non-prorated for the entire warranty period.
- C. The term of the warranties shall begin on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Building signage shall be recommended by the Manufacturer for the installation indicated.
- B. Building signage shall be suitable for, and compatible with, the required installation.

- C. Building signage shall be suitable for, and compatible with, the substrates and surfaces indicated.

2.2 INTERIOR ROOM IDENTIFICATION SIGNS

- A. Signs shall be InForm Series by ASI-Signage, or approved equal.
 - 1. Signs shall consist of raised braille characters and conform to ADAAG.
 - 2. Signs shall be 3-inches by 10-inches, extruded engineered PVC/Acrylic alloy with integral colors, rounded corners, high impact resistance, and UV stabilized resins.
 - 3. Signs shall be solid integral color plaques with raised White lettering.
 - 4. Background color shall be: As selected from manufacturer's full range.
 - 5. Unless otherwise noted, all lettering shall be Helvetica Medium.
 - 6. Signs shall be mounted at 60" above the floor and located on the swing side (opposite the hinge side) of the door entering each room. For double doors, locate the room identification signs on adjacent wall to the right side of the door. The Contractor shall notify the ARCHITECT if there are any discrepancies in mounting locations and shall be located as directed by the ARCHITECT.

2.3 ADA BUILDING SIGNS

- A. Manufacturer and Product, or Equal:
 - 1. Subject to the requirements indicated, provide Manufacturer and product listed below, or equal.
 - a. Seton Identification Products; Economy Braille Signs
- B. Description:
 - 1. Signs shall be injected molded plastic with Grade 2 Braille.
 - 2. Signs shall be provided at all restrooms, exit doors, and stairwells.
 - 3. Signs shall be suitable for interior or exterior use, and resist UV light, dirt, and harsh chemicals.
 - 4. Signs shall be 6-inches wide by 9-inches tall with rounded corners. Colors, letters, and other aspects of the signs shall be in accordance with OSHA standards. If OSHA standards do not apply, the color shall be selected by the ARCHITECT, unless otherwise indicated.

2.4 MAXIMUM CAPACITY SIGNS

- A. Manufacturer and Product, or Equal:
 - 1. Subject to the requirements indicated, provide Manufacturer and product listed below, or equal.
 - a. Seton Identification Products; Maximum Occupancy

B. Description:

1. Signs shall be 10-inches by 14-inches, fiberglass signs.
2. Rooms that are indicated with an occupant load greater than 50 occupants as shown on sheet A001 Code Analysis shall be provided with a sign as follows:
 - a. Maximum Occupant Load: __ Persons
 - b. Signs shall be located as directed by the ARCHITECT.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in Manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.
- B. Store materials carefully in accordance with the Manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.
- C. Handle materials in strict accordance with Manufacturer's written instructions.

3.2 LOCATIONS

- A. Signage shall be installed at the locations indicated or as otherwise required by the CODE, ADAAG, NFPA 704, and OSHA. Where a conflict occurs between the requirements of this Section and the references herein, the more stringent shall apply, as directed by the ARCHITECT.
- B. Where not indicated, signs shall be installed as directed by the ARCHITECT.
- C. Signs shall be mounted 60-inches (1520-millimeters) above the floor, unless otherwise indicated.

3.3 PROJECT CONDITIONS

- A. Comply with Manufacturer's written instructions for environmental conditions before, during, and after installation.
- B. Protect surrounding WORK from damage that may result from operations under this Section.

3.4 INSPECTION

- A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the WORK under this Section.

- B. Systems and components shall be inspected before installation.
 - 1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.
 - 2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.
- C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent WORK.
 - 1. Examine substrates, areas, and conditions where building signage will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed building signage.
 - a. Provide inserts, backing, blocking, anchoring devices, and reinforcements that must be built into other WORK for the installation of building signage and appurtenances. Coordinate delivery with other WORK to avoid delay.
 - 2. Notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected in an acceptable manner.
 - 3. Commencement of the installation by the CONTRACTOR shall indicate CONTRACTOR'S acceptance of the substrate, areas, and conditions.

3.5 PREPARATION

- A. Sequence installation properly with the installation and protection of other WORK, so that neither will be damaged by the installation of the other.

3.6 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with applicable references, with the requirements of the CODE, nfpa 704, OSHA, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ARCHITECT.
- B. The CONTRACTOR shall provide corrosion resistant fasteners, anchors, and shims required for a complete installation, and shall be secure, plumb, level, straight, and true to line, allowing for required movement, including expansion and contraction.
- C. The CONTRACTOR shall provide separation of dissimilar materials to ensure no galvanic action occurs.
- D. Horizontal lines shall be level, and vertical lines shall be plumb.
- E. The CONTRACTOR shall block and reinforce walls as required to support building signage, and appurtenances.

3.7 CLEANING, FINISHING, AND PROTECTION

- A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.
 - 1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.
 - 2. Residue shall not be left on any surfaces.
- B. Upon completion of the installation, building signage and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ARCHITECT.
 - 1. Cleaning shall be performed again immediately prior to acceptance of the WORK, when directed by the ARCHITECT.
 - 2. Cleaning shall be performed in accordance with the Manufacturer's written instructions.
- C. Building signage shall be protected from damage from subsequent construction operations.
- D. The CONTRACTOR shall make adjustments required until accepted.
- E. The CONTRACTOR shall remove scratches and blemishes to the satisfaction of the ARCHITECT.
- F. Damaged or defective items shall be removed and replaced at the direction of the ARCHITECT.
- G. When building signage WORK is completed, remove unused materials, containers, and equipment, and clean the Site of building signage debris.

3.8 SIGN SCHEDULE

QUANTITY	ROOM NO.	SIGN WORDING	NOTES
?	Ext	No Smoking	To be located by Architect
?	Ext	No Smoking within 25 feet of the building	At all exterior entries
1	111	OFFICE	A
1	112	DATA	A
1	113	MECHANICAL	A
1	114	BEDROOM	A
1	115	RESTROOM (ADA)	A
1	116	BEDROOM	A
1	117	RESTROOM	A
1	118	BEDROOM	A
1	119	RESTROOM	A
1	120	BEDROOM	A

1	121	RESTROOM (ADA)	
1	122	BEDROOM	A
1	123	JANITOR	A
1	124	BADROOM	A
1	125	LAUNDRY	A
1	126	STORAGE	A
1	127	BEDROOM	A
1	129	FITNESS	A
1	130	DECON	A
1	131	BUNKER GEAR	A
1	132	WATER ENTRY	A
1	133	SCUBA	A
1	134	ELECTRICAL	A
1	135	GARAGE SUPPLY	A
1	140	SHOWER	

- A. Room Identification Signs shall be located near the entry door to a room or space and shall be consistently located throughout all rooms, when feasible, unless noted otherwise by the Architect.
- B. Additional Signs shall be provided as indicated in other parts above and as found in Section 101419 – Dimensional Letter Signage.

