

BERKELEY COUNTY HEALTH DEPARTMENT ADDITION AND ALTERATIONS

VOLUME 2 DIVISIONS 2 through 12 TECHNICAL SPECIFICATIONS

CRA PROJECT NO. 3702

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary of Work" for use of premises and Owner-occupancy requirements.
 - 2. Division 1 Section "Temporary Facilities & Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities and environmental-protection measures for selective demolition operations.
 - 3. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
 - 4. Divisions 23 and 26 for demolishing, cutting, patching, or relocating mechanical and electrical items.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to the Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner that may be encountered during selective demolition remain the Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.
 - 1. Before demolition and throughout construction, all Prime Contractors shall be responsible to review with the Owner's, all items being removed by their trades. All items designated during this review to remain the Owner's property, shall be maintained in good condition and turned over to the Owner.

1.5 SUBMITTALS

- A. Qualification Data: For Contractor.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of proposed dust and noise-control temporary partitions and means of egress.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 6. Means of protection for items to remain and items in path of waste removal from the building.
 - 7. Use of elevators and stairs.

Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

- C. Pre-demolition Photographs or Recordings: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that specializes in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

- A. The Owner will occupy portions of the building immediately adjacent to the selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Comply with requirements specified in Division 1 Section "Summary of Work."
- B. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner as far as is practical.
 - 1. Before selective demolition, the Owner will remove the following items:
 - a. Free standing sheds in the parking lot.
 - b. Tower components above the concrete slab. Demolition of the concrete slab is in the contractors scope of work.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Architect and Owner. The Owner will remove the hazardous materials under a separate contract, or request a proposal to remove the hazardous materials.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

- F. All Contractors shall be responsible for verification of all existing building dimensions and conditions, including finishes and materials, systems shown and designated as existing on the Contract Drawings prior to starting demolition and construction. Any discrepancies in information indicated on the Contract drawings shall be directed in writing to the attention of the Architect prior to the start of demolition and construction. Verification of clearances required for all new equipment, piping, ductwork and related components shall be the Contractor's responsibility.
- G. All Contractors shall patch, repair or replace all existing finishes and materials disturbed or damaged during demolition. All repair or replacement shall match adjacent existing and/or new finishes and materials as indicated.
- H. See Architectural, Structural, Mechanical, Electrical and Plumbing drawings for demolition work required. Coordinate all Work by other Contractors, including, but not limited to, capping and disconnection of building services.
- I. Existing conditions as appear in these Contract Documents may vary with actual conditions because of undocumented work performed by Owner's staff and by other contractors.
- J. All Contractors shall be responsible for verification of all demolition conditions related to accepted Alternate bids, including finishes and materials, systems shown and designated as existing or new on the Contract Drawings prior to starting of demolition and construction. Any discrepancies in information indicated on the Contract Drawings shall be directed in writing to the attention of Architect prior to starting demolition and construction.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine the extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Engage a professional engineer to survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, or preconstruction videotapes.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproductions.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary of Work."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. The Owner will arrange to shut off indicated services/systems when requested by the Contractor. The Contractor may make these arrangements if approved by the Owner.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition, provide temporary services/systems that bypass the area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where an entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities & Controls"
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective `demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities & Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Reuse of Building Elements: Do not demolish building elements beyond what is indicated in the Contract Documents without Architect's approval.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area on-site.
 5. Protect items from damage during storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete at junctures with construction to remain, using power-driven saw. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

- E. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 7 Sections for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories as indicated in the demolition and renovation notes.
- F. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.
- G. Refer to the drawings for additional demolition work if any for each room or building component.
- H. Prepare existing remaining substrates to receive new finishes as indicated on the finish schedule. Preparation of substrates shall be in conformance with the installation requirements of each new finish.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 – CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Semirigid joint fillers.
 - d. Vapor-retarder and barrier installation.
 - e. Anchor rod and anchorage device installation tolerances.
 - f. Cold and hot weather concreting procedures.
 - g. Concrete finishes and finishing.
 - h. Curing procedures.
 - i. Forms and form-removal limitations.
 - j. Shoring and reshoring procedures.
 - k. Methods for achieving specified floor and slab flatness and levelness.
 - l. Floor and slab flatness and levelness measurements.
 - m. Concrete repair procedures.
 - n. Concrete protection.
 - o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
 - p. Protection of field cured field test cylinders.

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1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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. Steel-fiber reinforcement content.
 - 10. Synthetic micro-fiber content.
 - 11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 - 12. Intended placement method.
 - 13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.

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8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders and vapor barriers.
12. Repair materials.

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

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
2. Admixtures:
 - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

E. Preconstruction Test Reports: For each mix design.

F. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

1.7 QUALITY ASSURANCE

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

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage

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1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. 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.
- D. 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.

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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.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 36, smooth, galvanized steel bars, cut true to length with ends square and free of burrs.
- B. Zinc Repair Material: ASTM A 780/A 780M.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, Type I/II.
 2. Fly Ash: ASTM C 618, Class F.
 3. Slag Cement: ASTM C 989/C 989M, Grade 120.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

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1. Maximum Coarse-Aggregate Size: 1 inch nominal, typical.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94/C 94M.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fibrillated Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.
1. Available Products
 - a. Fibrillated Fibers:
 - 1) Euclid Chemical Company; Fiberstrand F.
 - 2) Grace Construction Products, W.R. Grace & Co.; Grace Fibers.
 - 3) Propex Concrete Systems; Fibermesh, 300.
- B. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.
1. Available Products
 - a. Grace Construction Products: Strux 90/40
 - b. Propex Concrete Systems: Fibermesh 650
 - c. Euclid Chemical Company: TUF-Strand SF

2.6 VAPOR RETARDERS AND BARRIERS

- A. Vapor Retarder: A 10 mil vapor retarder with a permeability of 0.04 perms or lower when tested in accordance with ASTM E 96; meeting or exceeding the requirement of ASTM E 1745 Class A; and wherein the vapor retarder component (plastic) is no less than 10 mils thick in accordance with ACI 302.1 R-96, and consists of multi-layer extruded virgin polyolefin plastic. Ungraded

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polyethylene sheet is not acceptable. Include companion joint tape, mastic, and accessory materials.

1. Available products include:
 - a. Stego Wrap “10A” (10 mil) by Stego Industries LLC.
 - b. Griffolyn 10 Mil Green by Reef Industries.
 - c. Perminator 10 by W.R. Meadows

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.8 RELATED MATERIALS

- A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

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- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 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, according to ACI 301.
1. Use a qualified independent 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: 25 percent by mass.
 2. Slag Cement: 50 percent by mass.
 3. Limit total percentage of portland cement substitutes to 50 percent by mass.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement, typical.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use high-range water-reducing 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, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. All normal weight concrete except slabs-on-grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated at 28 days.

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2. Slump Limit: 5 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
3. Air Content:
 - a. At exterior exposed conditions. 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 - b. All other conditions: No air entrainment required.

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

1. Minimum Compressive Strength: As indicated at 28 days.
2. Slump Limit: 5 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
3. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
4. Synthetic Micro Fiber: As indicated.
5. Synthetic Macro Fiber: As indicated.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Secure facilities for storage, initial curing, and field curing of test samples, including continuous electrical power.
 - 4. Security and protection for samples and for testing and inspection equipment at Project site.

3.3 FORMWORK INSTALLATION

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

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- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.4 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.5 INSTALLATION OF VAPOR RETARDER AND VAPOR BARRIER

- A. Sheet Vapor Retarders and Vapor Barrier: Place, protect, and repair sheet vapor retarder or barrier in accordance with ASTM E1643 and manufacturer's written instructions.
 - 1. Install vapor retarder/barrier with longest dimension parallel with direction of concrete pour.
 - 2. Face laps away from exposed direction of concrete pour.
 - 3. Lap vapor retarder/barrier over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder/barrier to concrete.
 - 4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
 - 5. Terminate vapor retarder/barrier 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/barrier manufacturer's instructions.
 - 7. Protect vapor retarder/barrier during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder/barrier material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install bond-breaking polyethylene strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend bond-breaking polyethylene strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

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2. Terminate full-width bond-breaking polyethylene 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 bond-breaking polyethylene strips in lengths as long as practicable. Where more than one length is required, overlap pieces a minimum of six inches.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items 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. Do not add water to concrete during delivery, at Project site, or during placement unless withheld at the plant as indicated on delivery ticket and approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. 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 (ACI 301M).
 - 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 (150 mm) 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.

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- E. 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.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish:
 - a. Perform no later than one day after form removal.
 - b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
 - c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
 2. Grout-Cleaned Rubbed Finish:
 - a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
 - b. Do not clean concrete surfaces as Work progresses.
 - c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.

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- d. Wet concrete surfaces.
 - e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish:
- a. Mix 1 part portland cement to 1 part fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint.
 - b. Mix 1 part portland cement and 1 part fine sand with sufficient water to produce a mixture of stiff grout. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
 - c. Wet concrete surfaces.
 - d. Compress grout into voids by grinding surface.
 - e. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screeding Concrete:
- 1. Act of striking off surface of concrete to pre-determined grade conforming to elevations shown on Drawings shall be accomplished with use of rigid screed guides. Use of wet screed guides is to be avoided on elevated surfaces.
 - 2. At elevated placements, metal deck and other formwork continues to deflect for short period after strike off. Subsequent re-straightening of surface often moves concrete paste from over beams into resulting depressions. It is suggested that Contractor plan for initial slab thickness of design depth plus 1/8 in (3mm) (minimum). Intent shall be to satisfactorily plan for sufficient material to re-straighten slab surface and still maintain specified slab thickness and adequate cover over reinforcing steel.
 - 3. Contractor shall include in his bid any additional concrete required to achieve specified slab surface finish tolerance. Finish floor tolerances shall be as specified elsewhere in this section.
 - 4. Cast-in-Place Concrete Framing System(s):
 - a. Grade for strike off shall be set at predetermined distance above top surface of formwork.
 - b. Minimum slab thickness, as specified on Drawings, shall be maintained throughout slab surface.
 - c. It is anticipated that occasional Local Areas may be identified where actual deflection of formwork during concreting operations differs from that anticipated

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by Contractor. At such isolated areas, modify procedures by one or combination of following:

- 1) Modify formwork camber where possible.
- 2) Where over deflection of formwork occurs, maintain concrete slab design thickness at each end of affected beams and increase slab thickness at mid-span by amount of over deflection experienced.

5. Concrete on metal Deck over Steel Framing System:

- a. Grade for strike off shall be set at redetermined distance above top surface of steel floor members.
- b. It is anticipated that occasional areas will be identified where actual deflection of steel beams during concreting operations differs from that anticipated by Engineer. At such locations, modify procedures by one or combination of following:
 - 1) Residual Camber and concrete placement: Modify fabricated camber in shop where possible for subsequent member placements having same conditions. Where this is not possible, maintain initial thickness at mid-span and increase slab thickness at each end of beam by $\frac{1}{2}$ of amount of residual camber. In case of beam with $\frac{1}{2}$ in (12 mm) of residual camber, slab thickness at ends of this beam only might be increased by $\frac{1}{4}$ in (6 mm).
 - 2) Over-Deflection of Beam during concrete placement: Modify fabricated camber where possible for subsequent member placements having same conditions. Where this is not possible, two options are suggested:
 - a) Option 1: Attach loose shore to underside of this beam only at midspan. Leave initial gap below shore equal to beam camber. As beam deflects during concrete placement, shore will halt deflection at desired point.
 - b) Option 2: Maintain initial concrete slab thickness at each end of this beam only and increase slab thickness at mid-span by amount of over deflection experienced.
- c. Provide benchmark on each column for use by finishers as guide when they are completing finishing in these areas. It is suggested that mark be placed at predetermined distance above design grade for use by finishers in the removal of excess material as needed.

C. 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 (6 mm) in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

D. Float Finish:

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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 (ACI A117M) tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

E. 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 or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155 (ASTM E1155M), for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
 - 2) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.
 - 3) Specified overall values of flatness, F_F 45; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 24.
 - 4) Specified Overall Value (SOV): F_F 50 and F_L 25 with minimum local value (MLV): F_F 40 and F_L 17.
 - 5) Specified Overall Value (SOV): F_F 25 and F_L 20 with minimum local value (MLV): F_F 17 and F_L 15.
 - b. Suspended Slabs:
 - 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
 - 2) Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.
 - 3) Specified overall values of flatness, F_F 45; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 24.

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8. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- F. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- G. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. 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. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 3. Cast anchor-bolt insert into bases. 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.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

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- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) 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.
- D. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) 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 (300-mm).
 - 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

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sides and ends lapped at least 12 inches (300 mm), 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 (300 mm).
 - 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 (300 mm), 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.

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- a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - 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 (150 mm) 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 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.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

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- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without

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coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 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: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 2. 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.

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- 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. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Post-installed anchor installation.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to 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.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; 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.
 5. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure one set of six 4 x 8 cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M.
 - a. 4 x 8 Specimens: Test two laboratory-cured specimens at 7 days and one set of three specimens at 28 days. Test one specimen at 56 days if required.
 - b. A compressive-strength test shall be the average compressive strength from a set of specimens obtained from same composite sample and tested at age indicated.
 8. 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.

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9. 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.
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 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: 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 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 according to ASTM E 1155 within 48 hours of finishing.

3.15 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 042000 - UNIT MASONRY (ASSEMBLIES)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Face brick.
4. Mortar and grout.
5. Reinforcing steel.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

- B. Related Sections include the following:

1. Division 3 Section "Cast-In-Place Concrete"
2. Division 5 Section "Metal Fabrications"
3. Division 5 Section "Structural Steel Framing"
4. Division 6 Section "Rough Carpentry"
5. Division 6 Section "Sheathing"
6. Division 7 Section "Sheet Metal Flashing and Trim"
7. Division 7 Section "Fire-Resistive Joint Systems"
8. Division 7 Section "Joint Sealants"
9. Division 8 Section "Hollow Metal Doors and Frames"

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

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

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

1.1 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified, to comply with requirements in Division 1 Section "Submittals".
- B. Pre-installation Coordination Drawings: In accordance with Division 1 Section "Project Coordination", prepare drawings to coordinate the unit masonry assemblies with the Work of other trades. Coordination drawings shall be reviewed by all Prime Contractors at the Masonry Pre-Installation Conference. Coordination items include, but are not limited to the following:
 1. Sizes and locations of all masonry openings, coordinated with items installed by other trades, both interior and exterior, i.e., louvers, grilles, doors and windows, scuppers, etc. At a minimum, coordination drawings must show ALL required openings through the finished exterior building masonry.
 2. Locations of all expansion and control joints.
 3. Locations of all in-wall rainwater conductors and outlets through the wall.
 4. Locations of all piped sleeves and other foundation penetrations.
- C. Shop Drawings: In accordance with Division 1 Section "Submittals", prepare and submit shop drawings including details of the following, at a scale of not less than 3" = 1'-0".
 1. Locations and types of lintels.
 2. Indicate required horizontal and vertical reinforcing and horizontal masonry bond beams.
 3. Fabricated flashing details, sections and installation methods including, but not limited to, through-wall base flashings, sill flashings, head flashings, low roof/high wall flashings, cap flashings, corner flashings, end dam flashings, stepped flashings and 2-piece flashing assemblies.
 4. Locations and detailed methods of attachment to supporting structural items and systems.
 5. Submit details and installation methods incorporating special shape units.
 6. Submit documentation of constructability issues related to design, installation methods, applicable building codes, fire-rating and/or compatibility conditions. Accompany documentation with the most recent Technical Standards published by the International Masonry Institute, National Concrete Masonry Association, Brick Industry Association and the product manufacturer's printed recommendations.
 - a. Compatibility Reports: Certification from foamed-in-place polyurethane insulation manufacturer indicating insulation is chemically and adhesively compatible with all adjoining cavity wall assembly materials including, but not limited to, membrane and metal flashing materials, sealants, backer rods, masonry reinforcing, masonry ties, gaskets and similar materials. List all materials, if any, which may be damaged by coming into contact with foamed-in-place insulation, either by short-term or long-term contact. Refer to Division 7 Section "Foamed-In-Place Insulation."
- D. Samples for Initial Selection of the following:

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

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

1.2 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1093 to conduct the testing indicated, as documented according to ASTM E548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, through one source from a single manufacturer and manufacturing plant.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Testing Service: Owner to engage a qualified independent testing agency to perform tests in compliance with applicable codes.
- E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per Applicable Code by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- F. Sample Panels: Prior to installation of above grade unit masonry, build sample panels, using single wythe veneer materials selected for the completed Work. Build sample panels for each type of veneer masonry in sizes approximately 48 inches long by 48 inches high by full unit thickness.
 - 1. Locate panels in the locations indicated or, if not indicated, as directed by Architect.
 - 2. Clean exposed faces of panels with masonry cleaner indicated.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.
 - b. Demolish and remove sample panels when directed.

- G. Mockup Panels: Prior to installation of above grade unit masonry, allowing sufficient time for construction and approval, build mockup panels, using materials and products indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build mockup panels for each type of unit masonry assembly in sizes of full assembly thickness by approximately 72 inches long by 72 inches high or larger to accommodate all necessary components.
 1. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 2. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.
 3. Provide masonry opening with installed aluminum window frame, steel lintel, sill and associated blocking, air-barrier and flashing as detailed in the drawings and as specified in this Section.
 4. Include metal coping, roof edge fascia, gutters, *thru-wall* overflow roof scupper and associated blocking and fasteners as detailed in the drawings and as specified in Division 7 Section "Sheet Metal Flashing and Trim."
 5. Omit portions of veneer, sill, coping, fascia and aluminum frame in order to provide viewable "*cut-away*" areas and items of construction ordinarily hidden behind finished wall construction. Coordinate with Architect prior to Mockup Panel construction.
 6. Build mockups for the following types of unit masonry assemblies in sizes required by full assembly thickness, including face veneer, cavity, backup and accessories. Include a sealant-filled vertical joint at least 16 inches long in each mockup.
 - a. Exposed unit masonry veneer with unit masonry backup assembly.
 - b. Exposed unit masonry veneer with metal stud backup assembly.
 - c. Other assemblies incorporating unit masonry backup and claddings as specified in related sections including but not limited to, metal panel systems and exterior insulation finish system.
 - d. Sealants as specified in Division 7 Section "Joint Sealants."
 7. Clean exposed faces of mockups with masonry cleaner as indicated.
 8. Protect accepted mockups from the elements with weather-resistant membrane.
 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 10. Approval of mockup panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; incorporation of specified and detailed products and

accessories and other material and construction qualities specifically approved by Architect in writing.

- a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

11. Demolish and remove mockups only when directed by Architect.

- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.3 DELIVERY, STORAGE, AND HANDLING

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

1.4 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

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

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for ALL INTERIOR outside corners.
 3. Provide single score units where indicated.
- B. Concrete Masonry Units: ASTM C90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi (MPa).
 2. Weight Classification: Normal weight.
 3. Size (Width): Manufactured to the following dimensions:

- a. 4 inches nominal; 3-5/8 inches actual.
 - b. 6 inches nominal; 5-5/8 inches actual.
 - c. 8 inches nominal; 7-5/8 inches actual.
 - d. 10 inches nominal; 9-5/8 inches actual.
 - e. 12 inches nominal; 11-5/8 inches actual.
 - f. 14 inches nominal; 13-5/8 inches actual.
 - g. 16 inches nominal; 15-5/8 inches actual.
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
- C. Decorative Concrete Masonry Units: ASTM C90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi (MPa).
 2. Weight Classification: Normal weight.
 3. Size: Manufactured to dimensions indicated.
 4. Finish: Exposed faces matching color, pattern, and texture of Architect's samples.
 - a. Normal-weight aggregate, ground finish.
 - b. Normal-weight aggregate, textured finish.
 - 1) Provide units made with aggregate matching aggregate in Architect's sample.
 5. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen. Provide test results to Architect.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Block Plus W-10; Addiment Inc.
 - 2) Dry-Block; W. R. Grace & Co., Construction Products Division.
 - 3) Rheopel; Master Builders.
 6. Field Applied Water Repellent: Where required by Decorative Concrete Masonry Unit manufacturer, provide field applied water repellent, subject to compliance with requirements of masonry manufacturer.
 7. Color and Texture: As a minimum standard of quality, this specification is based on the products indicated below:
 - a. Ground Face CMU (unfilled units): Trenwyth Industries Color Group A: Raven Stone.
 - b. Textured Masonry: Trenwyth Industries Mesastone: Color Group B: Stoneybrook.
 - c. Split Face CMU: York Building Products YBP-631-8 inches x16 inches x 4 inches

8. 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, the following:

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

2.2 BRICK

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

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

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

1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

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

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.

2. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C67.

3. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."

4. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C67 with no observable difference in the applied finish when viewed from 10 feet.

5. Size: Manufactured to the following actual dimensions:

a. Standard Brick: 3-1/2 to 3-5/8 inches thick by 2-1/4 to 2-3/8 inches high by 7-1/2 to 7-5/8 inches long.