END OF SECTION 101400

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Section 101419 – DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide building signage and appurtenant WORK, complete and in place, in accordance with the Contract Documents.

1.2 SUMMARY

- A. This section includes the following:
 - 1. Dimensional letters of cast metal construction for interior and exterior application.
 - 2. Signage installation accessories.
- B. Intent: It is intended that the Architect will consult with the Owner and the signage subcontractor to establish a specific schedule of the various signs. The Subcontractor will be responsible to participate in the consultation with the Owner, developing and distributing the final shop drawings describing the requirements for the dimensional letter signage, furnishing the various signs and for installing the various signs. The Subcontractor shall furnish all mounting materials.

1.3 SUBMITTALS

- A. Product Data: Submit product data for specified products. Include material details for each sign specified.
- B. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- C. Samples: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- D. Closeout Submittals:
 - 1. Submit maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

1.4 QUALITY ASSURANCE

- A. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

- B. 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.
- C. Supplier: Obtain all products in this section from a single supplier.

1.5 PROJECT CONDITIONS

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
- C. Handle products in accordance with manufacturer's instructions.

1.7 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing sign letters.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which 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 deterioration of metal and finishes beyond normal weathering.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Building signage shall be recommended by the Manufacturer for the installation indicated.
- B. Building signage shall be suitable for, and compatible with, the required installation.

- C. Building signage shall be suitable for, and compatible with, the substrates and surfaces indicated.

2.2 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- B. SEPARATION OF DISSIMILAR METALS
 - 1. When products are installed in metal panel systems, the signage manufacturer shall ensure that proper separation of dissimilar metals has been installed. Manufacturer shall certify in writing that the recommended approach for this project application is appropriate.

2.3 DIMENSIONAL CHARACTERS

- A. Manufacturers, or equal:
 - 1. ACE Sign Systems, Inc. www.acesign.com.
 - 2. ASI Sign Systems: www.asisignage.com.
 - 3. Gemini, Inc. www.signletters.com.
- B. Cast Metal Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
 - 1. Character Material: Steel
 - 2. Letter Height (capital letters): As indicated on Drawings or as indicated in the schedule.
 - 3. Exterior Letter Thickness: 3-inches thick
 - 4. Interior Letter Thickness: 1-inch thick
 - 5. Font: As indicated on Drawings or as selected by Architect.
 - 6. Finish: Manufacturer standard primer with Painted top coat
 - a. Color: TBD
 - 7. Messages: As shown on the Drawings/Schedule.
 - 8. Mounting: 1-inch offset studs, non-corroding for substrates encountered.

2.4 ACCESSORIES

- A. Anchors and Inserts: Provide non-ferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use anchors as recommended by manufacturer for installation indicated.

2.5 FABRICATION – GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
- C. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
- D. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

2.6 FINISHES, GENERAL

- 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 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in Manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.
- B. Store materials carefully in accordance with the Manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.
- C. Handle materials in strict accordance with Manufacturer's written instructions.

3.2 LOCATIONS

- A. Where not indicated, signs shall be installed as directed by the ARCHITECT.

3.3 PROJECT CONDITIONS

- A. Comply with Manufacturer's written instructions for environmental conditions before, during, and after installation.
- B. Protect surrounding WORK from damage that may result from operations under this Section.

3.4 INSPECTION

- A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the WORK under this Section.
- B. Systems and components shall be inspected before installation.
 - 1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.
 - 2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.
- C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent WORK.
 - 1. Examine substrates, areas, and conditions where building signage will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed building signage.
 - a. Provide inserts, backing, blocking, anchoring devices, and reinforcements that must be built into other WORK for the installation of building signage and appurtenances. Coordinate delivery with other WORK to avoid delay.
 - 2. Notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected in an acceptable manner.
 - 3. Commencement of the installation by the CONTRACTOR shall indicate CONTRACTOR'S acceptance of the substrate, areas, and conditions.

3.5 PREPARATION

- A. Sequence installation properly with the installation and protection of other WORK, so that neither will be damaged by the installation of the other.

3.6 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with applicable references, with the requirements of the CODE, nfpa 704, OSHA, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ARCHITECT.

- B. The CONTRACTOR shall provide corrosion resistant fasteners, anchors, and shims required for a complete installation, and shall be secure, plumb, level, straight, and true to line, allowing for required movement, including expansion and contraction.
- C. The CONTRACTOR shall provide separation of dissimilar materials to ensure no galvanic action occurs.
- D. Horizontal lines shall be level, and vertical lines shall be plumb.
- E. The CONTRACTOR shall block and reinforce walls as required to support building signage, and appurtenances.

3.7 CLEANING, FINISHING, AND PROTECTION

- A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.
 - 1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.
 - 2. Residue shall not be left on any surfaces.
- B. Upon completion of the installation, building signage and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ARCHITECT.
 - 1. Cleaning shall be performed again immediately prior to acceptance of the WORK, when directed by the ARCHITECT.
 - 2. Cleaning shall be performed in accordance with the Manufacturer's written instructions.
- C. Signage shall be protected from damage from subsequent construction operations.
- D. The CONTRACTOR shall make adjustments required until accepted.
- E. The CONTRACTOR shall remove scratches and blemishes to the satisfaction of the ARCHITECT.
- F. Damaged or defective items shall be removed and replaced at the direction of the ARCHITECT.
- G. When building signage WORK is completed, remove unused materials, containers, and equipment, and clean the Site of building signage debris.

3.8 SIGN SCHEDULE

QTY	LETTERING	HEIGHT	LOCATION	NOTES
1	CASTLE ROCK FIRE STATION #152	18"	Exterior	A
1	CRFD LOGO	TBD	Exterior	A

1	MONUMENT SIGN	TBD	Exterior	B
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NOTE A: Exterior main façade signage-see plans for location and placement

NOTE B: Monument signage

END OF SECTION 101419

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SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel toilet compartments configured as toilet enclosures and urinal screens.

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.
 - 4. Show ceiling grid and overhead support or bracing locations.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.
- E. Product Certificates: For each type of toilet compartment, from manufacturer.
- F. Maintenance Data: For toilet compartments to include in maintenance manuals.

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: 25 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 toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Structural Requirements:
 - 1. Toilet partitions, including related assemblies, components, and attachment details shall comply with the CODE and shall be designed and installed for resistance to the structural design criteria indicated in the Contract Documents in accordance with the CODE. Where a conflict occurs between the requirements of this Section and the CODE, the more stringent shall apply.
 - 2. The CONTRACTOR shall provide additional non-standard bracing, reinforcements, anchors, and heavier gauge materials in order to conform to the structural design criteria indicated and to other performance requirements indicated.
 - 3. Toilet partitions shall be floor mounted, overhead braced.
 - 4. Urinal screens shall be wall-mounted type.
 - 5. Provide units complete with anchorages, reinforcements, and supporting framework for securing the toilet partitions and urinal screens to other WORK.

2.2 TOILET PARTITIONS AND URINAL SCREENS

- A. Manufacturer, or Equal:
 - 1. Subject to the requirements indicated, provide products from one of the Manufacturers listed below, or equal.
 - a. Global Steel Products Corporation.
 - b. Knickerbocker Partition Corporation.
 - c. Sanymetal.
- B. Description:

1. Steel sheets shall conform to ASTM A 591, Class C, galvanized-bonderized steel.
2. Units shall be provided with Manufacturer's standard sound deadening, double-faced honeycomb, impregnated kraft-paper core.
3. Units shall be flush construction, composed of 2 steel sheets pressure laminated and bonded to core, and shall be in thickness and gauge as indicated, with formed and reinforced edges. Provide with oval crown locking strip. Mitered and welded corners, with exposed welds ground smooth, finished to match panels and polished.
4. Provide units with cut-outs, drilled holes and internal reinforcement to support the required loads and to receive the required partition-mounted hardware, toilet accessories, and grab bars.
5. Partitions, screens, and doors: 1-inch thick (25.4 mm), 22 gauge steel sheets. Corners shall be secured with a formed stainless steel corner clip.
 - a. Provide units in sizes and configuration as indicated.
 - b. Urinal screens shall be 18-inches (45.7 cm) by 50-inches (127 cm) size, unless otherwise indicated. Provide with two continuous integral side angles for fastening.
6. Pilasters: 1 1/4-inch thick (31.75 mm), 18-gauge steel sheets. Pilasters shall be integrally rolled and shall be provided with concealed, full-galvanized, anchoring and leveling, support devices.
 - a. Provide stainless steel top trim piece, as indicated, finished to match hardware.
7. Accessories:
 - a. Accessories, including hardware, exposed fittings and fasteners, shall be Manufacturer's standard design, stainless steel, heavy duty, corrosion resistant operating hardware and accessories with polished chrome finish, unless otherwise indicated.
 - 1) Provide additional purse hooks on interior side of all toilet compartment doors.
 - b. Wall and pilaster brackets and stirrup brackets shall be Manufacturer's standard design for attaching panels to walls and to pilasters. Brackets shall be heavy extruded aluminum, heat-treated, etched and finished to match hardware.
 - c. Pilaster top trim pieces: One piece ASTM A 167, Type 302/304 stainless steel, 3-inches (76.2 mm) in height, minimum 29 gauge, finish to match hardware.
 - d. Doors shall be provided with the following hardware:
 - 1) Hinges – Concealed controlled gravity type, Sanymetal No. 7961 or equal. Set hinges on out-swing doors to be self-closing and to return to the fully closed position.
 - 2) Latch and Handle – Face material flush with edge locking strip with all working parts completely concealed within door thickness. Latch bolt-stainless steel exposed escutcheon plate and handle-chrome plated. Sanymetal No. 8800 or equal.
 - 3) Coat hook and bumper – Secured with machine screws attached into concealed reinforcements.
 - 4) Stop and keeper – One piece with rubber bumper through bolt flush mounted with pilaster surface to receive latch bolt.
8. Anchorages and Fasteners:
 - a. Manufacturer's standard exposed fasteners of stainless steel or brass, finished to match hardware. Use theft-resistant (one-way) type heads and nuts for exposed anchorages.
 - b. For concealed anchors use hot-dip galvanized steel.
 - c. Concealed Reinforcement for Anchorages: minimum 12 gauge.
 - d. Concealed Reinforcement for Tapping: minimum 14 gauge.

9. Handicapped Accessible Toilet Partitions:
 - a. Partition construction and anchors shall be adequately reinforced and supported to withstand loads imposed on partition supported grab bars.
 - b. Doors shall be swing out, self-closing type and shall provided minimum 36-inches clear opening.
 - c. Provide bumpers mounted on doors with means of preventing doors from swinging of more than 90 degrees.
 - d. Units shall comply with ADAAG and with the CODE.

2.3 FINISH

- A. Steel shall be galvanized and bonderized with nominal zinc coating on each side. Steel shall be cleaned and given one coat of baked-on, rust-resistant primer followed by an extra smooth finish coat of synthetic enamel. The coating shall be electrostatically applied and baked-on in a controlled, dust-free atmosphere.
- B. Baked Enamel Finish
 1. After fabrication and before applying enamel coating system, clean the galvanized steel surfaces to remove processing compounds, oils and other contaminants.
 2. Prime the metal with a baked-on rust-inhibiting primer.
 3. Apply two finish coats of thermosetting enamel, applied by the electrostatic process and baked in accordance with the paint Manufacturer's instructions.
- C. Color shall be selected and approved by the Owner from a color range including custom colors, and may be required to exactly match colors in other Sections, as determined by the Owner.
 1. Tentative color selection:
 - a. To be selected.
 2. The Owner reserves the option of changing this tentative color selection during the submittal process with no additional cost to the Owner.
 3. Final colors shall be selected and approved by the Owner prior to installation.

2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.

- D. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- E. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- F. Door Size and Swings: 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 designated as accessible.

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
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with brackets as recommended in writing by the manufacturer near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer 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 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. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

- E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware 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 SHOWER ACCESSORIES

PART 1 - GENERAL

1.1 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. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.
- D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.2 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.3 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.

1.4 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, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-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 ACCESSORIES SCHEDULE

- A. Refer to the Drawings for locations and quantities of item numbers indicated below:

Item Number	Description	Manufacturer Product / Model Number, or Equal
GB36	36-inch (91 cm) Grab Bar	BOBRICK MODEL B-6806.99 X 36
GB42	42-inch (107 cm) Grab Bar	BOBRICK MODEL B-6806.99 X 42
GB18	18-inch Grab Bar	BOBRICK MODEL B-6806.99 X 18
SMTP	Surface Mounted Toilet Paper Dispenser	BOBRICK MODEL B-2740
RPTWR-12	Recessed Paper Towel Dispenser – 12 Gallon Waste Receptacle	BOBRICK MODEL B-3974
SMSD	Surface Mounted Soap Dispenser	BOBRICK MODEL 818615

Item Number	Description	Manufacturer Product / Model Number, or Equal
MS	Mirror, Channel Frame (tempered glass)	BOBRICK MODEL B-165 2436
US	Utility Shelf with Mop/Broom Holder	BOBRICK MODEL B-239 X 34
TB	Surface-Mounted Towel Bar	BOBRICK MODEL B-673
RH	Robe Hook	BOBRICK MODEL B-671

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories 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 method in 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.