6. Color and Texture: As a minimum standard of quality, this specification is based on the products indicated below:

- a. Brick color to match the existing building. Architect to select color from the manufacturers entire selection range.
7. Manufacturers: Available Products: Subject to compliance with requirements, product that may be incorporated into the Work include, but are not limited to, the following:
- a. Glen-Gery Corp.
 - b. Redland Brick, Inc.
 - c. Endicott, Inc.
 - d. General Shale, Inc.
 - e. U. S. Brick

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.
- D. Aggregate for Mortar: ASTM C144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C404.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer as that used in the concrete masonry units (Section 2.C.5.a).
- H. Water: Potable.
- I. Available Products: Subject to compliance with requirements and suitability as reviewed by the Engineer, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Colored Portland Cement-Lime Mix:
 - a. Eaglebond; Blue Circle Cement.
 - b. Color Mortar Blend; Glen-Gery Corporation.
 - c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.

- d. Centurion Colorbond PL; Lafarge Corporation.
- e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
- f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).

2. Mortar Pigments:

- a. True Tone Mortar Colors; Davis Colors.
- b. Centurion Pigments; Lafarge Corporation.
- c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

3. Water-Repellent Admixture:

- a. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
- b. Mortar Tite; Addiment Inc.
- c. Rheopel; Master Builders.

2.4 REINFORCING STEEL

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

2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A951 and as follows:

- 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
- 2. Wire Size for Side Rods: W1.7 or 0.148 inch diameter unless otherwise noted.
- 3. Wire Size for Cross Rods: W1.7 or 0.148 diameter unless otherwise noted.
- 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c. Truss type shall not be used in vertically reinforced unit masonry walls.

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

- 1. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches o.c. and with separate adjustable veneer ties engaging the cross ties. Crossties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face. Unless otherwise indicated, install in first and second courses above finished floor and in alternating back-up masonry courses thereafter.
 - a. Use where indicated and where horizontal joints of facing wythe do not align (1-1/4 inches or less) with those of backup wythe.
 - b. Use where facing wythe is of different material than backup wythe.

- c. Provide #270 Adjustable Ladder Eye-Wire Anchor System by Hohmann & Barnard, Inc., or equal product.
2. Adjustable (3-piece) type with ladder type reinforcement at back-up wythe which includes an extended cross rod. A vertical rod is hooked onto the extended cross rod and extends down to and behind the cross rod of the next lower truss type unit. An adjustable vee tie is hooked around the vertical rod for placement into the mortar joint of the face veneer.
- a. Use where indicated and where horizontal joints of facing wythe do not align (greater than 1-1/4 inches) with those of the back-up wythe.
 - b. Provide Tie-HVR Anchor System by Hohmann & Barnard, Inc., or equal product.

2.6 TIES AND ANCHORS, GENERAL

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

2.7 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME OR LINTELS

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section: Crimped 1/4 inch diameter, hot-dip galvanized steel wire anchor section for welding to steel.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25 inch diameter, hot-dip galvanized steel wire.

2.8 ANCHORS FOR CONNECTING TO SUBSTRATES

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. X-Seal® Veneer Anchors with VBT-Vee Byna-Tie by Hohmann & Barnard, Inc., or equal product.

2. X-Seal® Anchor shall be coordinated to details and/or conditions for the appropriate length to accommodate cavity width from face of rigid insulation to the masonry veneer and to include the appropriate connection interface to the anchor substrate, pronged legs to match insulation thickness so that prongs abut the steel studs, and/or at masonry the face of the substrates. Provide appropriate stainless steel self-drilling self-tapping screws and gasketed seal tape by Hohmann & Barnard, Inc., or equal product.
3. 2-Seal Byna-Lok Wire Tie shall be coordinated to details and conditions for metal stud wall construction for the appropriate length to accommodate cavity width from face of rigid insulation face to the masonry veneer and to include the insulation thickness and sheathing thickness so that the anchor barrel abuts the metal studs. The anchor barrel has a dual-barrel #12 self-drilling shaft with factory-installed EPDM washers to seal both the face of the insulation and the air barrier. The Byna-Lok Wire Tie is 9 gauge or 3/16 wire, anchors spaced at 16 inches x 16 inches directly into metal studs by Hohmann & Barnard, Inc., or equal product.
4. Veneer Anchors #345-SV at sill blocking and #345-BT at jamb blocking spaced and secured at 16 inches o.c. horizontally and vertically. Coordinate details and/or conditions for the appropriate length to accommodate cavity width from face of rigid insulation and/or wood blockings and/or concrete masonry back-up face to the masonry veneer and to include the appropriate connection interface to the anchor substrate. Provide appropriate stainless steel self-drilling self-tapping screws. Hohmann & Barnard, Inc., or equal product.

2.9 JOINT STABILIZATION ANCHORS

- A. General: Provide stabilization anchors in horizontal joints of masonry units across the joint between walls at T-shape wall intersections as follows:
 1. Use either a manufactured steel joint stabilizing anchor consisting of two steel rods, connected together on each side of masonry joint by sliding plate assemblies or 1-1/2 inch x ¼ inch x 32 inch steel strap anchor with 3 inch (90 degree) right-angle bent ends at masonry shear walls.
 2. Anchors to be embedded in grout-filled cores of hollow concrete masonry units.
 3. 16 inches o.c. vertical spacing.
 4. Finish: Mill galvanized or hot-dip galvanized to comply with ASTM A153.

2.10 ADJUSTABLE MASONRY-VENEER ANCHORS

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment through rigid insulation to wood or metal studs, and as follows:
 1. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

- B. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie section and a metal anchor section complying with the following requirements:
 - 1. Anchor Section: Gasketed sheet metal plate with screw holes top and bottom; top and bottom ends bent to form pronged legs to penetrate insulation/sheathing and contact studs or concrete masonry unit face; and raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
 - a. Plate 1-1/4 inches wide by 6 inches long with strap 5/8 inch wide by 6 inches long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch.
 - b. Provide anchor manufacturer's standard, self-adhering, gaskets manufactured to fit behind anchor plate and to prevent moisture from penetrating sheathing at pronged legs and screw holes.

- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Screw-Attached, Masonry-Veneer Anchors:
 - a. X-Seal with box tie with drip and X-Seal Tape, by Hohmann & Barnard, Inc., or equal product.

2.11 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.

- B. Anchor Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153, Class C; of diameter and length indicated and in the following configurations:
 - 1. Headed bolts.
 - 2. Nonheaded bolts, bent in manner indicated.

- C. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Type: Chemical anchors.
 - 2. Type: Expansion anchors.
 - 3. Type: Undercut anchors.
 - 4. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
 - 5. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.12 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabrications listed in Unit Masonry Assemblies take precedence over Division 7 Materials. Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
1. Fabricate through-wall metal flashing embedded in masonry from Type 304 26 gauge (.018 inches thick) Stainless Steel, formed to shape indicated.
 2. Fabricate metal expansion-joint waterstop from Type 304 26 gauge (.018 inches thick) Stainless Steel, formed to shape indicated.
 3. Fabricate Stainless Steel Drip Plate from Type 304 26 gauge (.018 inches thick) Stainless Steel, furnished with a smooth, factory-formed hemmed edge. Width: 3-inches
 4. Fabricate Copper Drip Plate from 20 ounce per square foot Sheet Copper, furnished with a smooth, factory-formed hemmed edge. Width: 3-inches
- B. Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the following, unless otherwise indicated:
1. EPDM: Ethylene Propylene Diene Terpolymer synthetic rubber. Flexible 40 mil elastomeric rubber membrane. Minimum width as detailed.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
1. Pre-fabricated Metal Flashing:
 - a. Cheney Flashing; Cheney Flashing Company, Inc.
 - b. Sandell
 2. EPDM Flashing, flexible membrane:
 - a. Carlisle Pre-Kleened EPDM; Carlisle Coatings & Waterproofing, Incorporated.
 - b. Firestone Flashgard Thru-Wall Flashing; Firestone Building Products Co.
 - c. H & B Epra-Max EPDM Thru-Wall Flashing; Hohmann & Barnard, Inc.
 3. Single-Wythe Masonry Flashing:
 - a. High-density polypropylene sloped continuous flashing pans with integral weep spouts, connector bridges, and included 90 percent open weave polyester mesh drainage mats in each CMU core. System size to fit standard CMU widths; Block Flash by Mortar Net Solutions, or equal product.

2.13 MISCELLANEOUS MASONRY ACCESSORIES/MATERIALS

A. Available Products: Subject to compliance with requirements, materials that may be incorporated into the Work include the following:

1. For substitution products, refer to Division 1 Section "Substitution Procedures."

B. Compressible Expansion Material: Closed cell neoprene sponge with sensitive adhesive on one side ASTM D1056 Grade 2A1.

Products: Provide one of the following:

1. Hohmann & Barnard, Inc., NS-Neoprene Sponge
2. Dur-O-Wal, D/A 2015
3. Sandell Mfg. Co., Inc.

C. Compressible Exterior Expansion Joint Filler: Silicone faced acrylic-impregnated expanding foam sealant and closed-cell foam sealant system. ASTM E283-04, compressible up to 50 percent; of width and thickness indicated. Color as selected by Architect, from full range of standard and special colors.

Products: Provide the following:

1. Colorseal, Emseal Joint Systems, Ltd.

D. Preformed Control-Joint Gaskets: Styrene-Butadiene-Rubber Compound designed to fit standard sash block and to maintain lateral stability in masonry wall. ASTM D2000, Designation M2AA-805.

Products: Provide one of the following:

1. Hohmann & Barnard, Inc.
2. Dur-O-Wal
3. Sandell Mfg. Co., Inc.

E. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).

F. Sill Weep: Weeps shall be installed as detailed at 16-inches o.c. on top of the metal drip plate along the length of the sill. Install per manufacturers printed instructions.

Products: Provide the following:

1. Hohmann & Barnard, Inc., 341 W/S Weep
 - a. Medium density polyethylene tested in conformance with ASTM D2244, D638 and D746.
 - b. 3/8 inch O.D. x 4 inch long with extended 4 inch wicks and brass or stainless steel screen to match color of drip plate.
 - c. Lay extended wicks horizontally in opposite directions.

- G. Cavity Drainage Material: Free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings. Use standard thickness products in compliance with manufacturer's gap tolerance between cavity substrate surfaces.

Products: Provide one of the following:

1. Mortar Net; Mortar Net USA, Ltd.
2. Mortar Trap, Hohmann & Barnard, Inc. (Basis of Design)

- H. Cavity Weep: Free-draining. Color as selected by Architect, from full range of standard and special colors.

Products: Provide one of the following:

1. Mortar Net Weep Vents, Mortar Net USA, Ltd.
2. Mortar Trap, Hohmann & Barnard, Inc.
 - a. Height of weep shall match the height of the specified masonry veneer (up to 4 inch nominal) as indicated in Products. Use the 4 inch nominal height weep at 8 inches or higher masonry veneer units.
 - b. Color as selected to match associated mortar.
 - c. Made from polyester mesh.
3. Hohmann & Barnard, Inc., QV-Quadro-Vent
 - a. Polypropylene tested in conformance with ASTM D2240, D790B, D638 and D1238B.
 - b. Honeycomb design.
 - c. Color as selected to match associated mortar.
 - d. Size according to associated masonry veneer units.

- I. Cavity Vent: Free-draining. Color as selected by Architect from full range of standard and special colors.

Products: Provide one of the following:

1. Mortar Net Weep Vents, Mortar Net USA, Ltd.
2. Mortar Trap Weep Vents, Hohmann & Barnard, Inc.
 - a. Height of weep shall match the height of the specified masonry veneer (up to 4 inch nominal) as indicated in Products. Use the 4 inch nominal height weep at 8 inches or higher masonry veneer units.
 - b. Color as selected by Architect to match associated mortar.
 - c. Made from polyester mesh.
3. Hohmann & Barnard, Inc., QV-Quadro-Vent
 - a. Polypropylene tested in conformance with ASTM D2240, D790B, D638 and D1238B.
 - b. Honeycomb design.
 - c. Color as selected to match associated mortar.

d. Size according to associated masonry veneer units.

- J. Stud Wall Cavity Wall Flashing Termination Bar: 304 stainless steel 1 inch x 1/8 inch x 8 foot long bar with foam-tite seal, bar punched to accept fasteners at 8 inches o.c., secure into each stud. Hohmann & Barnard, Inc. termination bar T2 with FTS Foam-Tite Seal, or equal product.
- K. Cavity Air Barrier (installed over C.M.U. above exterior grade): Continuous single component, asphalt free, fluid applied vapor permeable self-sealing elastomeric air barrier membrane which permits moisture vapor to escape through the membrane while remaining resistant to water and air penetration ASTM E2178, ASTM E96 and ASTM E2357. Apply over C.M.U. at 60 square foot (25 mils wet) per gallon. Must be compatible with contacted surfaces and materials including cavity insulation.

Products: Subject to compliance with requirements, provide the following:

1. Basis of Design: Enviro-Barrier VP™, Sandell Moisture Protection Systems by Hohmann & Barnard, Inc.

Other products that may be incorporated into the Work include, but are not limited to, the following:

1. Air Bloc 31MR – Manufactured by Henry Company
2. Perm-A-Barrier VP – Manufactured by WR Grace
3. Fire Resist Barritech VP – Manufactured by Carlisle Coatings & Waterproofing

- L. Vapor Retarder (Installed over C.M.U. below exterior grade or interior floor slab elevation changes only and/or where noted or detailed): Continuous fluid applied membrane, asphalt based non-fibered emulsion-type damp proofing which permits moisture vapor to escape through the film membrane while remaining resistant to water and air penetration ASTM D1187, ASTM D1227, E2178, ASTM E96, and ASTM E2357. Must be compatible with contacted surfaces and materials including cavity insulation.

Products: Subject to compliance with requirements, materials that may be incorporated into the Work include, but are not limited to, the following:

1. Karnak, 100AF Non-filtered Emulsion Damproofing, Karnak Corporation
2. Sealmastic, Non-fibered Emulsion Damproofing, W.R. Meadow

- M. Cavity Air Barrier (installed over Gypsum Sheathing): Continuous single component, asphalt free, fluid applied vapor permeable self-sealing elastomeric air barrier membrane which permit moisture vapor to escape through the membrane while remaining resistant to water and air penetration ASTM E2178, ASTM E96 and ASTM E2357. Apply over exterior gypsum sheathing at 75 square foot (20 mils wet) per gallon. Must be compatible with contacted surfaces and materials including cavity insulation

Available Products:

1. Basis of Design: Enviro-Barrier™ VP, Sandell Moisture Protection Systems by Hohmann & Barnard, Inc.

Subject to compliance with requirements, other products that may be incorporated into the Work include, but are not limited to, the following:

1. Air Bloc 31MR – Manufactured by Henry Company
2. Perm-A-Barrier VP – Manufactured by WR Grace
3. Fire Resist Barritech VP – Manufactured by Carlisle Coatings & Waterproofing

- N. Cavity Air Barrier Accessories (installed over C.M.U. and Gypsum Sheathing) for use in detailing transitions between dissimilar materials, cracks and voids, window and door openings, etc.

Available Products:

1. Enviro-Barrier™ Mastic, gun grade mastic, Sandell Moisture Protection Systems by Hohmann & Barnard, Inc.
2. Stretch-X-Seal Membrane, a flexible self-sealing adhesive backed with release liner, transition membrane flashing and sill tape, Sandell Moisture Protection Systems, by Hohmann & Barnard, Inc.
3. Spray-Tape™, a water based single component self-sealing spray or brush applied detail flashing for air barriers applied at 100 square foot (60 mils wet), a minimum of 3 inches around the opening and a minimum of 3 inches into the opening, Sandell Moisture Protection Systems, by Hohmann & Barnard, Inc.

Subject to compliance with requirements, other products that may be incorporated into the Work include, but are not limited to, the following:

1. Accessories – Manufactured by Henry Company
2. Accessories – Manufactured by WR Grace
3. Accessories – Manufactured by Carlisle Coatings & Waterproofing

- O. Cavity Insulation (Installed over C.M.U.): 16 inches x 96 inches square-edged extruded-polystyrene board. ASTM C578, Type IV, compressive strength 25 p.s.i. with manufacturer's standard board joint sealing system.

Products: Provide one of the following:

1. Foamular 250, Owens-Corning Co.
2. Cavitymate or Scoreboard, Dow Chemical Co.

- P. Cavity Insulation (Installed over Gypsum Sheathing or Plywood Sheathing): 48 inch x 96 inch shiplap or tongue and groove edged extruded-polystyrene board. ASTM C578, Type IV, compressive strength 25 p.s.i. with manufacturer's standard board joint sealing system.

Products: Provide one of the following:

1. Foamular 250, Owens-Corning Co.
2. Cavitymate SC, Dow Chemical Co.

- Q. Insulation Inserts: (installed in cores of C.M.U.) as indicated on the drawings. Insert in each C.M.U. core individually molded expanded polystyrene with a minimum density of 1.3 pounds

per cubic foot, thermal resistance of 5.0 per inch of thickness at 75 degrees. ASTM C578 Standard Type X.

1. ICON Universal Inserts, as produced by Concrete Block Insulating Systems, Inc. or equal product.
- R. Gypsum Sheathing: Gypsum sheathing for wall cavity assemblies takes precedence over Division 6 materials. Gypsum sheathing conforming with ASTM C1177 and ASTM E84 with glass mats both sides and long edges, water-resistant treated core. Subject to compliance with requirements of the following:
1. Dens-Glass Gold Sheathing, Georgia-Pacific.

2.14 MASONRY CLEANERS

- A. 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 cleaner manufacturer and manufacturer of masonry units being cleaned. Follow brick manufacturer's recommendations for cleaning solution for each brick type.
1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
 - a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
 - 1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 600 Detergent; ProSoCo, Inc.
 - b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
 - 1) 200 Lime Solv; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
 - c. Cleaners for Brick Subject to Metallic Staining:
 - 1) 202V Vana-Stop; Diedrich Technologies, Inc.
 - 2) Sure Klean Vana Trol; ProSoCo, Inc.

2.15 MORTAR AND GROUT MIXES

- A. General: Do not use calcium chloride. The use of admixtures shall not be considered unless their suitability is reviewed by the Engineer and demonstrated by laboratory test results simulating the conditions that warrant the desired use of the admixture.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification.
 - 1. Limit cementitious materials in mortar to portland cement and hydrated lime.
 - 2. For masonry below grade, foundation walls, retaining walls in contact with earth, and where indicated, use Type M or S mortar one (1) part portland cement, (1/4) part Type S hydrated lime and (3-3/4) parts sand, with minimum 28-day compressive strength of 2500 psi.
 - 3. For above grade exterior brick and non-load bearing partitions use Type N mortar (1) part portland cement, (1) part hydrated lime Type S and (6) parts sand.
 - 4. For exterior above grade and load bearing clay brick and manufactured stone use Type S mortar.
 - 5. For interior and exterior tuck pointing use Type N mortar. For restoration work it is important for the masonry contractor to review the existing masonry and submit for approval the appropriate type mortar.
 - 6. For new brick veneer above grade use Type N mortar.
 - 7. For natural stone masonry use Type M mortar.
- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
 - 1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
 - 2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
 - 3. For mineral-oxide pigments and mortar cement mortar, not more than 5 percent.
 - 4. For carbon-black pigment and mortar cement mortar, not more than 1 percent.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
 - 1. Mix to match Architect's sample.
- F. Grout for Unit Masonry:
 - 1. Use either pea gravel cement concrete or grout confirming to ASTM C476 with a minimum 28-day compressive strength of 3000 psi.
 - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

2.16 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

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

- H. ***No conduit or pipe shall be installed vertically or horizontally in the cavity***, except for items such as wall hydrants, electrical fixtures, etc., for which penetrations shall be horizontal, perpendicular through cavity, located directly at the intended item.
- I. Install air barrier systems per manufacturer's recommended printed procedures.
- J. Install insulation board systems per manufacturer's recommended printed procedures.
- K. In lieu of field formed flashing corners and end dams, preformed stainless steel corners and end dams may be used at the contractor's option. All products shall be compatible with the flashing system and shall be installed per the manufacturer's recommended printed procedures in addition to the sealing requirements described in the specification.
- L. Install insulation per manufacturer's printed procedures.
- M. Install single wythe masonry flashing per manufacturer's printed procedures.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- E. For exposed 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. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

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

1. One-half running bond with vertical joint in each course centered on units in courses above and below.
 2. One-third running bond at utility size face brick with vertical joint in each third course aligning vertically.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H. Entire courses and/or individual units of irregular surface faced masonry (i.e., split face) shall be turned smooth side out in locations as directed by Architect during Preinstallation Conference.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
1. Install compressible filler in joint between top of partition and underside of structure above.
 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
1. With full mortar coverage on horizontal and vertical face shells.
 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and compress into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
- C. Set stone trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for soiled stone surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- D. Site wall copings or caps (including stone, concrete and masonry) to be set on EPDM flashing. Extend EPDM flashing from a point of 1 inch behind the exterior face of the outer wythe of masonry for the full width of the wall to a point 1 inch behind the exterior face of the outer wythe behind the exterior face of the outer with of masonry on the opposite wall face. Seal laps between lengths of flashing with lap sealant, overlap 2 inches to 3 inches. Provide water-tight seal around anchors using flashing manufacturer's recommended products. Tool exposed joints to a point 3/8 inch below face of coping or cap material. Apply continuous sealant bead in tooled joints. Sealant to match site wall mortar color. Adhere metal drip plate with elastomeric sealant or manufacturer's approved bonded tape creating a ¼ inch drip plate. Seal laps between lengths of flashing with lap sealant, overlap minimum 4 inches. Seal laps between lengths of drip plate with lap sealant, overlap minimum 4 inches. Provide positive drainage to weeps where bottom of flashing turns out to outer wythe.
- E. Sill Units (including stone, concrete and masonry): Tool exposed joints to a point 3/8 inch below face of material. Apply continuous sealant bead in tooled joints. Sealant to match mortar color. At brick sills tool exposed joints to match adjacent joints. Tool joints between weeps.
- F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- G. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with grout at exterior walls, except cavity walls, and solidly with mortar at interior walls and partitions.