END OF SECTION 102800

SECTION 104400 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide fire extinguishers and appurtenant WORK, complete, in place, and operational in accordance with the Contract Documents.

1.2 REFERENCES

- A. Where reference is made to any of the below, the revision in effect at the time of bid opening shall apply.
- B. Building Code: Refer to the Drawings to determine which building code applies. The applicable building code, defined by the Drawings, is referenced herein as “the CODE”.
- C. National Fire Protection Association publications (NFPA):
 - NFPA 10 Standard for Portable Fire Extinguishers
- D. Underwriter’s Laboratories (UL)

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 013300 – CONTRACTOR Submittals.
 - 1. Literature: Manufacturer’s specifications, technical data, installation methods, and maintenance instructions.
 - 2. Certifications:
 - a. UL certification for each fire extinguisher unit provided.
 - b. Certification of Manufacturer qualifications demonstrating compliance with the qualifications requirements indicated.
 - 3. When requested by the ARCHITECT, furnish other certifications as may be required to show compliance with the Contract Documents.
 - 4. Shop Drawings: Complete Shop Drawings showing location and detail of installation. Shop Drawings shall include mounting and bracket details.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Fire extinguishers shall be provided by a single Manufacturer.

- B. Manufacturer Qualifications:
 - 1. Fire extinguisher Manufacturer shall have a minimum of 20 years of fire extinguisher manufacturing experience.
 - 2. Manufacturers without these qualifications will not be accepted.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Fire extinguishers, accessories, and installation shall comply with the CODE, NFPA 10, and with the Manufacturer's published recommendations and specifications.

2.2 FIRE EXTINGUISHERS:

- A. Manufacturer, or Equal:
 - 1. Subject to the requirements indicated, provide products from one of the Manufacturers listed below, or Equal.
 - a. J.L Industries, Inc.
 - b. Larsen's Manufacturing Co.
 - c. General Fire Extinguisher Co.
- B. Description:
 - 1. Unless noted otherwise, Fire extinguishers shall be 20 lb capacity, 20A:120BC (ABC), UL-rated, chemical multipurpose type.
 - a. Locate Fire extinguishers with a maximum of 75-feet travel distance between extinguishers, or as required by NFPA, whichever is more stringent. Preference shall be given to a location near the entry to the space if Fire Extinguishers (FE) are not otherwise located on the Drawings.
 - 1) Locate Fire extinguishers in vehicle garage, workshops, and storage spaces, extinguishers with a maximum of 50-feet travel distance between extinguishers, or as required by NFPA, whichever is more stringent. Preference shall be given to a location near the entry to the space if Fire Extinguishers (FE) are not otherwise located on the Drawings.
 - 2. Fire extinguishers in rooms or spaces containing energized electrical equipment, including but not limited to, electrical switchgear, motor control centers, variable frequency drives, generator rooms, etc., shall be 20 lb capacity 10 BC, UL-rated, carbon dioxide type.

- a. Locate Fire extinguishers with a maximum of 50-foot travel distance between extinguishers, or as required by NFPA, whichever is more stringent. Preference shall be given to a location near the entry to the space if Fire Extinguishers (FE) are not otherwise located on the Drawings.
3. Fire extinguishers in rooms containing combustible cooking media (oils and fats) shall be Type K, UL-rated type.
 - a. Locate Fire extinguishers with a maximum of 30-foot travel distance from the hazard, or as required by NFPA, whichever is more stringent. Preference shall be given to a location on the nearest wall adjacent to the cooktop or related appliance, if Fire Extinguishers (FE) are not otherwise located on the Drawings.
4. Fire extinguishers shall be provided with severe duty corrosion resistant finish, red enamel steel cylinders.
5. Fire extinguishers shall be provided with mounting brackets, which support the bottom and sides of extinguishers, and are specially designed for the extinguisher, as recommended in writing by the Manufacturer.

2.3 FIRE EXTINGUISHER CABINETS

- A. Unless noted otherwise, Fire extinguisher cabinets shall be ADA-compliant, Type 304 Stainless Steel, 2-1/2" Rolled Edge, Semi-Recessed Type.
 - a. In salt air and other corrosion-prone environments, cabinets shall be Clear Anodized Aluminum.
- B. Cabinets shall be mounted with its leading edge at or below 27" above finished floor and shall have a recessed handle.

2.4 ADDITIONAL EXTINGUISHERS

- A. Provide 3 additional ABC units and 3 additional BC units to be located as directed.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in Manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.
- B. Store materials carefully in accordance with the Manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.
- C. Handle materials in strict accordance with Manufacturer's written instructions.

3.2 LOCATIONS

- A. The CONTRACTOR shall verify the fire extinguisher locations and mounting heights on the Contract Drawings with the Fire Marshall before installation. If locations on the Drawings are not accepted by the Fire Marshal, install fire extinguishers where directed by the ARCHITECT.

3.3 PROJECT CONDITIONS

- A. Comply with Manufacturer's written instructions for environmental conditions before, during, and after installation.
- B. Protect surrounding WORK from damage that may result from operations under this Section.

3.4 INSPECTION

- A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the WORK under this Section.
- B. Systems and components shall be inspected before installation.
 - 1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.
 - 2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.
- C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent WORK.
 - 1. Examine substrates, areas, and conditions where fire extinguishers and appurtenances will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed fire extinguishers and appurtenances.
 - a. Provide inserts, backing, blocking, anchoring devices, and reinforcements that must be built into other WORK for the installation of fire extinguishers and appurtenances. Coordinate delivery with other WORK to avoid delay.
 - 2. Notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected in an acceptable manner.
 - 3. Commencement of the installation by the CONTRACTOR shall indicate CONTRACTOR's acceptance of the substrate, areas, and conditions.

3.5 PREPARATION

- A. Sequence installation properly with the installation and protection of other WORK, so that neither will be damaged by the installation of the other.

3.6 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with applicable references, the requirements of the CODE, with NFPA 10, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ARCHITECT.
- B. The CONTRACTOR shall block and reinforce walls as required to support the fire extinguishers and appurtenances.
- C. The CONTRACTOR shall provide corrosion resistant fasteners, anchors, and shims required for a complete installation, and shall be secure, plumb, level, straight, and true to line, allowing for required movement, including expansion and contraction.
- D. The CONTRACTOR shall provide separation of dissimilar materials to ensure no galvanic action occurs.
- E. Horizontal lines shall be level, and vertical lines shall be plumb.
- F. Secure mounting brackets and fire extinguishers to structure, square and plumb.

3.7 CLEANING, FINISHING, AND PROTECTION

- A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.
 - 1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.
 - 2. Residue shall not be left on any surfaces.
- B. Upon completion of the installation, fire extinguishers and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ARCHITECT.
 - 1. Cleaning shall be performed again immediately prior to acceptance of the WORK, when directed by the ARCHITECT.
 - 2. Cleaning shall be performed in accordance with the Manufacturer's written instructions.
- C. Fire extinguishers shall be protected from damage from subsequent construction operations.
- D. The CONTRACTOR shall make adjustments required until accepted.

- E. The CONTRACTOR shall remove scratches and blemishes to the satisfaction of the ARCHITECT.
- F. Damaged or defective items shall be removed and replaced at the direction of the ARCHITECT.
- G. When fire extinguishers WORK is completed, remove unused materials, containers, and equipment, and clean the Site of fire extinguishers debris.
- H. Fire extinguishers shall be inspected and certified within 30 days of Substantial Completion.

END OF SECTION 104400

SECTION 105143 - WIRE MESH STORAGE LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wire mesh storage lockers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Groves Inc. Ready Rack

2.2 MATERIALS

- A. Steel Wire: ASTM A510.
- B. Steel Plates, Channels, Angles, and Bars: ASTM A36/A36M.
- C. Steel Sheet: Cold-rolled steel sheet, ASTM A1008/A1008M, Commercial Steel (CS), Type B.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- E. Seismic Bracing: Angles with legs not less than 1-1/4 inch wide, formed from 0.040-inch-thick, metallic-coated steel sheet; with bolted connections and 1/4-inch-diameter bolts.
- F. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."
- G. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, complying with MPI#79.
- H. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.3 WIRE MESH STORAGE LOCKERS

- A. Unit Sizes:
 - 1. Width: 24 inches.
 - 2. Depth: 24 inches.
 - 3. Height: 60 inches.
- B. Mesh: 0.135-inch-diameter, intermediate-crimp steel wire woven into 1-by-2-inch rectangular mesh.
- C. Wall Panels: 1-1/4-by-1-1/4-by-1/8-inch steel angle framing on top, bottom, and back sides, and 3-by-1/8-inch cold-rolled steel flat bar framing on front side, with wire mesh welded to framing.
 - 1. Horizontal Panel Stiffeners: 1-1/4-by-1-1/4-by-1/8-inch steel angles or 3/4-by-1/4-inch hot-rolled steel flat bars.
- D. Backs: 0.034-inch-thick, metallic-coated steel sheet. Required for back-to-back units only.
- E. Doors: Fabricated from same mesh as wall panels, with framing fabricated from 1-1/4-by-1-1/4-by-1/8-inch steel angles on four sides with wire mesh welded to framing. Include padlock hasp.
 - 1. Horizontal Stiffeners for Single-Tier Doors: 3/4-by-1/4-inch steel flat bars.
 - 2. Hinges: Full-surface type, 2-1/2-by-2-1/2-inch steel, 1-1/2 pairs per single-tier door; bolted, riveted, or welded to door and jamb framing.
- F. Finish for Uncoated Ferrous Steel: Enamel or powder-coated finish unless otherwise indicated.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. General: Fabricate wire mesh storage lockers from components of sizes not less than those indicated. Use larger size components as recommended by wire mesh manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 - 1. Fabricate wire mesh storage lockers to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Wire Mesh Storage Lockers: Fabricate initial storage locker with front and two sides. Fabricate additional storage lockers as add-on units designed to share one side with initial storage locker.
 - 1. Fabricate wall panel and door framing with slotted holes for connecting adjacent panels.
 - 2. Prehang doors in factory.

2.5 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
- B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- D. Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard enamel or powder-coat finish, suitable for use indicated, with 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 WIRE MESH STORAGE LOCKERS ERECTION

- A. Anchor wire mesh storage lockers to floor with 3/8-inch-diameter expansion anchors at 12 inches o.c. through bottom panel framing. Shim panel framing as required to achieve level and plumb installation.
- B. Anchor wire mesh storage lockers to walls at 12 inches o.c. through back corner panel framing.
- C. Attach adjacent wire mesh storage lockers to each other through side panel framing.
- D. Install doors complete with door hardware.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly and easily without binding or warping. Adjust hardware to function smoothly. Confirm that hasps engage accurately and securely without forcing or binding.
- B. 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.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 105143

RFFFSECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide:
 - 1. Cone tapered aluminum flagpoles.
 - 2. Bases.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. LEED Building Design and Construction v3 Reference Guide 2009
- B. ASTM:
 - 1. B241 - Aluminum and Aluminum Alloy Seamless Pipe and Seamless Extruded Tubes
 - 2. C150 - Portland Cement

1.3 SUBMITTALS

- A. Product Data: Manufacturer's technical data and installation instructions for each type of flagpole required.
- B. Shop Drawings: Show general layout, jointing, complete anchoring and supporting systems.
- C. Samples: Each finished metal as requested.

1.4 QUALITY ASSURANCE

- A. Manufacturing Standards: Complete unit by single manufacturer, including fittings, accessories, bases, anchorage devices.
- B. Design Criteria: Withstand minimum 90-mph wind velocity when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height indicated.

1.5 PRODUCT HANDLING

- A. Spiral wrap with heavy Kraft paper or other protective wrapping, prepare for shipment in hard fiber tube or other protective container.
- B. Deliver completely identified for installation procedure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
1. American Flagpole Company, Lake Elmo, MN www.aflag.com
 2. Concord Industries, Inc. www.concordindustries.com
 3. Eder Flag Manufacturing Company
 4. Morgan-Francis Flagpoles www.morgan-francis.com

2.2 ALUMINUM FLAGPOLE

- A. Fabricate from seamless extruded tubing:
1. Comply with ASTM B241, alloy 6063-T6.
 2. Minimum wall thickness: 3/16-inch (0.188 inch).
 3. Tensile strength: Not less than 35,000 psi and yield point of 30,000 psi.
 4. Heat-treated, age-hardened after fabrication.
 5. Cone tapered aluminum flagpole.
 6. Height: 25 and 30 feet.
 7. Butt: 5 inches.
 8. Construct, ship to Site in 1 piece.
- B. Base: Illuminator Series Tilt Shoe Base.