3.6 BONDING OF MULTIWYTHE MASONRY

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

3.7 CAVITIES

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

3.8 MASONRY JOINT REINFORCEMENT

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

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Anchor masonry to structural members with flexible channel slot anchors embedded in masonry joints and attached to the structure. Provide a 1-inch space in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

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

3.10 CONTROL AND EXPANSION JOINTS

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

3.11 LINTELS

- A. Install lintels where indicated.
- B. Provide lintels at all masonry wall openings greater than 12 inches wide. Refer to Structural drawings and Lintel Schedule.

3.12 FLASHING, WEEPS, AND VENTS

- A. General: Install continuous embedded flashing and weeps in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer. Adhere all flashing to steel angles.
- C. Install flashing as follows:

- 1a. At thru-wall base flashing conditions and masonry relieving angles at composite masonry walls, including cavity walls, extend EPDM flashing from a point of 1 inch behind the exterior face of the outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches behind the insulation over the air barrier system and into the inner wythe 1-1/2 inches. Install air barrier behind the flashing. Adhere metal drip plate with elastomeric sealant or manufacturer's approved bonding tape creating a ¼ inch drip plate. Seal laps between lengths of flashing with lap sealant, overlap minimum 4 inches. Seal laps between lengths of drip plate with lap sealant, overlap minimum 4 inches. Provide positive drainage to weeps where bottom of flashing turns out to outer wythe. Install backer rod and sealant under drip plate at masonry relieving angle conditions.
- 1b. At thru-wall base flashing conditions and masonry relieving angles at metal stud masonry veneer walls extend EPDM flashing from a point of 1-inch behind the exterior face of the outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches on the exterior face of the sheathing over the air barrier system and secure with metal termination bar and continuous elastomeric sealant, secure into each metal stud. Install air barrier behind the flashing. Adhere metal drip plate with elastomeric sealant or manufacturer's approved bonding tape crating a ¼ inch drip plate. Seal the top of the EPDM flashing to the sheathing in accordance with flashing manufacturer's recommended termination seal system. Seal the air barrier to the EPDM flashing with the membrane manufacturer's flashing tape. Seal laps between lengths of flashing with lap sealant, overlap minimum 4 inches. Seal laps between lengths of drip plate with lap sealant, overlap minimum 4 inches. Install backer rod and sealant under drip plate at masonry relieving angle conditions.
- 1c. At masonry opening (i.e. window) sill flashing conditions, extend EPDM flashing from a point of 1 inch behind the exterior face of the outer wythe of masonry, through the outer wythe, turned up vertically and continuing horizontally below window frame sill to meet angle flashing stop. Flashing to extend vertically in joint between window frame and vertical leg of angle flashing stop, terminating just below top edge. Flashing to be concealed below joint sealant. Seal laps between lengths of flashing with lap sealant, overlap minimum 4 inches. Extend flashing at sill ends and turn up not less than 2 inches to form a pan. Install air barrier behind the flashing. Adhere metal drip plate with elastomeric sealant or manufacturer's approved bonding tape creating a ¼ inch drip plate. Seal laps between lengths of flashing with lap sealant, overlap minimum 4 inches. Seal laps between lengths of drip plate with lap sealant, overlap minimum 4 inches. Provide positive drainage to weeps where bottom of flashing turns out to outer wythe. At precast sills install weep material horizontally on top of the metal drip plate at 16 inches o.c. At brick sills install sill weeps vertically at 16 inches o.c. Center the weeps upon the length of the sill and tool the joints. At wood blocking sills provide Hohmann & Barnard, Inc. #345 SV and at wood blocking jambs provide Hohmann & Barnard, Inc. #345-BT veneer anchors as indicated in the details. Space and secure anchors horizontally and vertically at 16 inches o.c.
2. At lintels and shelf angles, extend EPDM flashing a minimum of 4 inches into masonry at each end or to cover the extent of the lintel, which is greater. At heads and sills, extend flashing at ends and turn flashing up not less than 2 inches to form a pan. Extend EPDM flashing from a point of 1 inch behind the exterior face of the outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches behind the insulation over the air barrier system and into the inner wythe 1-1/2 inches. Install air barrier behind the flashing. Adhere metal drip plate with elastomeric sealant or manufacturer's approved

bonding tape creating a ¼ inch drip plate. Seal laps between lengths of flashing with lap sealant, overlap minimum 4 inches. Seal laps between lengths of drip plate with lap sealant, overlap minimum 4 inches. Provide positive drainage to weeps where bottom of flashing turns out to outer wythe. Install backer rod and sealant under drip plate at masonry relieving angle conditions.

- 3a. At low roof to high wall conditions, composite masonry walls, including cavity walls, install a (two piece interlocking type) 26 gauge stainless steel sheet flashing through the outer wythe of masonry. Turn up embedded piece a minimum of 2 inches, flush with inner wythe of masonry at cavity to form a pan (Behind insulation). Overlap ends of stainless steel flashing a minimum of 6 inches and seal lap with elastomeric sealant. Extend EPDM flashing from a point 1 inch behind exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches (behind insulation) over the air barrier system and into the inner wythe 1-1/2 inches. Install air barrier behind the flashing. Seal lap between stainless steel flashing and EPDM flashing with elastomeric sealant. Install interlocking piece of flashing over roof termination as indicated on drawing.
 - 3b. At low roof to high wall conditions, at metal stud masonry veneer walls, install a (two piece interlocking type) 26 gauge stainless steel sheet flashing through the outer wythe of masonry. Turn up embedded piece a minimum of 2 inches, flush with inner wythe of masonry at cavity to form a pan (behind insulation). Overlap ends of stainless steel flashing a minimum of 6 inches and seal lap with elastomeric sealant. Extend EPDM flashing from a point 1 inch behind exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches on the exterior face of the sheathing over the air barrier system and secure with metal termination bar and continuous elastomeric sealant, secure into each metal stud. Install air barrier behind the flashing. Seal the lap between stainless steel flashing and EPDM flashing with elastomeric sealant. Install interlocking piece of flashing over roof termination as indicated on drawing. Seal the top of the EPDM flashing to the sheathing in accordance with flashing manufacturer's recommended termination seal system. Seal the air barrier to the EPDM flashing with the membrane manufacturer's flashing tape.
- D. Install cavity weeps, cavity vents, sill sweeps and cavity drainage material in the head joints in exterior wythes of masonry as indicated on drawing and as follows:
- 1. Space cavity weeps at minimum 24 inches o.c., 16 inches o.c. at 16 inches long masonry units.
 - 2. Space cavity vents at minimum 48 inches o.c.
 - 3. Install continuous sill weep material horizontally on top of flashing.
 - 4. Place continuous cavity drainage material immediately above flashing in cavities.
 - 5. Test weep with water poured into cavity to insure draining water freely comes out of each weep hole.
- E. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.13 AIR BARRIER SYSTEM

- A. Apply cavity air barrier system on the entire exterior face of the inner wythe of masonry (behind insulation board) to form a monolithic membrane on the cavity wall. Air barrier accessories shall

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

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

3.14 REINFORCED UNIT MASONRY INSTALLATION

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

3.15 FIELD QUALITY CONTROL

- A. Contractor shall engage a qualified independent testing agency to perform field quality-control testing indicated below.
- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 35,000 bricks or 5,700 concrete masonry units Testing requirements for mortar and grout may be deleted if prism testing is retained.
- C. Mortar properties will be tested per ASTM C780.

- D. Grout will be sampled and tested for compressive strength per ASTM C1019.
- E. Prism-Test Method: For each type of structural masonry wall construction indicated, masonry prisms will be tested per ASTM C1314, and as follows:
 - 1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.
- F. Test weeps. Allow masonry 12 hours setting time before test. Test to be done in 10' lengths of cavity.

3.16 REPAIRING, POINTING, AND CLEANING

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

3.17 MASONRY WASTE DISPOSAL

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

END OF SECTION 042000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes, but is not limited to the following items. Contractor shall thoroughly review and use both the Architectural and Structural drawings for details requiring miscellaneous metal fabrications that may be detailed throughout.

1. Loose bearing plates.
2. Loose steel lintels.
3. Miscellaneous steel angles and clip angles for support of wood framing.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Steel and other metal shapes, plates and bars for applications not specifically noted herein.
6. Metal fabrications detailed in the drawings and not specifically noted herein.
7. Elevator hoist beams.
8. Shelf angles.
9. Elevator pit sump covers.
10. Metal bollards.
11. Fasteners.
12. Miscellaneous materials.

- B. Products furnished, but not installed under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

- C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 4 Section "Unit Masonry (Assemblies)" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 5 Section "Structural Steel Framing."

4. Division 9 Section "Painting" for primers and paint products.
5. Division 9 Section "High Performance Coatings" for primers.

1.3 COORDINATION

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

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding Qualifications: Qualify procedures and personnel according to the following. Certify that welder has satisfactorily passed AWS qualification tests for welding processes involved.

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 DELIVERY AND COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Deliver fabrications to the Project site and store to avoid damage.

C. Identify pieces with suitable mark for easy location.

D. Deliver products in their original wrappings or carton clearly marked for identification and bearing manufacturer's name, and model or part number, if applicable. Store to avoid damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36, except all wide flange shapes shall conform to ASTM A992/A572, Grade 50.
- C. Steel Plates to be Bent or Cold Formed: ASTM A203.
- D. Cold-finished Steel Bars: ASTM A108.
- E. Checkered Plate: ASTM A786, rolled from plate complying with ASTM A500, or hot-rolled ASTM A283, Grade C or D.
- F. Steel Tubing: Cold-form steel tubing complying with ASTM A500, or hot-rolled ASTM A501.
- G. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads; welded or seamless; uncoated or hot-dipped galvanized as indicated on Contract Drawings.
- H. Stainless-Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type304.
- I. Stainless-Steel Bars and Shapes: ASTM A276, Type304.
- J. Cast Iron: Either gray iron, ASTM A48, or malleable iron, ASTM A47, unless otherwise indicated.
- K. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- M. Aluminum Castings: ASTM B26, Alloy 443.0-F.

2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D1187.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

- E. Shop Primer for Galvanized Metal: Factory-formulated galvanized metal primer for exterior application.
 - 1. ICI Dulux Paints; 4160-XXXX Devguard Multi-purpose Tank and Structural Primer.
 - 2. Kelly-Moore: 1722 Kel-Guard Acrylic Galvanized Iron Primer.
 - 3. MAB Paints: Rust-O-Lastic Hydro-Prime II Acrylic (DTM) Maintenance Primer 073-189.
 - 4. Pittsburgh Paints: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
 - 5. Sherwin Williams: Galvite HS Paint B50WZ3.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3; with hex nuts, ASTM A563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Machine Screws: ASME B18.6.3.
- G. Lag Bolts: ASME B18.2.1.
- H. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- I. Plain Washers: Round, carbon steel, ASME B18.22.1.
- J. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
- K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in

concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

- L. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
- M. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

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

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 1. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with primer specified in Division 9 Sections "Painting" and "High-Performance Coatings" where indicated.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, when members will be embedded in concrete or

masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.

- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with primer specified in Division 9 Section "Painting".

2.9 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 3/4 inch in least dimension.
- B. Provide steel angle supports as indicated.

2.10 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe 1/4-inch wall-thickness round steel tubing. Galvanize exterior bollards.
 - 1. Provide bollards as detailed on Drawings.
 - 2. Bollards shall be concrete filled with mounted tops.
- B. Prime bollards with primer specified in Division 9 Section "Painting".

2.11 ABRASIVE METAL NOSINGS

- A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Nosings: Cross-hatched units, 4 inches wide with 1/4-inch lip, for casting into concrete.
- B. Manufacturers: Subject to requirements, provide one of the following:
 - 1. American Safety Tread
 - 2. Balco, Inc.
 - 3. Barry Pattern & Foundry
 - 4. Safe-T-Metal Company
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- D. Apply bituminous paint to concealed surfaces of cast-metal units.

2.12 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with primer specified in Division 9 Section "Painting".

2.13 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with primer specified in Division 9 Section "Painting".

2.14 STEEL WELD PLATES AND ANGLES

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

2.15 FINISHES, GENERAL

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

2.16 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standards listed below:
 - 1. ASTM A123 for galvanizing steel and iron products.
 - 2. ASTM A153 for galvanizing steel and iron hardware.

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

2.17 ALUMINUM FINISHES

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

3.3 INSTALLING METAL BOLLARDS

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

3.4 INSTALLING NOSINGS

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

3.5 INSTALLING BEARING AND LEVELING PLATES

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

3.6 ADJUSTING AND CLEANING

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

END OF SECTION 055000

SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1.
2. Framing with dimension lumber.
3. Framing with timber.
4. Framing with engineered wood products.
5. Shear wall panels.
6. Rooftop equipment bases and support curbs.
7. Wood blocking, cants, and nailers.
8. Wood furring and grounds.
9. Wood sleepers.

- B. Related Requirements:

1. Section 061063 "Exterior Rough Carpentry."
2. Section 061323 "Heavy Timber Construction."
3. Section 061533 "Wood Patio Decking" for elevated decks, including support framing.
4. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
5. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.
6. Section 313116 "Termite Control" for site application of borate treatment to wood framing.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

SECTION 061000 – ROUGH CARPENTRY

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

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

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

SECTION 061000 – ROUGH CARPENTRY

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:

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1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Treatment shall not promote corrosion of metal fasteners.
 2. Exterior type is suitable for both exterior and interior applications. Interior type is only for interior applications.
 3. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 4. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 5. Retain option in "Design Value Adjustment Factors" Subparagraph below if applicable. Revise description of locations to suit Project. Verify adjustment factors with Project's structural engineer.
 6. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
- C. Retain option in first paragraph below if required for plywood backing panels.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

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1. Retain only first option in subparagraph below if authorities having jurisdiction require classification marking on all materials.
2. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:
 - a. Southern pine or mixed southern pine; SPIB.
 - b. Spruce-pine-fir; NLGA.
 - c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

B. Load-Bearing Partitions: No. 2 grade.

1. Application: Exterior walls and interior load-bearing partitions.

C. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade.

1. Species:
 - a. Southern pine; SPIB.

2.5 TIMBER FRAMING

A. Comply with the following requirements, according to grading rules of grading agency indicated:

1. Species and Grade: Southern pine; No. 1 grade; SPIB.
2. Maximum Moisture Content: 20 percent.
3. Additional Restriction: Free of heart centers.

2.6 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal-depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi.

SECTION 061000 – ROUGH CARPENTRY

- C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
 - 1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal-depth beam members, 2400 psi for columns.
 - 2. Modulus of Elasticity, Edgewise: 2,000,000 psi for beam members, 1,800,000 psi for columns.

- D. Laminated-Strand Lumber (LSL): Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
 - 1. Extreme Fiber Stress in Bending, Edgewise: 2325 psi for 12-inch nominal-depth members.
 - 2. Modulus of Elasticity, Edgewise: 1,550,000 psi.

- E. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
 - 1. Trus Joist TJI or equal.
 - 2. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
 - 3. Structural Properties: Depths and chord sizes not less than those indicated.
 - 4. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.

- F. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.
 - 1. Manufacturer: Provide products by same manufacturer as I-joists.
 - 2. Material: Product made from any combination solid lumber, wood strands, and veneers.
 - 3. Thickness: 1-1/8 inches or 1 1/4 inches as indicated.
 - 4. Comply with APA PRR-401, rim board or rim board plus grade. Factory mark rim boards with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

SECTION 061000 – ROUGH CARPENTRY

- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 METAL FRAMING ANCHORS

- A. Basis of Design Manufacturer: Simpson Strong-Tie Co., Inc.
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preserved-treated lumber and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

SECTION 061000 – ROUGH CARPENTRY

- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- I. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

SECTION 061000 – ROUGH CARPENTRY

- L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.
- M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

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

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs. Fasten plates to supporting construction unless otherwise indicated.
 - 1. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

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2. For load-bearing walls, provide jamb studs and headers as indicated.

3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 2. Where framed into wood supporting members by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
- H. Provide solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal-size lumber, double-crossed and nailed at both ends to joists.
 2. Steel bridging installed to comply with bridging manufacturer's written instructions.
 3. I-joist bridging between I-joists.

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3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal-size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.7 TIMBER FRAMING INSTALLATION

- A. Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch airspace at sides and ends of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.8 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

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1. Size: 2-by-12-inch nominal size, minimum.
 2. Material: Laminated-veneer lumber, parallel-strand lumber or solid lumber.
 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 5 inches of effective depth.
 4. Spacing: At least three framing members for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.9 PROTECTION

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

END OF SECTION 061000

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

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. Wood roof trusses.
2. Wood girder trusses.

- B. Related Requirements:

1. Section 313116 "Termite Control" for site application of borate treatment to wood trusses.

1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

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- B. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For metal connector-plate manufacturer, professional engineer and fabricator.
- B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.
- D. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated lumber.
 - 2. Fire-retardant-treated wood.
 - 3. Metal-plate connectors.
 - 4. Metal truss accessories.
- E. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents.

1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
 - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. 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.

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
 - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
 - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
 - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
 - 1. Design Loads: As indicated.
 - 2. Maximum Deflection under Design Loads: As indicated.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S.
 - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

- B. Grade and Species: Provide visually graded or mechanically graded dimension lumber for truss chord and web members, of not less than the following grade of the following species:
 - 1. Grade for Chord Members: No. 2, Southern Yellow Pine
 - 2. Grade for Web Members: No. 3, Southern Yellow Pine.
- C. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for both top and bottom chords.
- D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preserved-treated lumber and where indicated.
- D. Stainless-Steel Sheet: ASTM A 666, Type 304, and not less than 0.035 inch thick.
 - 1. Use for exterior locations, wood-preserved-treated lumber, fire-retardant treated lumber, and where indicated.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
- B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

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

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

1. [Simpson Strong-Tie Co., Inc.](#)
- B. Allowable design loads, as published by manufacturer, shall comply with or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 1. Use for interior locations unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

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- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
 - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Section 061000 "Rough Carpentry."
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- L. Replace wood trusses that are damaged or do not comply with requirements.
 - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

3.2 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on exposed surfaces according to ASTM A 780/A 780M and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify the following:
 - 1. Temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.
 - 2. Installation of hangers and connectors that connect trusses to girder trusses, beams, bearing walls, or shear walls.
 - 3. Connection of multi-ply girder trusses.

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

- B. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

END OF SECTION 061753

SECTION 064000 – INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Custom plastic laminate cabinets and millwork.
 - 2. Hardware and accessories for custom cabinets and millwork.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 2. Division 12 Section "Simulated Stone Fabrication" for solid-surface-material countertops and backsplashes.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including high-pressure decorative laminates, cabinet and millwork hardware and accessories, and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show large scale details, full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for grommets and other wire management components installed in architectural woodwork.
 - 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection:

1. Plastic laminates.
2. Edging/banding materials.

D. Samples for Verification:

1. Lumber with selected finishes, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge.
2. 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 and running trim.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A shop that produces premium grade woodwork, and that meets the standards of AWI's Quality Certification Program, and 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. AWI labeling and certification for fabrication is not required.
- B. Installer Qualifications: Skilled workers that meet the standards of AWI's Quality Certification Program.
- C. Quality Standard: AWI labeling and certification for fabrication is not required; however, as a standard of quality the Fabricator and Installer shall comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- E. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.
- F. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
 2. Low-Emitting Materials: Composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 4. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- C. Thermoset Decorative Overlay: Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Wilsonart International; Div. of Premark International, Inc.
- E. Adhesive for Bonding Plastic Laminate: Resorcinol.

2.2 PLASTIC LAMINATE CABINETS & MILLWORK

- A. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
1. Horizontal Surfaces Other Than Tops: Grade HGS.
 2. Vertical Surfaces: Grade VGS.
 3. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
- B. Materials for Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 2. Drawer Sides and Backs: Hardwood plywood.
 3. Drawer Bottoms: Hardwood plywood.

- C. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- D. Door and Drawer Edging: Provide 3mm PVC edging for all doors and drawers on laminate custom cabinets/millwork. Color shall be equal to “Wood Tape” brand, as selected from manufacturer’s full range of colors.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in solid colors, wood grains and special patterns, all of which shall consist of a matte finish, unless otherwise noted.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- A. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Wire Pulls: Doug Mockett, No. DP240A Flight Pull
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal.
- G. Drawer Slides: BHMA A156.9, B05091.
 - 1. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 - 2. File Drawer Slides: Grade 1HD-100 and Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Accessories: Equal to products manufactured by Doug Mockett & Company, Inc. Refer to Drawings for locations and types.

1. Grommets: For cable passage through countertops; 1-1/4-inch outside diameter, black, molded-plastic grommets and matching plastic caps with slot for wire passage. Equal to "OG Series."
 2. Wire Management Hangers: Equal to "Model No. WM9;" color to be determined.
 3. Power and Data Modules: As indicated.
- K. 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.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

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

2.12 FASTENERS AND ANCHORS

- A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements. For metal framing supports, provide screws as recommended by metal framing manufacturer.