2.3 FLAGPOLE MOUNTING

- A. 16-gage minimum galvanized corrugated steel tube, sized to suit flagpole and installation, complete with welded steel bottom base and support plate, lightning ground spike, steel centering wedges, all welded construction; loose hardwood wedges at top for plumbing pole after erection.
- B. Galvanize steel parts after assembly including foundation tube.
- C. Manufacturer's standard flash collar, finished to match flagpole.

2.4 SHAFT FINISH

- A. Fine, directional, mechanical satin polish (NAAMM-32).
- B. Buff; seal aluminum surfaces with clear, hardcoat wax.

2.5 FITTINGS

A. Finial Ball:

1. Manufacturer's standard flush seam ball.
2. Size as indicated, or if not indicated, to match pole butt diameter.
3. 14-gage spun aluminum.
4. Finished to match pole shaft.
5. 6-inch diameter.

B. Truck: Ball-bearing non-fouling, revolving, double-track assembly of cast metal, finished to match pole shaft.

C. Cleat: Internal spring action cam-cleat mounted inside the pole secured behind a reinforced cast aluminum locking access door.

D. Halyards:

1. Interior
2. Type:
 - a. 5/16-inch white nylon.

E. Halyard Flag Snaps: Two chromium-plated bronze swivel snaps per halyard set.

2.6 CONCRETE

A. Portland cement, coarse aggregate, fine aggregate and water.

B. Transit mixed in proportions to attain 28-day compressive strength of not less than 3,000 psi.

C. Use minimum 5 sacks portland cement, complying with ASTM C150, per cubic yard of wet concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation:

1. Excavate for foundation concrete to neat clean lines in undisturbed or recompact soil.
2. Provide forms where required due to other foreign matter from excavation.
3. Moisten earth before placing.

B. Concrete:

1. Refer to Structural Drawing.
2. Anchor bolts to be cast into poured concrete wall.

3. Place immediately after mixing.
4. Chute to avoid segregation of mix.
5. Set corrugated steel tube, lightning ground spike and support plate in concrete foundation structure.
6. Compact concrete in place by use of vibrators to consolidate.
7. Moist-cure exposed concrete for at least 7 days, or use non-staining curing compound in freezing weather.
8. Finish trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base perimeter.

C. Flagpole Installation:

1. Comply with final Shop Drawings, manufacturer's instructions.
2. Positive lightning ground for each installation.
3. Paint portions of ground-set Flagpole below grade with heavy coat of bituminous paint.
4. Insert flagpole in foundation sleeve; properly sleeve, align and shim, tamp sleeve full of dry sand to permanently hold flagpole in proper alignment. Remove shims, slide aluminum flash collar down over opening of foundation sleeve.

END OF SECTION 107500

SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Kitchen exhaust ventilation.
 - 3. Refrigeration appliances.
 - 4. Cleaning appliances.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Field quality-control reports.
- C. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Gas-Fuel Conversion: Provide gas-fueled appliances with manufacturer's high-altitude conversion kit installed by a qualified service agency according to manufacturer's written instructions for Project location and type of fuel.

1.6 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.

2.2 RANGES

- A. Gas Range: Freestanding range with two oven(s).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Wolf 60" Range Gas GR606DG.
 - 2. Gas Burners: Six burners and Infrared Dual Griddle.
 - 3. Anti-Tip Device: Manufacturer's standard.
 - 4. Material: Stainless steel

2.3 KITCHEN EXHAUST VENTILATION

- A. Overhead Exhaust Hood:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Wolf.
 - 2. Type: Wall-mounted, exhaust-hood system.
 - 3. Exhaust Fan: Variable-speed fan built into hood and with manufacturer's standard capacity.
 - a. Venting: As indicated on Drawings.
 - 4. Finish: Stainless steel.

2.4 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Samsung: RF263BEAESR
- 2. Type: Freestanding.
- 3. Storage Capacity:
 - a. Refrigeration Compartment Volume: 15.6 cu. ft..
 - b. Freezer Volume: 5.13 cu. ft..
- 4. General Features:
 - a. Dispenser in door for ice and cold water.
 - b. Interior light in refrigeration compartment.
 - c. Automatic defrost.
 - d. Interior light in freezer compartment.
 - e. Automatic icemaker and storage bin.
- 5. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
- 6. Front Panel(s): Stainless steel.

2.5 DISHWASHERS

- A. Dishwasher: Complying with AHAM DW-1.
 - 1. Jackson Avenger LT
 - 2. Type: Built-in undercounter.
 - 3. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 - 4. Front Panel: Stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After installation, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 113013

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnish and install horizontal roller solar scrim shades, manually and electrically operated, as scheduled. Provide dual shade system with both shade and blackout where scheduled.
- B. Furnish and install aluminum pocket housing for recessed installations.
- C. Furnish and install aluminum fascia/valance closure for surface-mounted or inside-jamb mount installations.

1.02 QUALITY ASSURANCE

- A. Reference Standards: Conform to the current requirements of applicable portions of standards, codes and specifications, except where more stringent requirements are shown or specified.
 - 1. Flame-retardant fabrics shall meet the applicable requirements of the National Fire Protection Association (NFPA) and as referenced herein.
 - 2. Applicable provisions of the codes referenced in Section 01 41 00, or as adopted by any jurisdiction with authority over this Project.
- B. Installation of window shades shall be by qualified personnel employed by firms specializing in work of this type, with a minimum of five (5) years successful experience in projects of similar size, complexity, and type of application.
- C. Sustainability Compliance: Refer to Section 01 35 66 for submittal and documentation requirements.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature indicating specifications, installation of window shades, method of attachment, clearances and operation and hardware.
- B. Samples: Submit samples of manufacturer's full color and fabric lines for selection by the Architect.
- C. Sustainability Submittals:
 - 1. Product Data or other documentation from material manufacturer indicating percentages, by weight, of post-consumer and pre-consumer recycled content. Include statement of material costs for each product having recycled content, excluding labor costs for installation.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver window shades to site wrapped in a manner to prevent damage to components or marring of surfaces.
- B. Store in a clean, dry area, laid flat and blocked off ground to prevent sagging, twisting or warping.
- C. Interior temperature shall be maintained between 60° and 90° F during and after installation, and relative humidity shall not exceed 80%.

1.05 WARRANTIES

- A. Provide manufacturer's standard written three (3) year warranty covering defects in materials and workmanship.

PART 2 PRODUCTS

2.01 ROLLER SOLAR SCRIM SHADES

- A. General: Roller type window shades to provide filtered solar control, consisting of fabric, roller mechanism, accessories and trims for manual and electronic operation as scheduled in Part 4 of this Section.
 - 1. Size(s): As indicated in Part 4 of this Section for aluminum storefront (wood) window systems.
 - 2. Single Window Size(s): Unit width shall match width of each individual window. Match exposure over frames at end conditions.
 - 3. Paired Window Size(s): Unit widths shall match width of each pair of windows. Match exposure over mullions at end conditions as applicable.
 - 4. Continuous Storefront Window Systems: Unit widths shall match width of each section of fixed aluminum storefront window system. Provide maximum 1/2" separation between installed window shade units, to be centered on mullions of storefront window system, except where inside jamb mounting is specified. Match exposure over mullions at end conditions as applicable.
- B. Shade Fabric: Vinyl-coated polyester, complying with applicable ASTM standards. Provide manufacturer's flame-retardant fabrics meeting requirements of NFPA 01 flame retardancy tests.
 - 1. Pattern: Radiance, E Screen by Insolroll, as basis of design. Double shade system with both shade and blackout. Provide where scheduled.
 - 2. Color: To be selected by the Architect from manufacturer's full line of standard colors. Outside (exterior) to be reflective aluminized finish. One (1) color shall be used throughout the project.

3. Openness Factor: 5% typical; 3% at west-facing walls.
- C. Blackout Shade Fabric: Vinyl-coated polyester, complying with ASTM D1925. Provide manufacturer's flameretardant fabrics meeting requirements of NFPA 01 flame retardancy tests.
1. Pattern: Classico Dual-Sided Collection blackout shade fabric by Lutron, as basis of design.
 2. Color: To be selected by the Architect from manufacturer's full line of colors. Outside (exterior) to be reflective aluminized finish. One (1) color shall be used throughout the project.
- D. Roller Mechanism: Manufacturer's standard assembly for window size(s) required.
1. Direction of Roll: Regular.
- E. Mounting:
1. Surface-mounted over face of aluminum storefront framing or window casings, with no pocket enclosure.
 2. Inside-jamb mount for individual wood windows.
- F. Operation: Refer to Part 4 Schedules at the end of this Section.
1. Manual.
 2. Electronic. Provide manufacturer's standard wall-mounted 2-position wall switch.
- G. Accessories: Metal roller-type chain retainer clip. Plastic clip-type is not acceptable.
- H. Sustainability Design Criteria:
1. Credits MR 4.1 and 4.2, Recycled Content: No minimum requirement, but Contractor to provide information on recycled content.
- I. Approved Models and Manufacturers:
1. Mecho/5 by MechoSystems, Long Island, NY, 11101, (718) 729-2020, as basis of design.
 2. Insolroll Window Shading Systems, Louisville, CO, (800) 447-5534.
 3. Lutron Shading Solutions, Coopersburg, PA, (888) 588-7661.
 4. Lu-Tek Inc., Arvada, CO (800) 580-4041.

5. Hunter Douglas, Pearl River, NY, (800) 789-0331.
6. Manufacturers providing products of same design, function, performance, quality and appearance are acceptable.

2.02 PREFABRICATED METAL POCKET HOUSING ASSEMBLIES

- A. General: Provide manufacturer's standard prefinished, prefabricated extruded aluminum roller shade pocket assemblies, size, construction and accessories to be compatible with the specified roller shade(s).
- B. Material: Extruded aluminum 6063-T5 alloy.
- C. Recessed Shade Pocket Housing: Extruded aluminum housing with pocket bottom closure and end caps, manufacturer's standard thickness but capable of supporting edge clips of suspended acoustical ceiling systems.
- D. Surface-Mounted or Inside-Jamb Mounted Shade Pocket Housing: Extruded aluminum housing with fascia and end caps, manufacturer's standard thickness.
- E. Finish: Manufacturer's standard satin anodized aluminum finish, dark bronze.
- F. Sustainability Design Criteria:
 1. Recycled Content: 60% minimum.
- G. Approved Manufacturers: Pocket housings shall be furnished and fabricated by the same manufacturer as the specified roller shade assemblies.

PART 3 EXECUTION

3.01 PREPARATION

- A. Installer shall inspect the window and/or door openings and substrates to receive window coverings and notify the Contractor of any conditions that may potentially affect the proper installation and operation of the window coverings. Do not proceed with installation until such conditions have been corrected to the satisfaction of the Installer.
- B. Field verify necessary measurements of windows scheduled to receive pleated shade installation.
- C. Ensure that adequate blocking is provided for installation of window blind system head track assemblies. Refer to Section 06 10 00, Rough Carpentry, and/or Section 09 22 16, Non-Structural Metal Framing, as applicable.
- D. Ensure that cutouts and preparatory work are correctly done.

3.02 INSTALLATION

- A. General: Install window shades, accessories and operating hardware in accordance with manufacturer's written instructions and recommendations.
- B. Adjust hardware and operable parts to ensure proper operation.
- C. Clean all window shades, head track assemblies and valance trims.

PART 4 SCHEDULES

4.01 INSTALLATION SCHEDULE

- A. Install roller solar scrim shades, manually operated, in the following locations:
 - 1. Offices 105G, 105F, PRGM 108, LT 109, LT 110, Dining 151
- B. Install dual roller solar scrim/blackout shades, manually operated, in the following locations:
 - 1. Bunk 122, 124, 126, 127, 128, 129, 130, 131, 132, 134, 135, 137, 138
- C. Shades are not required at the following locations:
 - 1. Fitness Room.
 - 2. Doors and sidelites at entries and vestibules.
 - 3. All interior doors, sidelites and windows.
- D. Quantities are the responsibility of the Installer. Consult with Architect as necessary.

END OF SECTION 122413

SECTION 123661 - SIMULATED STONE COMPONENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid-surface-material countertops and backsplashes.
 - 2. Solid-surface material window sills.

1.2 ACTION SUBMITTALS

- A. Product Data: For solid-surface materials
- B. Shop Drawings: Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 COUNTERTOPS AND SILLS

- A. Configuration: Provide countertops with the following front and backsplash style:
 - 1. Front: Straight, slightly eased at top
 - 2. Backsplash: Straight, slightly eased at corner
 - 3. Endsplash: Matching backsplash
- B. Countertops and Sills: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.
- C. Backsplashes: 3/4-inch- (19-mm-) thick, solid surface material.
- D. Cutouts and Holes:
 - 1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.