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

2.13 FABRICATION, GENERAL

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use the following methods for wood panel installation as noted on Drawings:
 - 1. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
 - 2. Use 'Z' clip system for hanging interior wood panels. Provide 2" aluminum clips with 1/4" projection and 3/8" lift off.
- F. 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.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- H. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

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

END OF SECTION 064000

SECTION 071110 - COMPOSITE SHEET WATERPROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 PERFORMANCE REQUIREMENTS

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

1.4 SUBMITTALS

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

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

1.5 QUALITY ASSURANCE

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

1.6. DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

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

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

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 SELF-ADHERING COMPOSITE SHEET

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

2.3 AUXILIARY MATERIALS

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

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 SURFACE PREPARATION

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

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

3.3 SELF-ADHERING COMPOSITE SHEET APPLICATION

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

3.4 PROTECTION / DRAINAGE COURSE INSTALLATION

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

3.5 CAP FLASHING INSTALLATION

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

3.6 DRAIN PIPE INSTALLATION

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

3.7 EXTRUDED-POLYSTYRENE INSULATION BOARD INSTALLATION

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

3.8 PROTECTING AND CLEANING

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

END OF SECTION 071110

SECTION 072100 BUILDING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Division 0 - Bidding and Contract Requirements and Division 1 General Requirements apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Insulation under slabs-on-grade.
 - 2. Insulated Nailboard
 - 3. Fiberglass Batt Insulation

- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
 - 2. Division 6 Section "Rough carpentry" for wood roof framing.
 - 3. Division 7 Section "Through-Penetration Firestop Systems" for safing insulation.
 - 4. Division 7 Section "EPDM Roofing, for insulation specified as part of roofing construction.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

- B. Product Data for each type of insulation product specified.

- C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

- D. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of foam-plastic insulations with building code in effect for Project.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Extruded-Polystyrene Board Insulation: (Cavity Wall)
 - a. Amoco Foam Products Company.
 - b. Dow Chemical Co.
 - c. UC Industries, Inc.; Owens-Corning Co.
 - 2. Polyisocyanurate Board Insulation: (Roof Insulation)

- a. Johns Manville
 - b. NRG Barriers, Inc.
3. Glass-Fiber Insulation:
- a. CertainTeed Corporation.
 - b. Knauf Fiber Glass GmbH.
 - c. Owens-Corning Fiberglas Corporation.
 - d. Schuller International, Inc.
4. Insulated Nailboard:
- a. GAF Cornell.
 - b. NRG Barriers, Inc.
 - c. Johns Manville.

INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
- 1. Type IV, 1.60-lb/cu. ft. minimum density, unless otherwise indicated.
 - 1. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
 - 2. Fire propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 4. Recycled Content: Not less than 50 percent blend of postconsumer and recovered polystyrene resins.
 - 5. Thermal Properties: Minimum continuous R-Value of 5.0 per inch.
 - 6. Foundation Insulation: Type IV, 25 psi; equal to "Dow Perimate."
- C. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using hydrochlorofluorocarbons as blowing agent and faced on both sides with aluminum foil to comply with referenced standards and with other requirements indicated below:
- 1. Federal Standard: FS HH-I-1972/1, Class 1 (nonreinforced core) or 2 (reinforced core).
 - 2. ASTM Standard: ASTM C 1289, Type I, Class 1 or 2.
 - 3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches.
 - 4. Thermal Resistivity: 7.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

- d. Unfaced, Flexible Glass-Fiber Sound Attenuation Insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 665, Type I; or with ASTM E 136, Type I.

- E. Insulated Nailboard: 5 3/8" closed cell polyisocyanurate rigid insulation with 5/8" OSB exterior nailing surface and glass reinforced facer. Install per manufacturers written requirements utilizing manufacturers approved fasteners, fastener spacing and sizing.
 - 1. Meets the requirements of ASTM C 1289, Type V.
 - 2. Long-Term Thermal Resistance: 20.5
 - 3. Flame Spread: ASTM E84, 20-30.
 - 4. Tensile Strength: ASTM C 209, 500 psi minimum.
 - 5. Compression Resistance 10% Consolidation: ASTM D1621, 20 psi minimum.
 - 6. Water Absorption: ASTM C209, 1.0% maximum.

2.3 SAFING INSULATION AND ACCESSORIES

- A. Slag-Wool-Fiber Board Safing Insulation: Semirigid boards designed for use as fire stop at openings between edge of slab and exterior wall panels, produced by combining slag-wool fibers with thermosetting resin binders to comply with ASTM C612, Type IA and IB; nominal density of 4 lb/cu. Ft.; passing ASTM E 136 for combustion characteristics; thermal resistivity of 4 deg F x h x sq. ft./BTU x in. at 75 deg F.

- B. Caulking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.

- C. Safing Clips: Galvanized steel safing clips approved by manufacturer of saving insulation for holding safing insulation in place.

2.4 VAPOR RETARDERS

- A. Polyethylene Vapor Retarder: ASTM D 4397, Class A, 10 mils thick, with maximum permeance rating of 0.13 perm.

- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Reinforced-Polyethylene Vapor Retarders:
 - a. DURA-SKRIM 6WW; Raven Industries, Inc.
 - b. Griffolyn T-65; Reef Industries, Inc., Griffolyn Div.

2.5 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.6 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:
 - 1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches in diameter, length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 - 1. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Adhesively Attached, Spindle-Type Anchors:
 - a. TACTOO Insul-Hangers; AGM Industries, Inc.
 - b. Spindle Type Gemco Hangers; Gemco.
 - 2. Insulation-Retaining Washers:
 - a. RC150; AGM Industries, Inc.
 - b. SC150; AGM Industries, Inc.
 - c. Dome-Cap; Gemco.
 - d. R-150; Gemco.
 - e. S-150; Gemco.
 - 3. Anchor Adhesives:
 - a. TACTOO Adhesive; AGM Industries, Inc.
 - b. Tuff Bond Hanger Adhesive; Gemco.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
- B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to written instructions of insulation manufacturer.

3.5 INSTALLATION OF CAVITY WALL INSULATION

- 1. Refer to Division 4 Section "Unit Masonry".

3.6 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Set reflective, foil-faced units with not less than 0.75-inch air space in front of foil as indicated.
- E. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members. Revise below to indicate type of concrete substrate, such as architectural precast concrete panels or cast-in-place concrete walls.

3.7 NOT USED

3.8 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.9 PROTECTION

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

END OF SECTION 072100

SECTION 072500 - AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Air barrier (water-resistive barrier).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product specified.
 - 1. For air barrier, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of air barrier at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For air barrier, from ICC-ES.

PART 2 - PRODUCTS

2.1 AIR BARRIER

- A. Air Barrier: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide air barrier as manufactured by DuPont Corporation; Tyvek Commercial Wrap, or equal product by one of the following:
 - a. Dow Chemical Company (The).
 - b. Raven Industries, Inc.

- c. Equal product by another manufacturer.
 - 2. Water-Vapor Permeance: 28 perms per ASTM E 96, Desiccant Method B.
 - 3. Air Permeance: Not more than 0.004 cfm/ft² at 75 Pa when tested according to ASTM E 2178.
 - 4. Allowable UV Exposure Time: Not less than three months.
 - 5. Basis Weight: 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 - 6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
 - 7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
 - 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84.
Flame Spread: 10, Smoke Developed: 10.
- B. Air Barrier Tape: Pressure-sensitive plastic tape recommended by air barrier manufacturer for sealing joints and penetrations in air barrier.

PART 3 - EXECUTION

3.1 AIR BARRIER INSTALLATION

- A. Cover exposed exterior surfaces of sheathing with air barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with air barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Air barrier: 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.

END OF SECTION 072500

SECTION 073130 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions", "Special Requirements" and "General Requirements" form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Asphalt shingles.
 - 2. Felt underlayment.
- B. Related Sections include the following:
 - 1. Division 6 Section "Sheathing" for roof deck wood structural panels.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings and counterflashings not part of this Section.
 - 3. Division 7 Section "Building Insulation" for insulated nail board roof insulation.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles, ridge vent, and exposed valley lining indicated.
 - 1. Include similar Samples of trim and accessories involving color selection.
- C. Samples for Verification: For the following products, of sizes indicated, to verify color selected.
 - 1. Asphalt Shingle: Full-size asphalt shingle strip.
 - 2. Ridge and Hip Cap Shingles: Full-size ridge and hip cap asphalt shingle.
 - 3. Self-Adhering Underlayment: 12 inches square.

- D. Qualification Data: For Installer, including certificate signed by asphalt shingle manufacturer stating that Installer is approved, authorized, or licensed to install roofing system indicated.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.
- F. Research/Evaluation Reports: For asphalt shingles.
- G. Maintenance Data: For asphalt shingles to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The manufacturer shall have a minimum of ten (10) years experience in the production of the type of roofing herein specified, and shall be able to show experience with projects of similar size and complexity.
- B. Installer Qualifications: The installer shall have a minimum of five (5) years experience installing the type of roofing herein specified on projects of similar size and complexity.
- C. Source Limitations: Obtain ridge and hip cap shingles ridge vents, felt underlayment, and self-adhering sheet underlayment through one source from a single asphalt shingle manufacturer.
- D. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.
- 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. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
 - 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
 - 1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.
 - 2. Do not install shingles when the ambient, or wind chill factor, is below 45 degrees Fahrenheit.

1.8 CONTRACTOR'S WARRANTY

- A. Contractor's Responsibility: The General Contractor shall take, or cause to have taken, any and all corrective measures necessary to keep the roofing system free of all defects, to the satisfaction of the Owner and to maintain the roofing system in a watertight condition. The contractor shall have the responsibility for said corrective measures for two (2) years after the date of Final Inspection. Then the Contractor shall be responsible for the removal and replacement of the roofing system, if in the judgment of the Owner, removal and replacement is necessary to keep the roofing system free of all effects or to maintain the roofing system in a watertight condition. The Contractor shall also repair, or remove and replace, if the Owner deems it to be necessary, or any part of the building, including the interior, damaged as a result of leaks in the roofing system. The interior of the building includes, but is not limited to, the furnishings and fixtures. There shall be no limit to the Contractor's liability for fulfilling the aforementioned responsibilities.
 - 1. Final Inspection shall include a statement, supplied by the Contractor and signed by an authorized representative of the roofing manufacturer, attesting to the fact that the roofing installation and finished condition is acceptable for warranty by the manufacturer.
- B. Exclusions: The Contractor shall not be responsible for repairs to, or replacement of, the roofing system, if repairs or replacement is necessary due to a natural disaster, such as lightning, flood, tornado or earthquake.

- C. Notification: The Owner will notify the Contractor, as soon as reasonable possible, after it has knowledge of defects in the roofing system. Should the Contractor fail to promptly take corrective measures, the Owner may undertake corrective measures. The Contractor shall be responsible for any and all expenses incurred by the Owner in undertaking the necessary corrective measures. In addition, the Owner's undertaking of corrective measures shall in no way relieve the Contractor of any of the aforementioned responsibilities.

1.9 MANUFACTURER'S WARRANTY

- A. The General Contractor shall provide the Owner with a thirty (30) year warranty, furnished by the manufacturer, which shall warrant that the said manufacturer will repair any leaks in the roofing system, not to exceed the original cost of the installed roof over the life of the warranty, installed by an applicator authorized by said manufacturer. The first ten (10) years of the warranty shall not be prorated.
- B. Leaks from the following causes shall be covered by the manufacturer's warranty:
 - 1. Defects in the roofing system material.
 - 2. Workmanship of the authorized applicator.
- C. The following exclusions are permitted in the manufacturer's warranty:
 - 1. Natural disasters such as lightning, hail, floods, tornadoes or earthquakes.
 - 2. Damage from traffic or storage of materials on the roof.
 - 3. Structural failure of roof deck, parapet or coping.
 - 4. Infiltration of moisture in, through or around walls, coping or building structure.
 - 5. Movement or deterioration of metal counterflashing or other metal components adjacent to the roof.
 - 6. Damage to the building (other than roofing and insulation) or its components adjacent to the roof.
- D. The warranty shall provide that in the event a leak should occur within the warranty period, and if such leak is within the coverage of the warranty, the warrantor will, at no expense to the Owner, make or have made, all necessary repairs to put the roof membrane, base flashing and roof insulation in a dry and watertight condition, using the same materials and specifications as the original application. There will be no limit to the warrantor's liability for making such repairs over the period of the warranty.
- E. The warranty shall provide that if, upon proper notification, the warrantor fails to promptly repair the roof, the Owner may make temporary repairs to avoid damage to the facility. Such action shall not be considered a breach of the provisions of the warranty.
- F. The Owner shall be permitted to make alterations, additions and repairs to the roof, within the written approved guidelines of the warrantor without jeopardizing the unexpired portion of the warranty's original term.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. SBS Modified Asphalt/Fiberglass Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, and self-sealing.
1. Available Products:
 - a. GAF Materials Corporation; Product: Timberline AS II (basis of design)
 - b. Celotex Corporation;
 - c. CertainTeed Corporation;
 - d. Atlas Roofing Corporation;
 - e. Georgia-Pacific Corporation;
 - f. Owens Corning;
 - g. TAMKO Roofing Products, Inc.;
 2. One-piece oversized: 13 1/4" x 38 3/4" with 5 5/8" exposure
 3. Class "A" fire rating
 4. Wind Performance – Meets ASTM D3161, Class F and ASTM 7158
 5. Impact Resistance – Class 4
 6. Algae Resistance: Granules treated to resist algae discoloration.
 7. Color and Blends: As selected by Architect from manufacturer's full range.
 8. Hip and Ridge Shingles: Manufacturer's standard, factory-precut units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

- A. Felts: ASTM D 226 or ASTM D 4869, Type I, asphalt-saturated organic felts, nonperforated.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inch diameter, barbed shank, 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. 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.

2.5 METAL FLASHING AND TRIM

- A. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
- 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 item.
1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
 2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 5 inches over the underlying asphalt shingle and up the vertical surface.
 3. Cricket Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of the chimney and/or web and 6 inches above the roof plane.
 4. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof deck flange wide enough to extend 1-½" below the new insulation board and existing wood deck, and a fascia flange with 3/8-inch drip at lower edge.

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 work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Single-Layer Felt Underlayment: Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 2 inches underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
 - 1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
- B. Double-Layer Felt Underlayment: Install double layers of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Install a 19-inch wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
 - 1. Apply a continuous layer of asphalt roofing cement over starter course and on felt underlayment surface to be concealed by succeeding courses as each felt course is installed. Apply over entire roof].
 - 2. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 3 inches in direction to shed water.
 - 3. Terminate felt underlayment extended up not less than 4 inches against sidewalls, curbs, chimneys and other roof projections.
- C. Install self-adhered EPDM ice damn from the bottom edge of sheathing to at least 3' toward the high point of the roof.

3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- D. Cricket Backer Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

- E. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- F. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

3.4 ASPHALT SHINGLE INSTALLATION

- A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 3/4 inch over fascia 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. 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.
- E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- F. Fasten asphalt shingle strips with roofing nails located according to manufacturer's written instructions.
 - 1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
 - 2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
 - 3. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- G. Ridge and Hip Cap 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.

3.5 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <Insert name of Owner.>
 2. Address: <Insert address.>
 3. Building Name/Type: <Insert information.>
 4. Address: <Insert address.>
 5. Area of Work: <Insert information.>
 6. Acceptance Date: <Insert date.>
 7. Warranty Period: <Insert time.>
 8. Expiration Date: <Insert date.>
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 100 mph;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with

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

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

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature.>
2. Name: <Insert name.>
3. Title: <Insert title.>

END OF SECTION 07313

SECTION 074243 - COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum-faced composite panels.
 - 2. Miscellaneous framing and fasteners.
- B. Related Sections include the following:
 - 1. Division 7 Section – Sheet Metal, Flashing and Trim for flashing and trim.
 - 2. Division 7 Section - Joint Sealants for sealants and caulking.
 - 3. Division 7 Section – Weather Barriers for weather barriers installed behind composite wall panels.
 - 4. Division 7 Section – Thermal Insulation for rigid board insulation.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Design system to accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to temperature and humidity ranges reasonably anticipated.
 - 2. Design system to accommodate tolerances of structure.
- B. Performance Requirements: Submit test data witnessed by an independent testing agency for the following:
 - 1. Structural tests for wind loads by "Chamber Method" in compliance with ASTM E72.
 - a. Standard test design loading: 20 psf (960 Pa) positive and negative wind load.
 - b. Design panel system to withstand code-imposed design loads, and a deflection limit of L/180 shall apply to positive load pressures only.
 - 2. Air Infiltration: 0.06 cfm per square foot (32 lps per square meter) air leakage under a static pressure of 1.56 psf (7.65 kg per square meter) when tested in accordance with ASTM E283.
 - 3. Water Penetration: No uncontrolled water penetration through the standard vertical panel and sealed joints at a static pressure of 6.24 psf (30.5 kg per square meter) when

tested in accordance with ASTM E331.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 Section – Submittals.
- B. Product Data: Manufacturer's data sheets on each product used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Submit shop drawings showing layout, flashings, drainage, ventilation, vapor barriers, vapor retarders, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- D. Initial Samples: For each finish product specified, two complete sets of color chips representing Manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 3-inches x 5-inches representing actual product, color, and patterns.
- F. Quality Assurance Submittals: Submit the following:
 - 1. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by Manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.
- B. Installer Qualifications:
 - 1. Installer experienced in performing Work of this Section who has specialized in installation of Work similar to that required for the Project.
 - 2. Panel Installer shall assume responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.
- C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer's installation instructions, and Manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store panels horizontally, off the ground, in Manufacturer's unopened packaging until ready for installation.
- B. Examine delivered materials upon receipt to ensure that no damage has occurred during shipment. Store metal-faced composite wall panels horizontally, covered with a suitable weather tight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with a positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. DO NOT allow storage space to exceed 120 deg. F.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

- A. Finish Warranty: Warranty shall commence on Date of Substantial Completion.
 - 1. Provide twenty (20) year written Warranty with PVDF fluoropolymer finish color coated metal finish covering color fading, chalking, and film integrity.
 - 2. Finish coating shall not peel, blister, chip, crack or check.
 - 3. Chalking, fading or erosion of finish measured by the following tests:
 - a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D659.
 - b. Finish coating shall not change color or fade in excess of 8 NBS units as determined by ASTM D2244.
- B. Material and Installation Warranty: Warranty shall commence on Date of Substantial Completion.
 - 1. Panels shall be warranted not to delaminate (separate) for a period of five (5) years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Laminators Inc., Hatfield, PA 19440. T: (877) OMEGA77; www.laminatorsinc.com. Subject to compliance with specified requirements, equal products by other manufacturers are also acceptable.
- B. Basis of Design Product: Omega-Lite Aluminum-Faced Composite Panels.

1. Panel Construction: Finished aluminum sheet over a corrugated polyallomer (CPA) core with backer sheet.
2. Panel Facing: Minimum 0.021-inch thick, smooth aluminum sheet complying with ASTM B209.
3. Panel Backing: Random coated aluminum sheet, minimum 0.013-inch thick, aluminum sheet complying with ASTM B209.
4. Panel Thickness: 6 mm (1/4 inch).
5. Fire Test Performance: ASTM E84, Class A.
6. Bond Test Performance: Passes ASTM C481-A Cyclic Aging.
7. Finish: Kynar 500 - PVDF fluoropolymer paint system meeting AAMA 2605.
8. Finish Colors: As selected by Architects from manufacturers full line of PVDF - Kynar finishes.
9. Aluminum Composite Wall Panel Installation System: One-Piece Tight-Fit Extrusion.

2.2 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C645, cold-formed metallic-coated steel sheet, ASTM A653, G40 (Z120) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Base or Sill Angles Channels: 0.079-inch nominal thickness.
- C. Hat-Shaped, Rigid Furring Channels:
 1. Nominal Thickness: As required to meet performance requirements
 2. Depth: As indicated.
- D. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.
 1. Nominal Thickness: As required to meet performance requirements
 2. Depth: As indicated
 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
 4. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch diameter
- E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 ACCESSORIES

- A. Manufacturer's Sealants and Accessories: Provide manufacturer's recommended sealants and accessories for product installation.
- B. Flashing: Fabricate flashing materials from 0.032 inch minimum thickness aluminum sheet painted to match composite wall panel system where exposed. Provide a 12-inch-wide lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-

hardening sealant.

- C. Aluminum Extrusions: ASTM B221 alloy and temper recommended by Manufacturer for type of use and finish indicated.
- D. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide Manufacturer's standard concealed fasteners.

2.4 FABRICATION

- A. Panels shall be fabricated and finished as required to provide material construction and performance as specified and as required by Manufacturer to comply with warranty provisions.
 - 1. Tolerances: Length and Width plus or minus 1/16-inch; squareness (diagonals) equal within 1/8-inch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with substrate installer present for compliance with requirements for structural soundness, installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances listed below.
 - a. 1/4-inch in any 20 feet length vertically or horizontally.
 - b. 1/2-inch in any building elevation.
 - 2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking, and that installation is within flatness tolerances required.
 - 3. Prepare written report endorsed by panel Installer and substrate installer, listing remedy for conditions detrimental to performance of the Work.
- B. Examine roughing-in for components and systems penetrating metal composite wall panels to verify actual locations of penetrations relative to seam locations before metal composite wall panel installation.
- C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with all Manufacturer's installation instructions, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation type

selected.

1. Install metal-faced composite wall panels according to orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and sub-girts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - a. Commence metal-faced composite wall panel installation and install a minimum of 300 sq. ft. in the presence of a factory-authorized representative.
 - b. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
 - c. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed. Install flashing and trim as metal-faced composite wall panel work proceeds.
- B. Work shall be done and completed in a thorough and workmanlike manner by mechanics skilled in their various trades.
- C. Caulk Installation: Refer to Division 7 Section "Joint Sealants".
 - a. Use only approved sealants as described in manufacturers guidelines. Install sealant continuously between metal base channel (sill angle) and concrete and elsewhere is indicated or, if not indicated, as necessary for waterproofing.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.4 CLEANING AND PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.
- B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose offsite.
- C. Touch-up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION

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

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
2. Roof insulation.
- 3.
4. Roof underlayment mat.
5. Walkways.

- B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof flashings and counter-flashings.
3. Division 7 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Before starting roof deck construction, conduct conference at Project site in accordance with Division 1 Section "Project Meetings".

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's representative, deck Installer and other installers whose work interfaces with or affects roofing, including installers of roof drains, roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize the construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

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

1.5 SUBMITTALS

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

1. Provide fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

- I. Field Quality Control Reports.

- J. Sample Warranties: For manufacturer's special warranties.

1. Refer to Warranty Form attached to the end of this Section.

- K. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that specified for this Project.

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

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

1.9 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.
 - 1. Accelerated Weathering: As tested by the manufacturer, roof membrane shall withstand a minimum of 2,000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

- A. EPDM Sheet: ASTM D4637, Type I, non-reinforced, EPDM sheet with factory-applied seam tape.
- B. EPDM Roofing System Basis of Design: Carlisle Syntec Sure-Seal fully-adhered roofing system.
 - 1. Subject to compliance with all specified requirements, other manufacturers offering products acceptable to the Work include, but are not limited to the following:

- a. Firestone Building Products Co.
 - b. Versico Roofing Systems.
 - c. Johns Manville.
- 2. Thickness: 60 mils, nominal.
 - 3. Exposed Face Color: Black.
 - 4. Source Limitations: Obtain components for roofing system from roof membrane manufacturer.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard, aerosol-based spray adhesive.
- E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch-wide, butyl splice tape with release film or factory-applied seam tape, width as recommended by manufacturer.
- F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
- G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8-inch-thick; with anchors.
- I. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, termination reglets, cover strips, and other accessories.

2.4 ROOF INSULATION

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

1. Basis of Design: Carlisle Syntec Systems; Carlisle Corp., SecurShield (coated glass facers)
2. Thermal Requirements: To obtain the required thermal envelope properties, the minimum long-term thermal resistance (LTTR) values shall be achieved, based on insulation board thickness.
 - a. Minimum LTTR Values for Polyisocyanurate Board Insulation:
 - 1) 30.0 continuous or 30.0 average depending upon specific roof areas.
 - 2) Provide two (2) layers of 2.6-inch-thick polyisocyanurate insulation, utilizing staggered boards, for a total base thickness of 5.2 inches, not including tapered insulation. The specified 5.2-inch thickness is based upon Carlisle Syntec Systems SecurShield. Overall thickness may vary based upon manufacturer.
 3. Compressive Strength: 20 psi and 25 psi.
 4. Size: 48 by 96 inches or 48 by 48 inches.

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

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

2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: ASTM C117, glass- mat, water-resistant gypsum substrate or ASTM C1278 fiber-reinforced gypsum board.
 1. Basis-of-Design Product: Georgia Pacific DensDeck. Subject to compliance with requirements equal products by other manufacturers are also acceptable.
 2. Thickness: 5/8-inch.
- D. Roof Underlayment Mat: Three (3)-dimensional reinforcement mat made of continuous nylon monofilaments fused at their intersections. The filament structure acts as a thermal break between the roof surface and the sheathing substrate and it reduces impact noise from rain or sleet greater than 13.5 dB.

1. Basis-of-Design Product: Colbond, Enkamat 7020. Subject to compliance with specified requirements, equal products but other manufacturers are also acceptable.
 - a. Tensile Strength: ASTM D6818, 240 lbs./ft.
 - b. Thickness: ASTM D6525; 3/4-inches.
 - c. Flame Spread: ASTM E84; 25.
 - d. Smoke Density: ASTM E84; 30.
- E. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or two other insulation layer as follows:
 1. Bead applied, low- rise, one-component or multi component urethane adhesive.

2.6 PAVERS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Decking."
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

- a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

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

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 6-inches in all directions.
 - a. Ensure that decking is dry and frost free prior to proceeding with Work.
 - b. Locate end joints over crests of decking.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4-inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4-inch with foam insulation.
 - g. Cut and fit insulation within 1/4-inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation over substrate.
 - 2. Install upper layer of insulation and tapered insulation with joints of each layer offset not less than 6-inches from previous layer of insulation.
 - a. Install with long joints continuous and with end joints staggered not less than 6-inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4-inch in width.

- d. At internal roof drains, slope insulation to create a square drain sump.
- e. Trim insulation so that water flow is unrestricted.
- f. Fill gaps exceeding 1/4-inch with foam insulation.
- g. Cut and fit insulation within 1/4-inch of nailers, projections, and penetrations.
- h. Mechanically attach upper layer of insulation, through base layer and down to substrate as required to meet specified wind speed warranty.

3.5 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply aerosol adhesive spray to substrate and underside of roof membrane at rate required by manufacturer, and allow to 'flash-off' before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters as required to meet specified windspeed warranty.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
- I. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread water cut-off mastic bed over deck-drain flange at roof drains at a rate of one (1) tube per drain, and securely seal roof membrane in place with clamping ring.

3.6 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply aerosol spray adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

- D. Clean splice areas, apply low-VOC EPDM primer, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars at a rate of 6-inches on-center or every pre-punched hole.

3.7 INSTALLATION OF WALKWAYS

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

3.8 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

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

END OF SECTION 075323

ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: Berkeley County, West Virginia
 2. Street Address: 200 Waverly Court
 3. Building Name/Type: Berkeley Health Department
 4. City/State: Martinsburg, WV
 5. Area of Work: Addition Roofs
 6. Acceptance Date: _____
 7. Warranty Period: Two (2) years from the date of Substantial Completion.
 8. Expiration Date: _____
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Fire;
 - c. Failure of roofing system substrate, including cracking, settlement, excessive Deflection, deterioration, and decomposition;
 - d. Faulty construction of parapet walls, copings, chimneys, skylights, vents, Equipment supports, and other edge conditions and penetrations of the work;
 - e. Vapor condensation on bottom of roofing; and
 - f. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations,

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

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

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

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

SECTION 076100 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Standing-seam metal roofing.

- B. Related Sections include the following:

- 1. Division 5 Section "Steel Deck" for steel roof deck.
- 2. Division 6 Section "Rough Carpentry" for wood framing and decking.
- 3. Division 7 Section "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.

1.3 PERFORMANCE REQUIREMENTS

- A. Install sheet metal roofing capable of withstanding normal thermal movement, wind loading, structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

1.4 SUBMITTALS

- A. Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Show details for forming, joining, and securing metal roofing, and for pattern of seams. Show expansion-joint details and waterproof connections to adjoining work and at obstructions and penetrations.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for metal roofing with color-coated finishes.
- D. Samples for Verification: 12-inch- (300-mm-) square specimens of metal roofing material with specified finishes applied. Where finishes involve normal color and texture variations, include Sample sets of 2 or more units showing the full range of variations expected.

- E. Product Certificates: Signed by manufacturers of the following products certifying that the products furnished comply with requirements:
 - 1. Sheet metal roofing.
 - 2. Special finishes.

- F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed sheet metal roofing similar in material, design, forming method, and extent to that indicated for this Project and with a record of successful in-service performance.

- B. Industry Standard: Unless otherwise shown or specified, comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown.

- C. Wind-Uplift Resistance: Provide roof assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.
 - 1. Maintain current certification of UL follow-up program for field-rolled panels on field-forming equipment.

- D. Mockups: Before installing sheet metal roofing, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using exposed and concealed materials and forming methods indicated for completed Work.
 - 1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting metal roofing Work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal coils, panels, and other roofing materials so they will not be damaged or deformed. Package roofing materials for protection against transportation damage.
- B. Handling: Exercise care in unloading, storing, and erecting roofing materials to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store metal roof coils and panels to ensure dryness. Do not store coils or panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Finish Warranty: Submit a written warranty executed by the manufacturer covering failure of the factory-applied exterior finish on metal roofing within the specified warranty period and agreeing to repair finish or replace sheet metal roofing that evidences finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- C. Warranty Period: 20 years from date of Substantial Completion.
- D. Special Weathertight Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace sheet metal roofing that fails to remain weathertight within the specified warranty period.
- E. Warranty Period: 5 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, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berridge Manufacturing Co. – Cee-Lock Panel System

2. Merchant & Evans, Inc.
3. Petersen Aluminum Corp.

2.2 ROOFING SHEET METALS

A. Aluminum Sheets: ASTM B 209 (ASTM B 209M) for Alclad alloy 3003 or 3004 with temper as required to suit forming operations and finish indicated.

1. Surface: Smooth, flat, mill finish – 16-1/2" panel width, 1 ½" seam.
2. Alternative alloys include 1100, Alclad 3003, 3004, 3105, 5005, and 5050, in A14, H14, H24, H32, or H34 temper.
3. Thickness: .0201
4. High-Performance Organic Coating Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402.
 - 1) Color and Gloss: to be selected from manufacturers standard color range.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum 40 mils (1 mm) thick. Provide primer when recommended by underlayment manufacturer.

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. WinterGuard; CertainTeed Corporation.
 - b. Bituthene Ice and Water Shield; Grace: W.R. Grace & Co.
 - c. Nordshield Ice and WaterGard; Nord Bitumi US, Inc.
 - d. F210; Northern Elastomeric, Inc.
 - e. Polyguard Deck Guard; Polyguard Products, Inc.

- f. Polyken 640 Underlayment Membrane; Polyken Technologies.
- g. QSC-707; Quaker Construction Products, Inc.
- h. Moisture Guard; Tamko Asphalt Products, Inc.
- i. Weather Watch; GAF Building Materials Corporation.
- j. Jiffy Seal Ice and Water Guard; Protecto Wrap Co.
- k. Ice Guard Membrane No. 108-AG; Royston Laboratories, Inc.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and accessory items as required for a complete roofing system and as recommended by sheet metal manufacturer and fabricator for metal roofing work, unless otherwise indicated.
- B. Metal Accessories: Provide components matching sheet metal roofing in finish and material that are required for a complete roofing system, including the following:
 - 1. Clips, flashings, and ridge closure strips.
 - 2. Trim, copings, fasciae, gutters, and louvers.
- C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- D. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to produce joints in roofing that will remain weathertight and as recommended by the roofing manufacturer for installation indicated.
- E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- F. Snow Guard Rail: Prefabricated, noncorrosive units designed to use with sheet metal roofing. Basis of design is the Snowgem wavelock 2" bar.

2.5 ROOF INSULATION

- 1. General: Preformed roof insulation boards manufactured or approved by Sheet Metal roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation. Provide 6" total thickness utilizing staggered boards.
- 2. Polyisocyanurate Board Insulation: ASTM C 1289, Type II

3. Composite Polyisocyanurate Nailbase Insulation Panels: ASTM C 1289, with factory-applied facing board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other.

2.5 FABRICATION

- A. General: Fabricate sheet metal roofing to comply with details shown, with metal roofing manufacturer's written instructions, and with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of installation indicated.
- B. Fabricate sheet metal to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, or would not be sufficiently waterproof and weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant (concealed within joints).
- D. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with bituminous coating or other permanent separation as recommended by manufacturer or fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of sheet metal roofing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate metal roofing with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal roofing. Strip with care to avoid damage to finish.

3.3 INSTALLATION, GENERAL

- A. Install roofing to comply with sheet metal roofing manufacturer's written instructions, unless otherwise indicated.
- B. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- C. Install underlayment and building's paper slip sheet on substrate under metal roofing, unless otherwise recommended by sheet metal manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal roofing. Apply from eave to ridge in shingle fashion and lap joints 2 inches (50 mm) minimum.
- D. Install building paper as only underlayment under terne metal.
- E. Coat back side of metal roofing with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.
- F. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown and as required for leakproof construction. Provide for thermal expansion and contraction of the Work. Seal joints as shown and as required for leakproof construction. Shop fabricate materials to greatest extent possible.
- G. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature is moderate, between 40 and 70 deg F (4 and 21 deg C), at time of installation, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C). Comply with requirements of Division 7 Section "Joint Sealants" for handling and installing sealants.
- H. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges, unless otherwise indicated.
- I. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- J. Rivet joints in uncoated aluminum where necessary for strength. Clean exposed surfaces of every substance that is visible or that might cause corrosion of metal or deterioration of finish.

3.4 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure metal roofing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 07610

SECTION 076150 – METAL SOFFIT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum soffit panels.
- B. Related Sections include the following:
 - 1. Division 7 Section "Manufactured Roof Panels" for preformed metal roof panels.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.

1.3 PERFORMANCE REQUIREMENTS

- A. Install sheet metal roofing capable of withstanding normal thermal movement, wind loading, structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

1.4 SUBMITTALS

- A. Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Show details for forming, joining, and securing metal roofing, and for pattern of seams. Show expansion-joint details and waterproof connections to adjoining work and at obstructions and penetrations.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for metal roofing with color-coated finishes.
- D. Samples for Verification: 12-inch- (300-mm-) square specimens of metal roofing material with specified finishes applied. Where finishes involve normal color and texture variations, include Sample sets of 2 or more units showing the full range of variations expected.
- E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project

names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed sheet metal roofing similar in material, design, forming method, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Industry Standard: Unless otherwise shown or specified, comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown.
- C. Wind-Uplift Resistance: Provide assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.
 - 1. Maintain current certification of UL follow-up program for field-rolled panels on field-forming equipment.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal coils, panels, and other materials so they will not be damaged or deformed. Package roofing materials for protection against transportation damage.
- B. Handling: Exercise care in unloading, storing, and erecting roofing materials to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store metal roof coils and panels to ensure dryness. Do not store coils or panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Finish Warranty: Submit a written warranty executed by the manufacturer covering failure of the factory-applied exterior finish on metal soffit system within the specified warranty period and agreeing to repair finish or replace sheet metal roofing that evidences finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- C. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Berridge Manufacturing Co.
 2. Merchant & Evans, Inc.
 3. Petersen Aluminum Corp.

2.2 SOFFIT SHEET METALS

- A. Aluminum Sheets: ASTM B 209 (ASTM B 209M) for Alclad alloy 3003 or 3004 with temper as required to suit forming operations and finish indicated.
1. Surface: Smooth, flat.
 2. Thickness: 0.032 inch (0.8 mm), unless otherwise indicated.
 3. High-Performance Organic Coating Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402.
 - b. Color and Gloss: to be selected by Architect from manufacturers full range of colors.

2.3 FABRICATION

- A. Fabricate soffit system to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.
- B. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- C. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with bituminous coating or other permanent separation as recommended by manufacturer or fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of sheet metal roofing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate metal roofing with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal roofing. Strip with care to avoid damage to finish.

3.3 INSTALLATION, GENERAL

- A. Install soffit system to comply with manufacturer's written instructions, unless otherwise indicated.
- B. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- C. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

3.4 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure metal roofing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 076100

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exposed trim and fascia.
 - 2. Metal flashing.
 - 3. Copings.
 - 4. Roof edge fascia.
 - 5. Scuppers.
 - 6. Gutters and downspouts.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for mockup requirements to include sheet metal flashing and trim.
 - 2. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 3. Division 7 Section "Standing Seam Metal Roofing" for metal roofing, flashings and trims associated with the metal roof.
 - 4. Division 7 Section "EPDM Roofing" for sheet metal flashing and trim required to be used in conjunction with membrane roofing systems.
 - 5. Division 7 Section "Joint Sealants" for elastomeric sealants to be installed in attachments, joints and penetrations of sheet metal flashing and trim.
 - 6. Division 21 Fire Protection Sections, Division 22 Plumbing Sections, Division 23 HVAC Sections and Division 26 Electrical Sections for various roof-mounted and penetrating items requiring sheet metal flashing and trim assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install flashings capable of resisting design forces according to recommendations in FMG Loss Prevention Data Sheet 1-49. Manufacture and install copings and roof edge flashings tested according to ANSI\SPRI ES-1 and capable of resisting design forces.

1. Refer to Structural Drawings for wind design criteria. At a minimum, design sheet metal flashings and trim to meet a 72 mph windspeed warranty.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes. For copings and roof edge flashings, allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements.
1. Temperature Change (Range): 120 deg. F, ambient; 180 deg. F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - a. Custom formed copings and roof edge flashings will be required for curved walls.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 6. Details of edge conditions, including eaves, crickets, and counterflashings as applicable.
 7. Details of special conditions.
 8. Details of connections to adjoining work.
 9. Detail formed flashing and trim at a scale of not less than 3 inches per 1 foot.
 10. Details of transitions between downspouts, cast iron boots and sub-surface storm drain systems.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Samples shall show the full range to be expected for each color required.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.

2. Trim, Copings, Roof Edge Flashings, Metal Closures, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 3. Accessories and Miscellaneous Materials: Full-size Sample.
- D. Qualification Data: For qualified fabricator.
- E. Maintenance Data: For sheet metal flashing, trim and accessories to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. The mockups required by this Section shall be installed as components of the full-scale masonry assemblies mockup specified in Division 4 Section "Unit Masonry (Assemblies)".
1. Build mockups of typical roof conditions, including coping assembly, scupper box and/or conductor head, fascia, fascia trim, and/or apron flashing, including supporting construction cleats, seams, fasteners, attachments and accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- D. Pre-installation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings".
1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
 2. Review methods and procedures related to sheet metal flashing and trim.
 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - 1. Surface: Smooth, flat.
 - 2. Exposed Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Color: As selected by Architect from manufacturer's full range of available two-coat colors.
 - b. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

- C. Stainless-Steel Sheet: ASTM A240 or ASTM A666, Type 304, dead soft, fully annealed.
 - 1. Finish: 2D dull, cold rolled (for installations not exposed to view).
 - 2. Finish: 4 polished directional satin (for installations exposed to view).
 - 3. Surface: Smooth, flat.

- D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality.
 - 2. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 - 3. Surface: Smooth, flat.
 - 4. Exposed Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Color: As selected by Architect from manufacturer's full range of available two-coat colors.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A153 or ASTM F2329 or Series 300 stainless steel.
- C. Solder:
1. For Stainless Steel: ASTM B32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.
- I. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene or polypropylene film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer in accordance with underlayment manufacturer's written instructions.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
 - b. Henry Company.
 - c. Owens Corning.
 - d. SDP Advanced Polymer Products Inc.
- J. Felt: ASTM D226, Type II (No. 30), asphalt-saturated organic felt; non-perforated.
- K. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to the greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. On-Site Fabrication: Subject to compliance with specified requirements, sheet metal flashing and trim components, with the exception of copings, may be fabricated on-site or shop-fabricated using UL-certified roll-forming equipment if sheet metal flashing and trim components are of same profile and warranted by manufacturer to be equal to factory-formed components. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances of 1/4 inch in 20 feet on slope and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.
- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- I. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- J. Do not use graphite pencils to mark metal surfaces.

2.4 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. ATAS International, Inc.
 2. Cheney Flashing Company.
 3. Hickman Company, W. P., an OMG, Inc. company.
 4. Johns Manville.
 5. Metal-Era, Inc.
 6. Petersen Aluminum Corporation, a Carlisle company.
 7. Una-Clad; Firestone Building Products.

2.5 COPINGS

- A. Copings: Fabricate in minimum 96 inch-long, but not exceeding 12 foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to anchor the exterior leg.
1. Coping Profile: As indicated on Drawings.
 2. Joint Style: Butted with expansion space and 6 inch-wide, exposed cover plate.
 3. Coping Material: Aluminum, 0.050 inch thick.
 4. Finish: Class 1 clear anodic finish.
 5. Corners: Shop or factory-mitered ONLY.
 6. Special Fabrications: Radiused Sections.

2.6 ROOF-EDGE FASCIAS

- A. Roof-Edge Fascia and Gravel Stop: Fabricate in minimum 96 inch-long, but not exceeding 12 foot-long sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to anchor the exterior leg.
1. Fascia Profile: As indicated on Drawings.
 2. Joint Style: Butted with expansion space and 6 inch-wide, exposed cover plate.
 3. Fascia Material: Aluminum, 0.050 inch thick.
 4. Finish: Class 1 clear anodic finish.
 5. Corners: Shop or factory-mitered ONLY.
 6. Special Fabrications: Radiused Sections.

2.7 MISCELLANEOUS LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Counterflashing: Fabricate from aluminum, 0.032 inch thick.
- B. Roof-Penetration Flashing: Fabricate from one of the following materials:
1. Copper: 16 oz./sq. ft.