- b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
 - c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.
2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.2 SOLID-SURFACE MATERIALS

- A. Certified Wood Materials: Fabricate countertops with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Composite Wood and Agrifiber Products: Provide products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- C. Particleboard: ANSI A208.1, Grade M-2.
- D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- E. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 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. Caesarstone
 2. Type: Provide Standard Type made from material complying with requirements for Standard Type, as indicated unless Special Purpose Type is indicated.
 3. Colors and Patterns (Basis-of-Design):
 - a. Restroom 105B, 105D, Exam 103, Restroom 112, Restroom 113 (SS1)
Caeserstone:
 - a. Color: Clamshell 4130
 - b. Finish: Polished

- b. Window sills throughout (SS2)
Caeserstone:
 - c. Color: Shitake 4230
 - d. Finish: Polished
- c. K'ette 104, Laundry 116 , Kitchen150 (SS3)
Caeserstone:
 - a) Color: Lagos Blue 4350
 - b) Finish: Polished
- d. Staff Bathrooms 121,123, 136, 140, 142, 144, 146, 202 (SS4)
Caeserstone:
 - e. Color: Eggshell 3141
 - f. Finish: Polished

2.3 ADHESIVES, SEALANTS, AND ACCESSORIES

- A. General: Use only adhesives formulated for solid-surface materials and recommended by their manufacturer for the application indicated.
- B. Water-Cleanable Epoxy Adhesive: ANSI A118.3
 - 1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal, W. R. Company.
 - b. Bonstone Materials Corporation.
 - c. C-Cure.
 - d. Custom Building Products.
 - e. Laticrete International, Inc.
 - f. MAPEI Corp.
 - g. Summitville Tiles, Inc.
 - 3. Color: Clear
- C. Sealant for Solid-Surface materials: Manufacturer's standard sealant of characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants" and will not stain the material it is applied to.
 - 1. Single-component, neutral-curing silicone sealant
 - 2. Color: Clear
 - 3. Use sealants that have a VOC content of 250g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- D. Joint Splines: Stainless-steel or brass washers approximately 1 inch (25 mm) in diameter and of thickness to fit snugly in saw-cut kerf in edge of units.
- E. Cleaner: Cleaner specifically formulated for solid-surface material types, finishes, and applications indicated, as recommended by producer and, if a sealer is specified, by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- F. Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by producer for application indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik Findley Inc.
 - b. Custom Building Products.
 - c. Hillyard, Inc.
 - d. HMK Stone Care System.
 - e. Miracle Sealants Company.
 - f. Stone Care International Inc.
 - g. Summitville Tiles, Inc.

2.4 FABRICATION, GENERAL

- A. Select material for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
 - 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Fabricate Solid-Surface materials in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.
 - 1. Dress joints straight and at right angle to face, unless otherwise indicated.
 - 2. Cut and drill sinkages and holes in material for anchors, supports, and attachments.
 - 3. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
 - 4. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased, unless otherwise indicated.
 - 5. Finish exposed faces to comply with requirements indicated for finish of each type required and to match approved Samples and mockups. Provide matching finish on exposed edges of Solid-Surface materials, splashes, and cutouts.

- C. Carefully inspect finished units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates indicated to receive Solid-Surface materials and conditions under which Solid-Surface materials will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of Solid-Surface materials.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by countertop Installer for anchoring Solid-Surface materials. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Clean dirty or stained surfaces by removing soil, stains, and foreign materials before setting. Clean material by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow material to dry before installing.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches (1.5 mm in 1200 mm).
- B. Variation from Level: Do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch (6 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
- D. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- E. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch (0.4-mm) difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION OF SOLID-SURFACE MATERIALS

- A. General: Install solid-surface materials over plywood subtops, unless otherwise indicated, with full spread of water-cleanable epoxy adhesive or as recommended in writing by the manufacturer.
- B. Do not cut in field, unless otherwise indicated. If solid-surface materials require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.
- C. Set solid-surface materials to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure solid-surface materials in place.
- D. When Joints are indicated: Space joints with 1/16-inch (1.5-mm) gap for filling with sealant. Use temporary shims to ensure uniform spacing.
 - 1. Install metal splines in kerfs in material edges at joints where indicated. Fill kerfs with sealant before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that solid-surface materials are properly aligned and joints are of specified width.
- E. Complete cutouts not finished in shop. Mask areas of solid-surface materials adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut material. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- F. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive and to countertops with adhesive. Mask areas of solid-surface materials adjacent to joints to prevent adhesive smears.
- G. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch (1.5-mm) gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.
- H. Apply sealant to gaps specified for filling with sealant; comply with Division 07 Section "Joint Sealants." Remove temporary shims before applying sealant.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean Solid-Surface materials as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Remove and replace Solid-Surface materials of the following description:

1. Broken, chipped, stained, or otherwise damaged material. Material may be repaired if methods and results are approved by Architect.
 2. Defective Solid-Surface materials.
 3. Defective joints, including misaligned joints.
 4. Interior Solid-Surface materials and joints not matching approved Samples and mockups.
 5. Interior Solid-Surface materials not complying with other requirements indicated.
- C. Replace in a manner that results in Solid-Surface materials matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- D. Clean Solid-Surface materials not less than six days after completion of installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage material.
- E. Sealer Application: Apply sealer to comply with producer's and sealer manufacturer's written instructions.

END OF SECTION 123661

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SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roll-up mats

1.2 SUBMITTALS

A. Contractor shall comply with the requirements of Section 013300 – Submittal Requirements

B. Product Data: For each type of floor mat and frame.

C. Shop Drawings: Show the following:

1. Items penetrating floor mats and frames.
2. Divisions between mat sections.
3. Perimeter floor moldings.

D. Samples: For each floor mat, tread rail, and frame member.

E. Maintenance data.

1.3 QUALITY ASSURANCE

A. Accessibility Requirements: Provide installed floor mats that comply with Sections 302 and 303 in ICC A117.1.

PART 2 - PRODUCTS

2.1 ROLL-UP MATS

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

1. American Floor Products Company, Inc.
2. ARDEN Architectural Specialties, Inc.
3. Balco, Inc.
4. Cactus Mat Mfg. Co.
5. K. N. Crowder Manufacturing, Inc.
6. C/S Group.

7. Durable Corporation.
8. J. L. Industries, Inc.
9. Kadee Industries, Inc.
10. Matco International.
11. Musson, R. C. Rubber Co.
12. Pawling Corporation; Architectural Products Division.
13. Reese Enterprises, Inc.

B. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails 2 inches wide by 3/8 inch thick, sitting on continuous vinyl cushions.

1. Tread Inserts: 1/4-inch- high, 28-oz./sq. yd. weight, level-cut, nylon-pile, fusion-bonded carpet.
2. Colors, Textures, and Patterns of Inserts: As selected by Architect from manufacturer's full range.
3. Hinges: LDPE (low noise).

2.2 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

B. Coat surfaces of aluminum frames that will contact cementitious material with manufacturer's standard protective coating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

3.2 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124813