2. Stainless Steel: 0.019 inch thick.

2.8 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated on Drawings, complete with outlet tubes. Separate dissimilar metals where conductor heads come into contact with scupper boxes. Fabricate from the following material:
 1. Aluminum: 0.050 inch thick, Class 1 clear anodic finish.
 2. Metallic-Coated Steel Sheet: 18 Ga. steel sheet.
- B. Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop-fabricate interior and exterior corners.
 1. Gutter Profile: Style A, according to cited sheet metal standard. Expansion Joints: Lap type or built in.
 2. Accessories: Wire-ball downspout strainer; valley baffles, where applicable. Provide outlet tubes, end caps and other special pieces as required.
 3. Material: Aluminum, 0.050 inch thick, Class 1 clear anodic finish. Metallic-Coated Steel Sheet: 18 Ga. steel sheet.
- C. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with shop-fabricated, mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
 1. Fabricated Hanger Style: Fig 1-35A, according to SMACNA's "Architectural Sheet Metal Manual." Material: Aluminum, 0.050 inch thick, Class 1 clear anodic finish.
 2. Metallic-Coated Steel Sheet: 18 Ga. steel sheet.

2.9 CAST IRON BOOTS

- A. Cast Iron Boots: Prefinished, gray iron castings complying with ASTM A48, contoured interior flow design with no boxed corners, weld seams or choke points. Include integral lug slots and side wall cleanout. Provide flexible rubber adaptor for connection to drainage pipe.
- B. Basis of Design Products: J.R. Hoe & Sons, Middlesboro, KY www.downspoutboots.com.
 1. Material: Cast iron.
 2. Length: Minimum 28 inches with integral side wall cleanout.
 3. Shape: Rectangular.
 4. Offset Configuration: As required.
 5. Opening Size: As required to receive downspout.

6. Finish: Powder coat. Color to be selected from manufacturer's full range of available colors.

2.10 PRECAST CONCRETE SPLASH BLOCKS

- A. Precast Concrete Splash Blocks: Precast concrete splash blocks with 3/16 inch radiused corners and 1/16-inch eased edges designed to channel water away from the base of the building.
- B. Basis of Design Products: Modern Precast www.modernprecast.com.
 1. Material: Concrete.
 2. Length: 36 inches.
 3. Width: 18 inches.
 4. Thickness: 3-7/8 inches
 5. Shape: Rectangular trough.
 6. Color: Standard gray.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine walls, roof edges and parapets for suitable conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof specialty and sheet metal flashing and trim systems.
1. Install roof specialties and sheet metal flashing and trim level, plumb and true to line and elevation with limited oil-canning. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats for securing sheet metal not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other, or where metals contact corrosive substrates such as pressure treated wood or cementitious construction, protect against galvanic action by one of the following methods:
1. Paint contact surfaces with bituminous coating or by other permanent separation coating as recommended by SMACNA.
 2. Separate contact surfaces with felt (No. 30).
 3. Separate contact surfaces with self-adhering sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of a corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4-inch for wood screws and metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder aluminum sheet.
 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning

and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

- F. Rivets: Rivet joints in uncoated aluminum where indicated or where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA standards, and as detailed on Drawings. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet O.C. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
 - 1. Calculate maximum storm water flows for roof areas to be drained by each gutter and size gutters to accommodate calculated flow volumes.
- C. Downspouts: Join sections with 1-1/2 inch telescoping joints with upper sections inserted into lower sections. Provide fasteners designed to hold downspouts securely following the specified attachment Figure. Locate fasteners at top and bottom of downspout and at approximately 60 inches centers in between.
 - 1. Provide elbows at base of downspouts to direct water away from building, or allow for connection into subsurface storm water system.
 - 2. As a minimum size, calculate maximum storm water flows for the roof areas to be drained by each downspout and size downspouts to accommodate calculated flow volumes.
 - 3. Install downspouts into cast iron boots. **PVC boots are not acceptable.**
 - 4. Provide rubber boot transition caps at downspout boots to finish off the downspout to boot connection, and to prevent debris from entering the boot.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standards. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification. Refer to details on Drawings.
 - 1. Install copings in accordance with ANSI/SPRI/FM 4435/ES-1.
 - 2. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24 inch centers.

3. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24 inch centers.
 4. All joints shall be weathertight.
- C. Roof Edge Fascias: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification. Refer to details on Drawings.
1. Install roof edge fascias in accordance with ANSI/SPRI/FM 4435/ES-1.
 2. Interlock exterior bottom edge of roof edge fascia with continuous cleat anchored to substrate at 24 inch centers.
 3. All joints shall be weathertight.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standards unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 4 Section "Unit Masonry (Assemblies)".

3.6 ERECTION TOLERANCES

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

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On

completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

- E. Replace sheet metal flashing and trims that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 078410 THROUGH-PENETRATION FIRESTOP SYSTEMS

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 through-penetration firestop systems for penetrations of duct, cable, cable tray, conduit, piping, electrical busways and raceways through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Floors.
2. Roofs.
3. Walls and partitions.
4. Openings between structurally separate sections of wall or floors.
5. Gaps between the top of walls and ceilings or roof assemblies.
6. Expansion joints in walls and floors.
7. Openings and penetrations in fire-rated partitions or walls containing fire doors.
8. Openings around structural members which penetrate floors or walls.

- B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for construction of openings in concrete slabs and walls.
2. Division 4 Section "Unit Masonry Assemblies" for construction of openings in masonry walls.
3. Division 15 Sections specifying duct and piping penetrations.
4. Division 16 Sections specifying cable and conduit penetrations.

1.3 DEFINITIONS

- A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire rated wall and floor assemblies.

1.4 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 2. Fire-resistance-rated floor assemblies.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Division 1 Section "Submittals".
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems 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.
 - 1. A manufacturer's representative shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. Training shall be performed to comply with manufacturer's published recommendations.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering through-penetration fire stop systems that may be included in the work include, but are not limited to the following:
 - 1. Specified Technologies, Inc., Somerville, NJ.
 - 2. 3M Fire Protection Products, St. Paul, MN.
 - 3. Tremco Sealants & Coatings, Beechwood, OH.
 - 4. Nelson Firestop Products, Tulsa, OK.
- B. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Through-Penetration Firestop System Schedule at the end of Part 3.
- C. Use only firestop products that have been tested in accordance with ASTM E 814 (UL 1479), ASTM E-119 (UL 263), ASTM E 84 (UL 723), and UL 2079.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber or fiberglass insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- C. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- D. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- E. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- F. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- H. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Verification of Conditions: Verify penetrations are properly sized and in suitable condition for application of materials.
- B. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
- C. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - 1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestop Systems with No Penetrating Items FS-1: Comply with the following:
 - 1. Available UL-Classified Systems: W-J-0003
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.
- C. Firestop Systems for Metallic Pipes, Conduit, or Tubing FS-2: Comply with the following:
 - 1. Available UL-Classified Systems: W-J1025.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.
- D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing FS-3: Comply with the following:
 - 1. Available UL-Classified Systems: W-J2013.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Intumescent wrap strips.
 - e. Firestop device.
- E. Firestop Systems for Electrical Cables FS-4: Comply with the following:
 - 1. Available UL-Classified Systems: W-J-3017.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Silicone foam.
- F. Firestop Systems for Insulated Pipes FS-5: Comply with the following:
 - 1. Available UL-Classified Systems: W-J5007.

2. Type of Fill Materials: One or more of the following:

- a. Latex sealant.
- b. Intumescent putty.
- c. Silicone foam.
- d. Intumescent wrap strips.

G. Firestop Systems for Miscellaneous Mechanical Penetrations FS-6: Comply with the following:

- 1. Available UL-Classified Systems: W-J-7001.
- 2. Type of Fill Materials: One or both of the following:

- a. Latex sealant.
- b. Mortar.

H. Firestop Systems for Groupings of Penetrations FS-7: Comply with the following:

- 1. Available UL-Classified Systems: C-AJ-8015.
- 2. Type of Fill Materials: One or more of the following:

- a. Latex sealant.
- b. Mortar.
- c. Intumescent wrap strips.
- d. Firestop device.
- e. Intumescent composite sheet.

END OF SECTION 078410

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:

1. Exterior sealants.
2. Exterior EIFS sealants.
3. Exterior and interior traffic sealants.
4. Interior sealants.
5. Interior food contact sealants.
6. Interior sanitary sealants.
7. Exterior and interior water immersed sealants.
8. Metal lap joint sealants.
9. Threshold and sheet metal bedding sealants.
10. Joint accessories.

- B. Related Sections include the following:

1. Division 4 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 7 Section "Through Penetration Firestop System" for building joint-sealant systems.
3. Division 8 Section "Glazing" for glazing sealants.
4. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
5. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 SUBMITTALS

- A. Shop Drawing:

1. Submit a Sealant Schedule, and related details, indicating specific installation and interface between sealants and building materials for each type of joint sealant and joint backing material used in this specification. Use SAME reference designations as indicated in this Specification for preparation of the Joint Sealant Schedule in Part 3.6. Submittals are subject to the requirements of Division 1 Specification Section "Submittals."

- B. Product Data:

1. For each joint-sealant product indicated.

C. Samples:

1. Submit standard cured color samples and charts for each sealant type illustrating full range of standard and custom colors.

D. Manufacturer's Certificate:

1. Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
2. For manufacturer's products that include the phrase, "but are not limited to the following," the Contractor shall be responsible to provide certification that the submittal product complies with the specified product. This certification is subject to the requirements of Division 1 Specification Section "Submittals," Part 1, Definitions.

E. Qualifications Data:

1. For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified. Provide SWRI (Sealant, Waterproofing and Restoration Institute) Validation Certificate.

F. Compatibility and Adhesion from sealant manufacturer indicating the following:

1. Building materials forming joint and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
3. Preconstruction Compatibility and Adhesion Field Test for each sealant and building material.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Submit recommended inspection intervals.
2. Submit instructions for repairing and replacing failed sealed joints.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Provide SWRI (Sealant, Waterproofing and Restoration Institute) Validation Certificate.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience for the following sealant types:
1. Multi-component sealants cure by chemical reaction. Cure times are predictable depending on atmospheric temperature. Silicone sealant cure is not affected by temperature, however, frost and moisture at bond line will impair adhesion.
 2. Single component sealants cure by reaction with moisture. Cure times will vary depending on atmospheric humidity and temperature.
 3. Fast cure (FC) sealants provide lesser cure times than corresponding standard cure products. Longer cure times will permit more accumulation of dust and other air-borne contamination on surface of sealant, potentially causing apparent color change.
 4. Sealant Types are M – Multi-Component and S – Single Component.
 5. Sealant Grades are P – Pourable or Self-Leveling used for horizontal traffic joints and NS – Non-Sag or Gunnable used for vertical and non-traffic joints.
 6. Sealant Classes are 25, 50, and 100/50 (extension/compression) representing movement capability in percent of joint width. Joint movement is based on the relative percentage of installed width. Design to a minimum of 4 times anticipated movement to accommodate design tolerances and expected movement based on coefficient of thermal expansion.
 7. Sealant Uses are T – Traffic, NT – Non-Traffic, I – Immersion, M – Mortar, A – Aluminum, and O – Other. Use O includes color anodized aluminum, metals other than aluminum, painted surfaces, brick, stone, tile, and wood for example.
 8. Immersion rated sealant applications require primer.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.

- E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of standard and custom colors.

2.2 URETHANE SEALANT TYPES – For exterior or interior use.

- A. **U1** - Multi-Component, Non-Sag, Urethane: ASTM C920, Type M, Grade NS, Class 50; Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; Dynatrol II.
 - 2. Polymeric Systems, Inc.; PSI-270.
 - 3. Tremco, Inc.; Dymeric 240 FC.
- B. **U2** - Multi-Component, Traffic-Grade Urethane: ASTM C920, Type M, Grade NS, Class 50; Uses T, Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Polymeric Systems, Inc.; PSI-270
 - 2. Tremco, Inc.; Dymeric 240 FC.
- C. **U3** - Single-Component, Non-Sag Urethane: ASTM C920, Type S, Grade NS, Class 100/50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Sika Corporation, Construction Products Division; Sikaflex-15LM.
 - 2. Tremco, Inc.; Dymonic 100
- D. **U4** - Single-Component, Non-Sag Urethane: ASTM C920, Type S, Grade NS, Class 25, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; Dynatrol I-XL.
 - 2. Sika Corporation, Construction Products Division; Sikaflex-1a.
 - 3. Tremco, Inc.; Dymonic or Fulkem 116.
- E. **U5** - Single-Component, Pourable, Traffic-Grade Urethane: ASTM C920, Type S, Grade P, Class 25, Uses T. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; Urexpan NR-201.
 - 2. Tremco, Inc; Vulkem 45SSL.
 - 3. Sika Corporation, Construction Products Division; Sikaflex-1CSL.
- F. **U6** - Immersible, Single Component, Pourable, Traffic-Grade Urethane: ASTM C 920, Type S, Grade P, Class 25, Uses T and I. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Sika Corporation, Construction Products Division; Sikaflex-1CSL.
 - 2. Tremco, Inc.; Vulkem 45 SSL.

- G. **U7** - Immersible, Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C920. Type M, Grade P, Class 25, for Use T and I. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. LymTal International, Inc.; Iso-Flex 880GB.
2. May National Associates, Inc.; Bondaflex PUR 2 SL.
3. Tremco, Inc.; Vulkem 245

2.3 SILICONE SEALANT TYPES – For exterior or interior use.

- A. **S1** - Single-Component, Non-Staining, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to the following:

1. Dow Corning Corporation; 756SMS, 791, 795 or 995.
2. Tremco, Inc.; Spectrem 3.
3. Pecora Corporation; 864, 895 or 898.

- B. **S2** - Single Component, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 100/50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Dow Corning Corporation; 790
2. Pecora Corporation; 301NS, 311NS.
3. Tremco, Inc.; Spectrem 1.

- C. **S3** - Single Component, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Dow Corning Corporation; 791, 795 or 995.
2. Pecora Corporation; 864, 895 or 898.
3. Tremco, Inc.; Spectrem 2, Proglaze SSG.

- D. **S-4** - Single Component, Field-Tintable, Non-Sag, Neutral-Curing Silicone: ASTM C920, Type S, Grade NS, Class 50, Uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Pecora Corporation; 890 FTS.
2. Tremco, Inc.; Spectrem 4TS.

- E. **S5** - Mildew-resistant, Single Component, Acid-Curing Silicone: ASTM C920, Type S, Grade NS, Class 25, uses NT. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. BASF Building Systems; Omniplus
2. Dow Corning Corporation; 786 Mildew Resistant.
3. Tremco, Inc.; Tremsil 200 Sanitary.

2.4 LATEX SEALANT TYPES – For Interior Use Only

- A. **L1** – Acrylic Latex or Siliconized Acrylic Latex, ASTM C834, Type OP, Grade NF. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. BASF Building Systems; Sonolac.
 2. Pecora Corporation; AC-20+.
 3. Tremco, Inc.; Tremflex 834.
- B. **L2** - Acoustical Joint Sealant for Exposed and Concealed Joints: ASTM C1311 Manufacturer's standard Non-sag, paintable, no staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. Tremco, Inc.; Acoustical Sealant.
 2. Pecora Corporation; AC-20 FTR, AIS-919.
 3. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 SOLVENT-RELEASE-CURING-JOINT SEALANTS:

- A. **B1** - Butyl-Rubber-Based Joint Sealant: ASTM C 1311. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following.
1. Tremco, Inc.; Tremco Butyl Sealant.
 2. Bostik, Inc.; Chem-Calk 300.
 3. Pecora Corporation; BC-158.

2.6 PREFORMED JOINT SEALANTS – For exterior or interior applications per manufacturer's standards.

- A. **PF1** - Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of procured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
1. Dow Corning Corporation; 123 Silicone Seal
 2. Pecora Corporation; Sil-Span
 3. Tremco, Inc.; Simple Seal.
- B. **PF2** - Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu.ft. (160 kg/cu.m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping. Subject to compliance with

requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Tremco, Inc.; illbruk illmod 600.
2. EMSEAL Joint Systems, Ltd.; Emseal 25V.
3. School International, Inc.; Sealtite, Sealtite 50N.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASATM C 1330, of type indicated below and size and density to control sealant depth and otherwise contribute to producing optimum sealant performance, paired to the sealant type. List the type on the Sealant Schedule.
 1. **Type C:** Closed-cell material with a surface skin.
 2. **Type O:** Open-cell material.
 - a. Bostik, Inc.
 - b. Pecora Corporation
 - c. Tremco, Inc.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant back materials, free of oil residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

2.9 EXISTING WORK

- A. Mechanically remove existing sealant.
- B. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.
- C. Allow joint surfaces to dry before installing new sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include, but are not limited to, the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous surfaces include, but are not limited to, the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.

2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead ¼ inch (6 mm) inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

Sealant types should be selected from the available listed products in Part 2 of this specification section. These sealants shall be indicated on the submittal schedule, using the same reference designation as indicated in Part 1.3.A. of this specification section.

- A. Exterior or Interior Sealant Joints

1. Applications:

- a. Control and expansion joints in cast-in-place concrete.
 - b. Joints between [architectural] [structural] precast concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Control and expansion joints in stone masonry.
 - e. Butt joints between metal panels.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
 - h. Control and expansion joints in soffits and overhead surfaces.
2. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified
- B. Interior Food Contact Sealant Joints.
1. Applications:
 - a. Joints in kitchen counter tops and work surfaces.
 - b. Joints between food service equipment and surrounding construction.
 - c. Other interior joints where incidental food contact may occur.
- C. Interior Sanitary Sealant Joints.
1. Applications:
 - a. Joints in toilet room and bathroom counter tops.
 - b. Joints between plumbing fixtures and adjacent materials.
 - c. Joints between locker room lockers and adjacent materials.
 - d. Joints between food service equipment and surrounding construction.
 - e. Other interior joints in wet areas where needed to limit mold and mildew growth.
- D. Immersed Sealant Joints.
1. Applications:
 - a. Joints in fountains and water features.
 - b. Joints in swimming pools.
 - c. Joints in vertical and horizontal surfaces of other potable water storage structures.
- E. Metal Lap and Bedding Sealant Joints.
1. Applications:
 - a. Concealed lap and hook joints in sheet metal flashing and trim.
 - b. Bedding joints under metal thresholds and saddles.
 - c. Bedding joints between sheet metal flashing and other materials.
- F. Preformed Joint Sealants:
1. Applications:

- a. Control and expansion joints in cast-in-place concrete.
- b. Joints between [architectural] [structural] precast concrete units.
- c. Control and expansion joints in unit masonry.
- d. Control and expansion joints in stone masonry.
- e. Butt joints between metal panels.
- f. Joints between different materials listed above.
- g. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
- h. Control and expansion joints in soffits and overhead surfaces.
- i. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
- j. Joints between EIFS and other materials.

G. Interior Prison Security Sealants: **[EDIT PER PROJECT]**

1. Applications:

- a. Control and expansion joints on exposed interior surfaces of floors, walls, etc., and at inmate/secure areas.
- b. Perimeter joints on exposed interior surfaces of interior and exterior openings, i.e., window and door frames, etc.
- c. Joints in precast walls, ceilings, and floor joints at inmate/secure areas.
- d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, and similar openings, and at inmate/secure areas. Refer to Security Sealants paragraph above for additional information.
- e. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified, and at inmate/secure areas.
- f. Joints between plumbing fixtures and adjacent materials at inmate/secure areas.
- g. Joints between locker room lockers and adjacent materials at inmate/secure areas.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Factory primed, field painted steel doors.
 - 2. Factory primed, field painted steel door frames.
 - 3. Factory primed, field painted borrowed-lite frames.
 - 4. Factory primed, field painted fire-rated door and frame assemblies.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section "Flush Wood Doors" for wood doors that get installed in hollow metal frames.
 - 3. Division 8 Section "Door Hardware" for door hardware and weather-stripping.
 - 4. Division 8 Section "General Glazing" for glass in steel doors and sidelights.
 - 5. Division 8 Section "Fire-Rated Glazing" for fire-rated glass in steel doors and sidelights.
 - 6. Division 9 Section "Painting" for field painting primed doors and frames.
 - 7. Divisions 26 through 28 Electrical Sections for power wiring and low voltage requirements for electrified hardware.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/ SDI A250.8.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site in accordance with Division 1 Section "Project Meetings".
 - 1. The Pre-installation Conference shall include representatives of the Owner's access control and security vendors. Prior to proceeding with the Work, the Contractor shall coordinate all equipment and rough-in requirements with these Owner vendors to ensure all required pathways, junction boxes, etc., are installed correctly.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Door hardware supplier shall furnish templates, template reference number and/or physical hardware to the steel door and frame supplier to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Include the following:
 - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
 - 2. Elevations of each door design.
 - 3. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Locations of reinforcement and preparations for hardware.
 - 6. Details of each different wall opening condition.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
 - 10. Details of conduit and preparations for power, signal, and control systems. **Include point-to-point wiring diagrams showing the following:**
 - a. Power requirements for each electrically operated door hardware component.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- E. Door Schedule: Submit schedule of doors and frames using **SAME** reference numbers for details and openings as those on Contract Documents.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E152, and are labeled and

listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg. F maximum in 30 minutes of fire exposure.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- D. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

1.8 COORDINATION

- A. Field Measurements: Verify actual dimensions of openings by field measurement before fabrication.
- B. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete and masonry inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- C. Coordinate requirements for installation of electrified door hardware, access control and security systems.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain hollow doors and frames from a single source, from a single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steelcraft; an Allegion company.
 - 2. Amweld Building Products, LLC.
 - 3. CECO Door Products; an ASSA ABLOY Group company.
 - 4. Curries Company; an ASSA ABLOY Group company.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg. F above ambient after 30 minutes of standard fire-test exposure.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

2.3 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A569.
- B. Cold-Rolled Steel Sheet: Carbon steel complying with ASTM A366, commercial quality, or ASTM A620, drawing quality, special killed.
- C. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

- D. Frame Anchors: ASTM A591, Commercial Steel (CS), 4oz coating designation; mill phosphatized. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A153, Class C or D as applicable.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: 1-3/4-inch flush panel; full flush door edges with continuous laser weld.
 - a. Provide undercuts as noted on the Door Schedule.
 - 2. Core Construction: As follows:
 - a. Standard Interior Doors: Manufacturer's standard honeycomb core.
 - b. Fire Doors: Manufacturer's standard core as required to provide fire-protection and temperature-rise ratings indicated.
 - c. Exterior Doors: 1.8 lb/cu. ft. density polyurethane core, laminated to both face sheets with contact adhesive; capable of carrying the following minimum thermal-resistance properties:
 - 1) ASTM C518, Calculated: 10.0 R-Value; 0.10 U-Factor.
 - 2) ASTM C1363, Operable: 2.9 R-Value; 0.35 U-Factor.
 - 3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth.
 - a. Vertical Edges for Single-Acting Doors: Beveled edge; 1/8 inch in 2 inches.
 - b. Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

4. Top and Bottom Edges: Closed with inverted 15-gauge-thick minimum end closures or channels of same material as face sheets, extending full width of the door and welded to face sheet.
 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Extra heavy-duty, Level 3, Model 2, seamless design, minimum 0.053-inch thick (16 Ga.) galvanized steel sheet faces.
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Heavy-duty, Level 2, Model 2, seamless design, minimum 0.042-inch-thick (18 Ga.) cold-rolled steel sheet faces
Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
 - a. At interior locations noted to be galvanized, provide extra heavy-duty, Level 3, Model 2 doors.
- D. Hinge Reinforcement: Minimum 7 gauge plate, 1-1/4 inch x 9 inches, or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- 2.5 HOLLOW METAL FRAMES
- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated (galvanized) steel sheet.
1. Fabricate frames with mitered or coped corners, face-welded unless otherwise indicated.
 2. Frames for Level 3 Steel Doors: 16-gauge-thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet; provide metallic-coated steel sheet where specifically indicated.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as face-welded, unless otherwise indicated.
 3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
 - a. Frames with sidelites in drywall installations shall be welded.

4. Frames for Level 2 and Level 3 Steel Doors, Wood Doors and Borrowed Lights: 16-gauge-thick steel sheet.

a. Fabricate interior frames from metallic-coated steel sheet where doors are noted to be galvanized in the Door Schedule.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

E. Plaster Guards: Provide minimum 0.0179-inch-thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

F. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry (Assemblies)."

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 19 gauge thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 7 gauge thick.

2. Stud-Wall Type: Designed to engage steel stud, welded to back of frames; not less than 19 gauge thick.

3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

4. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Provided at each jamb, formed from A60 metallic-coated material, minimum 19-gauge-thick.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 22-gauge-thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 22-gauge-thick, fabricated from same material as frames in which they are installed.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

- B. Grout Guards: Formed from same material as frames, minimum 8-gauge-thick.
- C. Metal Louvers: Door and frame manufacturer's standard metal louvers, unless otherwise indicated. Provide louvers where noted in the Door Schedule.
 - 1. Blade Type: Vision proof, inverted V or Y shape.
 - 2. Metal and Finish: Galvanized steel, minimum 20-gauge-thick, factory-primed for factory-painted, powder-coated finish. Match pre-finished door and frame paint color, where applicable.
 - 3. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 90 minutes and less; meet fire rating as indicated.

2.9 FABRICATION

- A. Fabricate hollow metal doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory-cut openings in doors.
 - 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.

- 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware. Provide minimum 14-gauge closer reinforcement.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections.
- G. Electrified Hardware Coordination: Factory-weld 18 gauge electrical knockout boxes to frame for electrical hardware preparation, including, but not limited to, through-wire transfer hardware, raceways and wiring harnesses, door position switches, electric strikes, magnetic locks and jamb-mounted card readers, as specified in the hardware sets in Division 8 Section "Door Hardware" and Division 26 through 28 Electrical Sections.
1. Provide electrical knockout boxes with dual 1/2-inch and 3/4-inch knockouts.
 2. Conduit shall be coordinated and installed in the field from middle hinge box and strike box, and strike box to door position box.
 3. Electrical knockout boxes shall comply with NFPA requirements and accommodate electrical door hardware, per door hardware set requirements.

4. Electrical knockout boxes for continuous hinges shall be located in the center of vertical dimension on hinge jamb.
- H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
 6. Glazing: Comply with requirements in Division 8 Sections "General Glazing" and "Fire-Rated Glazing" and with hollow metal door manufacturer's written instructions.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA-1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

2.11 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780.
 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.12 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP-8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Contractor shall verify the accuracy of all dimensions indicated for existing openings in which new hollow metal frames and doors are scheduled to be installed, as well as existing frames scheduled to remain and accommodate new doors and/or hardware. Verify existing frame conditions to include, but not be limited to, locations of strikes and hinges and hinge backsets, for new hardware provisions.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field-apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.**
 2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 4. In-Place Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 5. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

- b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Division 8 Sections "General Glazing" and "Fire-Rated Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly, between 2 inches o.c. and 9 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for door hardware requirements.
 - 2. Division 8 Section "General Glazing" for glass view panels in flush wood doors.
 - 3. Division 8 Section "Hollow Metal Doors and Frames" for metal frames for wood doors.
 - 4. Divisions 26 through 28 Electrical Sections for power wiring and low voltage requirements for electrified hardware.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Details of doors, including vertical and horizontal edge details.
 - 3. Indicate dimensions and locations of cutouts.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire ratings for fire doors.
 - 6. Indicate preparations for power, signal, and control systems.
- C. Door Schedule: Use **SAME** reference designations indicated on Drawings in preparing schedule for doors and frames.

- D. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with WDMA Architectural Woodwork Quality Standards Illustrated.
 - 1. Provide WDMA Quality Certification Labels or a WDMA letter of licensing for Project indicating that doors comply with requirements of grades specified.
 - 2. When requested, provide evidence that the installer has successful experience completing projects of similar scope and with products as specified herein.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist), or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

- a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Basis of Design Product – Aspiro Series by Masonite Architectural (includes Marshfield-Algoma, Graham, Mohawk and Maiman). Subject to compliance with requirements, the following manufacturers' products may also be incorporated into the Work:
 1. Flush Wood Doors:
 - a. VT Industries/Eggers.
 - b. Lambton.
- B. Manufacturers other than those listed above will not be accepted – No substitutions will be allowed.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
 1. Grade: Premium, with Grade A faces.
 2. Species and Cut: Maple, plain sliced.
 3. Veneer flitch match: Book match, running match.
 4. Pair Match: Provide for doors hung in same opening or separated only by mullions.
 5. Stiles: Same species as faces.

2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
 1. Particleboard: ANSI A208.1, Grade LD-2, 32 lb. density.
 2. Blocking: Provide solid wood blocking in particleboard-core doors for installation of hardware.
- B. Interior Veneer-Faced Doors:
 1. Core: Particleboard.
 2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed and then veneered or laminated in a one-step hot press method.
- C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated for installation of hardware.
 - a. Doors with exit devices provide top rail, bottom rail and 5 x 10 right and left lock blocks.
3. Edge Construction: At hinge stiles, provide manufacturer's standard veneer-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
 - a. At locations where new doors are being retrofitted into existing frames, provide lumber edge doors to all for minor field fitting.
4. Pairs: Furnish formed-steel edges and astragals with intumescent seals for pairs of fire-rated doors, unless otherwise indicated.
 - a. Finish steel edges and astragals with baked enamel.
5. Pairs with Surface Mounted Panic Devices: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.
6. Intumescent Seals For Fire Rated Doors: Category "A" doors with manufacturer's standard concealed intumescent seals.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors:
 1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular beads.
 3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.
- C. Metal Louvers: Where doors are indicated in the Door Schedule to receive louvers, provide the following:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Louvers, Inc.; a division of the Activar Construction Products Group.
 - b. Anemostat Products; a Mestek company.
 - c. L & L Louvers, Inc.
 - d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - e. McGill Architectural Products.
2. Blade Type: Vision-proof, inverted Y or V.
3. Metal and Finish: Cold-rolled steel, 18-gauge frames with 22-gauge blades, factory-finished. Color to be selected by Architect from manufacturer's full range of available colors.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Pre-machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light and Louver Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

- A. General: Comply with WDMA Architectural Woodwork Quality Standards Illustrated for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
 1. Grade: Premium.

2. Finish: WDMA System TR-6 catalyzed polyurethane, or UV cured polyurethane.
3. Staining: To be selected by Architect from manufacturer's full range of stain colors.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects, and replace at no cost to Owner.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Exterior storefront framing systems.
 - 2. Interior entrance systems.
 - 3. Manual-swing aluminum doors.
- B. Related sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for mockup requirements to include aluminum framed storefront systems.
 - 2. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 - 3. Division 8 Section "General Glazing" for glazing in aluminum-framed storefront systems.
 - 4. Division 8 Section "Door Hardware" for door hardware installed in aluminum door and frame assemblies.
 - 5. Divisions 26 through 28 Electrical Sections for power wiring and low voltage requirements for electrified hardware.

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Thermally Broken Construction: Provide aluminum-framed entrance systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site in compliance with Division 1 Section "Project Meetings".
 - 1. The Pre-installation Conference shall include representatives of the Owner's access control and security vendors. Prior to proceeding with the Work, the Contractor shall coordinate all equipment and rough-in requirements with these Owner vendors to ensure all required pathways, junction boxes, etc., are installed correctly.

1.5 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency evidencing compliance with requirements.
- D. Shop Drawings: For aluminum-framed entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work and the following:
 - 1. Layout and installation details, including anchors.
 - 2. Elevations at 1/4 inch = 1 foot, and window unit elevations at 3/4 inch = 1 foot scale.
 - 3. Full-size section details of typical composite members, including reinforcement and stiffeners.
 - 4. Details for flashing and drainage.
 - 5. Location of weep holes.
 - 6. Hardware, including operators.
 - 7. Glazing details.
 - 8. Accessories.
 - 9. **Include point-to-point wiring diagrams showing the following:**
 - a. Power requirements for each electrically operated door hardware component.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- E. Cutaway Sample: For each type of vertical-to-horizontal framing intersection of systems made from minimum 6 inch lengths of full-size components, and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.

3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
 6. Structural sealant joints.
- F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- G. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- H. Qualification Data: For Installer.
- I. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- J. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.
- K. Source quality-control reports.
- L. Field quality-control reports.
- M. Sample Warranties: For special warranties.
- N. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, registered in the state in which the project is located, to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with the performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:

- a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $1/175$ of the glass edge length for each individual glazing lite, or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to $1/360$ of clear span or $1/8$ inch, whichever is smaller.
 - a. Operable Units: Provide a minimum $1/16$ -inch clearance between framing members and operable units.
 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than $1/240$ of clear span plus $1/4$ inch for spans greater than 11 feet 8- $1/4$ inches or $1/175$ times span, for spans less than 11 feet 8- $1/4$ inches.
- E. Structural: Test according to ASTM E330 as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity for relevant exposure category, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 2. Entrance Doors:

- a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
 - 2. Maximum Water Leakage: According to AAMA 501.1. No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F (using $U_{cog}=0.29$), as determined according to NFRC 100.
 - 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.35 as determined according to NFRC 200.
 - 3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- J. Noise Reduction: Test according to ASTM E90, with ratings determined by ASTM E1332, as follows:
 - 1. Sound Transmission Class: Not less than 32 for 1-inch insulated glazing and 36 for laminated glazing.
 - 2. Outdoor-Indoor Transmission Class: Not less than 27 for 1-inch insulated glazing and 30 for laminated glazing.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

- a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.
- L. Performance Requirements of Operable Units: Testing shall demonstrate compliance with requirements indicated in AAMA 101-03 for air infiltration, water penetration, and structural performance for type, grade, and performance class of operable units required. Where required design pressure exceed the minimum for specified window grade, comply with requirements of AAMA 101, Section 3, "Optional Performance Classes," for higher than minimum performance class.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
- 1. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each component and each type of entrance and storefront system through one source from a single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field-testing, or in-service performance.
- 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Standards: Comply with AWS D1.2, "Structural Welding Code - Aluminum."

1.8 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
- 1. Mockup shall be a component of the comprehensive mockup specified in Division 4 Section "Unit Masonry (Assemblies)".

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.10 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace window components that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to the following:
 - 1. Structural failures including excessive deflection.
 - 2. Failure of system to meet specified performance requirements including water leakage, air infiltration or condensation.
 - 3. Noise or vibration created by wind and thermal and structural movements.
 - 4. Water penetration through fixed glazing and framing areas.
 - 5. Adhesive sealant failures.
 - 6. Cohesive sealant failures.
 - 7. Failure of operating components to function normally.
 - 8. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: 2 years from date of Substantial Completion.
- D. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Basis of Design Products are by YKK AP America, Inc. Subject to compliance with requirements, other manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Kawneer North America.
 2. EFCO Corporation.
 3. Oldcastle Building Envelope (formerly Vistawall Architectural Products).
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront systems as well as glazed aluminum curtain wall systems, including operable units and accessories, from the same manufacturer.
- C. Storefront Framing Products:
1. Thermally Broken 2-inch x 4-1/2-inch Storefront Systems: YES 45 TU (center set, flush glazed storefront system for insulated glass).
 - a. For use generally at exterior storefront locations. Where removable mullions are a component of the hardware set for thermally broken (2-3/8-inch thick) entrance doors, 6-inch storefront systems are required.
 2. Thermally Broken 2-inch x 6-inch Storefront Systems: YES 60 FI (center set, flush glazed storefront system for insulated glass).
 - a. For use generally at exterior storefront locations where the use of thermally broken (2-3/8-inch thick) doors AND removable mullions are a component of the assembly, and also where noted on Drawings or where required by wind loads against the overall frame.
 3. Non-Thermally Broken 1-3/4-inch x 4-1/2-inch Storefront Systems: YES 45 FS (center set, flush glazed storefront system for monolithic glass).
 - a. For use at interior locations where noted on Drawings.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below:
1. Sheet and Plate: ASTM B209.
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
 3. Extruded Structural Pipe and Tubes: ASTM B429.
 4. Structural Profiles: ASTM B308
 5. Bars, Rods, and Wire: ASTM B211.

6. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement:
 1. Structural Shapes, Plates, and Bars: ASTM A36.
 2. Cold-Rolled Sheet and Strip: ASTM A1008.
 3. Hot-Rolled Sheet and Strip: ASTM A1011.
 - C. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - D. Glazing: Refer to Division 8 Section "General Glazing".
 - E. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
 - F. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
 - G. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
 - H. Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at manufacturer's option, provide compressible stripping for glazing and weatherstripping such as molded EPDM or neoprene gaskets complying with ASTM D2000 Designation 2C415 to 3BC620, or molded PVC gaskets complying with ASTM D2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.
 - I. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 COMPONENTS

- A. Framing Components: Provide manufacturer's standard components complying with specified requirements.
- B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide non-staining, nonferrous shims for aligning system components.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to retain fastener threads.
 - 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 3. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

- E. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.

- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding flashing, compatible with adjacent materials and of type recommended by manufacturer.

- G. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D2000 requirements or molded PVC complying with ASTM D2287 requirements.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.4 DOORS

- A. Doors: Basis of Design Products; YKK AP America, Inc. – 50XT Wide Stile Door (thermally broken doors), and 50D Wide Stile Door (non-thermally broken). As scheduled, thermally broken doors shall be used at all exterior locations. Non-thermally broken doors shall be used at all interior locations.
 - 1. Thermally Broken Door Construction: 2-3/8-inch overall thickness, with nominal 1/8-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded.
 - 2. Non-Thermally Broken Door Construction: 1-3/4-inch overall thickness, with nominal 1/8-inch thick, extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded.
 - 3. Door Design: Wide stile (all doors).
 - a. Stile Width: 5 inches.
 - b. Top Rail: 6-1/2 inches.
 - c. Mid Rail: 6-1/2 inches.
 - d. Bottom Rail: 10 inches

- 1) Verify stile and rail dimensions indicated for entrance doors will properly accommodate and conceal prescribed hardware components, including, but not limited to, exit devices and closers. Report any discrepancies to the Architect.
4. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide non-removable glazing stops on outside of door.
- B. Door Hardware: As specified in Division 8 Section "Door Hardware".

2.5 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
1. Fabricate components for screw-spline frame construction.
 2. Fabricate components for head and sill-receptor frame construction with shear-block construction at intermediate horizontal components.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation. Provide ventilator units where detailed on Drawings.

- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 - 1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

2.7 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- G. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- I. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

- J. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 10 feet; 1/4 inch over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING AND CLEANING*

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for fire-rated doors.
- B. Lock cylinders for doors with balance of hardware specified in other sections.
- C. Thresholds.

1.02 RELATED REQUIREMENTS

- A. Section 081113 - Hollow Metal Doors and Frames.
- B. Section 081213 - Hollow Metal Frames.
- C. Section 081416 - Flush Wood Doors.
- D. Section 081433 - Stile and Rail Wood Doors.
- E. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. BHMA A156.1 - Standard for Butts and Hinges 2021.
- C. BHMA A156.2 - Bored and Preamsembled Locks and Latches 2017.
- D. BHMA A156.3 - Exit Devices 2020.
- E. BHMA A156.4 - Door Controls - Closers 2019.
- F. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
- G. BHMA A156.6 - Standard for Architectural Door Trim 2021.
- H. BHMA A156.7 - Template Hinge Dimensions 2016.
- I. BHMA A156.16 - Auxiliary Hardware 2018.
- J. BHMA A156.21 - Thresholds 2019.
- K. BHMA A156.26 - Standard for Continuous Hinges 2021.
- L. BHMA A156.28 - Recommended Practices For Mechanical Keying Systems 2018.
- M. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.
- N. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
- O. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
- P. DHI (KSN) - Keying Systems and Nomenclature 2019.
- Q. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
- R. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.
- S. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- T. ITS (DIR) - Directory of Listed Products current edition.
- U. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

- V. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.
- W. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- X. UL (DIR) - Online Certifications Directory Current Edition.
- Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- Z. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Attendance Required:
 - 2. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.
 - 3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - 4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 - 5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).

2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
 - a. Submit in vertical format.
 3. Include complete description for each door listed.
- D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.
- E. Samples for Verification:
1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
 2. Submit one (1) sample of hinge, latchset, lockset, closer, and [_____] illustrating style, color, and finish.
 3. Include product description with samples.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Supplier's qualification statement.
- J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- K. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

- C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
 - 1. Closers: Five years, minimum.
 - 2. Exit Devices: Three years, minimum.
 - 3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Closers:
 - 1. Provide door closer on each exterior door, unless otherwise indicated.
 - 2. Provide door closer on each fire-rated and smoke-rated door.
 - 3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
- D. Overhead Stops and Holders (Door Checks):
 - 1. Provide stop for every swinging door, unless otherwise indicated.
 - 2. Overhead Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.
 - 3. Overhead stop is not required if a floor or wall stop has been specified for the door.
- E. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.
- F. Weatherstripping and Gasketing:
- G. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.

3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide door hardware products that comply with the following requirements:
 1. Applicable provisions of federal, state, and local codes.
 2. Accessibility: ADA Standards and ICC A117.1.
 3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or [_____] as suitable for application indicated.
 5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
 6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

- A. Manufacturers: Conventional butt hinges.
 1. BEST; dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 1. Butt Hinges: As applicable to each item specified.
 - a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
 - b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
 - c. Template screw hole locations.
 - d. Bearing assembly installed after plating.
 - e. Bearings: Concealed fully hardened bearings.
 - f. Bearing Shells: Shapes consistent with barrels.
 - g. Pins: Easily seated, non-rising pins.
 - 1) Fully plate hinge pins.
 - 2) Non-Removable Pins: Slotted stainless steel screws.
 - h. UL 10C listed for fire-resistance-rated doors.
 2. Continuous Hinges: As applicable to each item specified.
- C. Sizes: See Door Hardware Schedule.

1. Hinge Widths: As required to clear surrounding trim.
 2. Sufficient size to allow 180 degree swing of door.
- D. Finishes: See Door Hardware Schedule.
1. Fully polish hinges; front, back, and barrel.
- E. Grades:
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.
- F. Material: Base metal as indicated for each item by BHMA material and finish designation.
- G. Types:
1. Butt Hinges: Include full mortise hinges.
 2. Continuous Hinges: Include geared hinges.
- H. Options: As applicable to each item specified.
- I. Quantities:
1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
 - a. Hinge weight and size unless otherwise indicated in hardware sets:
 - 1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
 - 4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
 2. Continuous Hinges: One per door leaf.
- J. Applications: At swinging doors.
1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.
- K. Products:
1. Butt Hinges:
 - a. Concealed bearing, five (5) knuckle.
 - b. Ball Bearing, Five (5) Knuckle.
 2. Continuous Hinges:

2.04 BOLTS

- A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
1. Flush Bolts:
 - a. Manual Flush Bolts: Manually latching upon closing of door leaf.

- 1) Bolt Throw: 3/4 inch (19 mm), minimum.
- 2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.
- C. Options:
 - 1. Extension Bolts: In leading edge of door, one bolt into floor, one bolt into top of frame.
- D. Products:
 - 1. Manual flush bolts.

2.05 EXIT DEVICES

- A. Manufacturers:
- B. Properties:
 - 1. Actuation: Crossbar.
 - 2. Touchpads: 'T' style metal touchpads and rail assemblies with matching chassis covers end caps.
 - 3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
 - 4. Lever Design: Match project standard lockset trims.
 - 5. Cylinder: Include where cylinder dogging or locking trim is indicated.
 - 6. Strike as recommended by manufacturer for application indicated.
 - 7. Sound dampening on touch bar.
 - 8. Dogging:
 - a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch (6 mm) hex key dogging.
 - b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
 - 9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.
 - 10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
 - 11. Handing: Field-reversible.
 - 12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
 - 13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.
- C. Grades: Complying with BHMA A156.3, Grade 1.
- D. Options:
- E. Products:

2.06 LOCK CYLINDERS

- A. Manufacturers:
 - 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties:
 - 1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - a. Provide cylinders from same manufacturer as locking device.
 - b. Provide cams and/or tailpieces as required for locking devices.
 - c. Provide cylinders with appropriate format interchangeable cores where indicated.
- C. Grades:
 - 1. Standard Security Cylinders: Comply with BHMA A156.5.
- D. Material:
- E. Types: As applicable to each item specified.

- F. Applications: At locations indicated in hardware sets, and as follows
 - 1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
 - a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.
- G. Products:
 - 1. Rim/mortise.

2.07 MORTISE LOCKS

- A. Manufacturers:
 - 1. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.
- B. Properties:
 - 1. Mechanical Locks: Manufacturer's standard.
 - a. Fitting modified ANSI A115.1 door preparation.
 - b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
 - c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
 - 1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
 - d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
 - e. Backset: 2-3/4 inch (70 mm).
 - f. Lever Trim:
 - 1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
 - 2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - 3) Spindle: Designed to prevent forced entry from attacking of lever.
 - 4) Independent spring mechanism for each lever.
 - (a) Trim to be self-aligning and thru-bolted.
 - 2. Electrified Locks: Same properties as standard locks, and as follows:
 - a. Voltage: 12 VDC.
 - b. Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.
- C. Finishes: See Door Hardware Schedule.
 - 1. Core Faces: Match finish of lockset.
- D. Grades:
- E. Options:
- F. Products: Mortise locks, including standard and electrified types.
 - 1. M9000.

2.08 CYLINDRICAL LOCKS

- A. Manufacturers:
 - 1. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.
- B. Properties:

1. Mechanical Locks:
 - a. Fitting modified ANSI A115.2 door preparation.
 - b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
 - c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
 - 1) Through-bolted anti-rotational studs.
 - d. Bored Hole: 2-1/8 inch (54 mm) diameter.
 - e. Backset: 2-3/8 inches (60 mm) unless otherwise indicated.
 - f. Latch: Single piece tail-piece construction.
 - 1) Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
 - g. Cylinders:
 - 1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
 - (a) Small format interchangeable.
 - h. Lever Trim:
 - 1) Style: See Door Hardware Schedule.
 - 2) Outside Lever Sleeve: Seamless one-piece construction.
 - 3) Keyed Levers: Removable only after core is removed by authorized control key.
- C. Finishes: See Door Hardware Schedule.
 1. Core Faces: Match finish of lockset.
- D. Grades: Comply with BHMA A156.2, Grade 1.
- E. Material: Manufacturer's standard for specified lock.
- F. Options:
- G. Products: Cylindrical locks, including mechanical types.
 1. C800 (Grade 1).

2.09 DOOR PULLS AND PUSH PLATES

- A. Manufacturers:
 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:
 1. Pull Type: Straight, unless otherwise indicated.
 2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
 - a. Edges: Beveled, unless otherwise indicated.
- C. Grades: Comply with BHMA A156.6.
- D. Material: Stainless steel, unless otherwise indicated.
- E. Products:

2.10 CLOSERS

- A. Manufacturers:
 1. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.
- B. Properties:
 1. Surface Mounted Closers: Manufacturer's standard.
 - a. Construction: R14 high silicon aluminum alloy.

- b. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
 - c. Hydraulic Fluid: All-weather type.
 - d. Arm Assembly: Standard for product specified.
 - 1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
 - 2) Parallel arm to be a heavy-duty rigid arm.
 - 3) Where "IS" or "S-IS" arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
 - e. Covers:
 - 1) Type: Standard for product selected.
 - (a) Full.
 - 2) Material: Plastic.
 - 3) Finish: Painted.
- C. Grades:
- 1. Closers: Comply with BHMA A156.4, Grade 1.
 - a. Underwriters Laboratories Compliance:
 - 1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 - (a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
- 1. Devices listed with California Department of Forestry and Fire Protection, Office of the State Fire Marshal.
- E. Types:
- 1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.
- F. Options:
- 1. Delayed action, adjustable with an independent valve.
- G. Installation:
- 1. Mounting: Includes surface mounted installations.
 - 2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
 - 3. At outswinging exterior doors, mount closer on interior side of door.
 - 4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
 - 5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
- H. Products:
- 1. Surface Mounted:
 - a. 8900.

2.11 PROTECTION PLATES

- A. Manufacturers:
 - 1. Trimco: www.trimcohardware.com/#sle.
- B. Properties:

1. Plates:
 - a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - b. Edges: Beveled, on four (4) unless otherwise indicated.
- C. Grades: Comply with BHMA A156.6.
- D. Material: As indicated for each item by BHMA material and finish designation.
 1. Metal Properties: Stainless steel.
- E. Installation:
 1. Fasteners: Countersunk screw fasteners
- F. Products:

2.12 STOPS AND HOLDERS

- A. Manufacturers:
 1. Trimco: www.trimcohardware.com/#sle.
- B. General: Provide overhead stop/holder when wall or floor stop is not feasible.
- C. Grades:
 1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.
- D. Material: Base metal as indicated for each item by BHMA material and finish designation.
- E. Types:
 1. Wall Bumpers: Bumper, concave, wall stop.
- F. Installation:
 1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.
- G. Products:
 1. Wall Bumpers.

2.13 THRESHOLDS

- A. Manufacturers:
- B. Properties:
 1. Threshold Surface: Fluted horizontal grooves across full width.
- C. Grades: Thresholds: Comply with BHMA A156.21.
- D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.
- E. Products:

2.14 KEYS AND CORES

- A. Manufacturers:
 1. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Properties: Complying with guidelines of BHMA A156.28.
 1. Provide small format interchangeable core.
 2. Provide Patented CORMAX keys and cores.
 3. Provide keying information in compliance with DHI (KSN) standards.

4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
5. Keying: Master keyed.
6. Include construction keying and control keying with removable core cylinders.
7. Supply keys in following quantities:
 - a. Master Keys: 4 each.
 - b. Construction Master Keys: 6 each.
 - c. Construction Keys: 15 each.
 - d. Construction Control Keys: 2 each.
 - e. Control Keys if New System: 2 each.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:

2.15 FINISHES

- A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Correct all defects prior to proceeding with installation.
- C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware using the manufacturer's fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.
- C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- D. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- E. Use templates provided by hardware item manufacturer.
- F. Do not install surface mounted items until application of finishes to substrate are fully completed.
- G. Wash down masonry walls and complete painting or staining of doors and frames.
- H. Complete finish flooring prior to installation of thresholds.

- I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Steel Doors and Frames: See Section 6549.
 - 3. For Steel Door Frames: See Section 081213.
 - 4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
 - 5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 6. Flush Wood Doors: See Section 081416.
 - 7. Stile and Rail Wood Doors: See Section 081433.
 - 8. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch (1024 mm).
 - b. Push Plates/Pull Bars: 42 inch (1067 mm).
 - c. Deadlocks (Deadbolts): 48 inch (1219 mm).
 - d. Exit Devices: 40-5/16 inch (1024 mm).
 - e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).
- J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
- K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

3.06 PROTECTION

- A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

Manufacturer List

Code	Name
DM	Dorma Door Controls

NA	National Guard
ST	BEST Hinges and Sliding
TR	Trimco

Option List

Code	Description
79022	Occupancy Indicator (Rose Trim)
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
CSK	COUNTER SINKING OF KICK and MOP PLATES

Finish List

Code	Description
26D	Satin Chrome
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
AL	Aluminum
GREY	Grey

Hardware Sets

Set #01

Doors: 101A

2	Continuous Hinge	661HD UL 85"	AL	ST
1	Exit Device	9100B x YC03R	626	DM
2	Closer	8916-AFP	689	DM
1	Threshold	896 SDKB 40"		NA

NOTE: Remaining Latching Hardware/Access control hardware by others, seals by ALM

Set #02 - Passage

Doors: 111, 112, 113, 114, 115, 201, 202

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Passage Set	C810 LRC	626	DM
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050 B Head & Jambs		NA
3	Silencer	1229A	GREY	TR

Set #03 - Single Bathroom

Doors: 118, 119, 124, 125, 216, 217

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Privacy Set	M9046 LRA 79022	626	DM
1	Closer	8916-AFP	689	DM
1	Mop Plate	KM050 6" x 35" B4E-HEAVY-KP CSK	630	TR
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050 B Head & Jambs		NA
3	Silencer	1229A	GREY	TR

Set #04 - Access control

Doors: 103, 104A, 106, 108, 109, 110A, 117, 121, 122A, 126A, 203, 205, 206, 207, 209, 210, 211, 212, 214, 218

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Closer	8916-AFP	689	DM
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050 B Head & Jambs		NA
3	Silencer	1229A	GREY	TR

NOTE: Latching Hardware/Access control hardware by others

Set #05 - EXT Panic Access Control

Doors: 110, 122B, 126C

3	Butt Hinge	CB168 4.5" x 4.5" NRP	26D	ST
1	Closer	8916 SPA	689	DM
1	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Drip Cap	16 A - 4" ODW		NA
1	Weatherstrip	700 SB 1 x 36" 2 x 86"		NA
1	Door Sweep	200 SB 36"		NA
1	Threshold	896 SDKB 40"		NA

3	Silencer	1229A	GREY	TR
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NOTE: Latching Hardware/Access control hardware by others

Set #06

Doors: 105, 126B

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Closer	8916-AFP	689	DM
1	Overhead Stop	912 S	626	DM
3	Silencer	1229A	GREY	TR

NOTE: Latching Hardware/Access control hardware by others

Set #07

Doors: 104B, 133

6	Butt Hinge	CB168 4.5" x 4.5" NRP	26D	ST
1	Automatic Flush Bolt	3810	626	TR
2	Closer	8916-AFP	689	DM
2	Kick Plate	K0050 10" x 34" B4E-HEAVY-KP CSK	630	TR
1	Weatherstrip	700 SB 1 x 36" 2 x 86"		NA
2	Door Sweep	200 SB 36"		NA
1	Threshold	896 SDKB 40"		NA
2	Silencer	1229A	GREY	TR

Set #08 - Panic Stair

Doors: 208, 221

3	Butt Hinge	FBB179 4.5" x 4.5"	26D	ST
1	Exit Device	F9300B x YR23	626	DM
1	Closer	8916-AFP	689	DM
1	Wall Bumper	1270CV	626	TR
1	Gasketing	5050 B Head & Jambs		NA
3	Silencer	1229A	GREY	TR

Set #09

Doors: 219

6	Butt Hinge	CB168 4.5" x 4.5" NRP	26D	ST
1	Automatic Flush Bolt	3810	626	TR
1	Lockset	C880J LRC	626	DM
2	Silencer	1229A	GREY	TR

Set #10

Doors: 101B

2	Continuous Hinge	661HD UL 85"	AL	ST
2	Door Pull	AP412 48"	630	TR
2	Closer	8916-AFP	689	DM
2	Push Plate	1001-3	630	TR

Set #11 - Coat Hooks

1 Coat & Hat Hook 3070-1 626 TR

NOTE: for doors 112, 113, 114, 115, 116, 205, 206, 207, 209, 210, 211, 212 & 214 installed on office/exam side

Opening List

Opening	Hdw Set	Opening Label	Door Type	Frame Type
HS011	11			
103	04			
105	06			
106	04			
108	04			
109	04			
110	05			
111	02			
112	02			
113	02			
114	02			
115	02			
117	04			
118	03			
119	03			
121	04			
124	03			
125	03			
201	02			
202	02			
203	04			
205	04			
206	04			
207	04			
208	08			
209	04			
210	04			
211	04			
212	04			
214	04			
216	03			
217	03			
218	04			
219	09			
221	08			
101A	01			

101B	10
104A	04
104B	07
110A	04
122A	04
122B	05
126A	04
126B	06

126C 05

END OF SECTION

SECTION 088000 – GENERAL GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - a. Windows.
 - b. Doors.
 - c. Interior borrowed lites.
 - d. Aluminum framed entrances and storefronts.
- B. Related Sections include the following:
 - 1. Division 8 Section "Hollow Metal Doors and Frames" for hollow metal doors and frames to receive general glazing.
 - 2. Division 8 Section "Flush Wood Doors" for wood doors to receive general glazing.
 - 3. Division 8 Section "Aluminum Entrances and Storefronts" for aluminum storefront framing systems to receive general glazing.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass or fabricated glass as defined in referenced glazing publications.
- B. Glazing Fabricators: Firms that produce fabricated glass products from primary glass as defined in referenced glazing publications.
- C. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- D. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- E. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the fabricating process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to fabricator's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the fabricating process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to fabricator’s written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- G. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the fabricating process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to fabricator’s written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: Defective manufacturing, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing purposes only. Confirm glass thicknesses by analyzing Project design loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E1300 and ICC’s International Building Code (applicable version) according to the following requirements:
 - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section 6.4.2, “Analytic Procedure,” based on mean roof heights above grade indicated on Drawings.
 - 1) Wind Design Data: As indicated on (Structural) Drawings.
 - 2) Basic Wind Speed: 90 mph
 - 3) Importance Factor: 1.15
 - 4) Exposure Category: C
 - b. Specified Design Snow Loads: As indicated on (Structural) Drawings, but not less than snow loads applicable to Project required by ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section 7, “Snow Loads”.
 - c. Probability of Breakage for Vertical Glazing: 8 lites per 1,000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.

- d. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
- e. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1-inch, whichever is less.
- f. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- g. Minimum Glass Thickness for Exterior Lites:

- 1) Manufacturer's standard to meet wind load criteria, but not less than 6 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Performance Characteristics: Provide glass with performance properties specified based on manufacturer's published test data as determined according to procedures indicated below:

- 1. For monolithic glass lites, properties are based on units with lites 6 mm thick.
- 2. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch-wide interspace.
- 3. Center-of-Glass thermal and optical performance properties shall be based on data and calculations from the current LBNL Windows 7.3 computer program expressed as Btu/sq. ft. x h x deg °F.
- 4. Fenestration Performance: Performance values that take into account the total fenestration (center-of-glass and framing members) normally identified with building energy codes such as ASHRAE-IESNA 90.1 and the IECC. Values can also be tested and certified by the National Fenestration Rating Council (NFRC).

1.5 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: Provide 12-inch-square samples of each glass product specified.

C. Glazing Schedule: Use same designations indicated on Drawings and specified herein for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
- E. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- F. Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants have been tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: From a qualified testing agency, indicating the specified products comply with requirements based on comprehensive testing of standard products. Provide product test reports for each glass product.
- I. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Monolithic Float Glass: Obtain all monolithic float glass from one source from a single manufacturer.
- C. Source Limitations for Insulating Glass: Obtain all insulating-glass units from one source from a single fabricator using the same type of glass and other components for each type of unit specified.
- D. Source Limitations for Laminated Glass: Obtain all laminated glass units from one source from a single fabricator using the same type of glass and other components for each type of unit indicated.
- E. Source Limitations for Glazing Accessories: Obtain all glazing accessories from one source from a single manufacturer for each product and installation method indicated.
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to the following publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA Publications: NGA “Glazing Manual”, “Sealant Manual” and “Laminated Glass Design Guide.”
 - 2. SIGMA Publications: SIGMA TM-3000, “Vertical Glazing Guidelines.”
 - 3. SIGMA Publication for Insulating Glass: SIGMA TM-3000, “North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.”

- H. Preinstallation Conference: Conduct conference at Project site in accordance with Division 1 Section “Project Meetings”.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

- I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
 - 1. Insulated Glass Certification Council (IGCC)

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.10 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

- B. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass fabricator agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass fabricator agreeing to furnish replacements for laminated-glass units that deteriorate as defined in "Definitions" Article within specified warranty period indicated below
 - 1. Warranty Period: 5 years from date of Substantial Completion.
- D. Manufacturer's Special Warranty for Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass fabricator agreeing to furnish replacements for coated-glass that deteriorates as defined in "Definitions" Article within specified warranty period indicated below. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as required by applicable glazing code.

2.2 MANUFACTURERS AND FABRICATION

- A. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Monolithic Float Glass
 - a. Vitro Architectural Glass.
 - b. Guardian Glass, Inc.
 - c. Pilkington, Inc.
 - d. AGC.

- B. Available Fabricators: Subject to compliance with requirements, fabricators of the products specified include, but are not limited to, the following:
1. Glass Enterprises, Inc.
 2. Viracon, Inc.
 3. Oldcastle Glass
 4. Trulite.

2.3 MONOLITHIC FLOAT GLASS

- A. Float Glass: ASTM C1036, Type 1, Class 1 (clear), Class 2 (tinted) transparent glass, flat, Quality q3 (glazing select); class, kind and condition indicated.
1. Provide Kind FT (fully tempered), Category 2, where safety glass is required by the applicable glazing codes.
- B. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
1. Flatness Tolerances
 - a. Roller-Wave or Ripple: Deviation from flatness at any peak shall be targeted not to exceed 0.003-inch as measured per peak to valley for 1/4-inch (6 mm) thick glass.
 - b. Bow and Warp: The bow and warp tolerances targeted shall not exceed 1/32-inch per linear foot.

2.4 INSULATING GLASS

- A. Insulating Glass Units – General: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E2190 for Class CBA units and with requirements specified in this Article.
1. **Type IG-1 Insulated Glass:** Insulated glass units consisting of two lites of clear, annealed glass separated by a 1/2-inch sealed air space. Provide insulated units with low “E” coating. Unless otherwise noted, for use in the building’s perimeter openings **primarily facing North and East**. Refer to Schedules and Frame Elevations for applied use.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with “Vitro Glass Solarban 60 Clear” or comparable product with the following characteristics:
 - 1) Ultra Violet: 18%.
 - 2) Visible Light Transmittance: 70%.
 - 3) Total Solar Energy Transmittance: 34%.
 - 4) Winter Night-time U Value: .29.
 - 5) Summer Day-time U Value: .27.
 - 6) Shading Coefficient: .45.
 - 7) Solar Heat Gain Coefficient: .39.
 - 8) Light to Solar Gain: 1.79.

- b. Insulating Glass Unit Make-up
- 1) Outboard Lite: "Vitro Glass Solarban 60 Clear", 1/4 inch-thick.
 - 2) Low "E" coating on 2nd. surface.
 - 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
 - 4) Inboard Lite: 1/4 inch-thick clear glass.
 - 5) Overall Thickness: 1-inch.
2. **Type IG-2** Insulated Glass: Insulated glass units consisting of two lites of clear, annealed glass separated by a 1/2-inch sealed air space. Provide insulated units with low "E" coating. Unless otherwise noted, for use in the building's perimeter openings **primarily facing South and West**. Refer to Schedules and Frame Elevations for applied use.
- a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 70 Clear" or comparable product with the following characteristics:
- 1) Ultra Violet: 6%.
 - 2) Visible Light Transmittance: 64%.
 - 3) Total Solar Energy Transmittance: 24%.
 - 4) Winter Night-time U Value: .28.
 - 5) Summer Day-time U Value: .26.
 - 6) Shading Coefficient: .31.
 - 7) Solar Heat Gain Coefficient: .27.
 - 8) Light to Solar Gain: 2.37.
- b. Insulating Glass Unit Make-up
- 1) Outboard Lite: "Vitro Glass Solarban 70 Clear", 1/4 inch-thick.
 - 2) Low "E" coating on 2nd surface.
 - 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
 - 4) Inboard Lite: 1/4-inch-thick clear glass.
 - 5) Overall Thickness: 1-inch.
3. **Type IG-3** Insulated Acid Etched Glass: Insulated glass units consisting of one lite of clear and one lite of acid etched glass separated by a 1/2-inch sealed air space. Provide insulated units with low "E" coating. Unless otherwise noted, for use in the building's perimeter openings **where noted on Drawings, primarily facing North and East**. Refer to Schedules and Frame Elevations for applied use.
- a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 60 Clear" or comparable product with the following characteristics:
- 1) Ultra Violet: 18%.
 - 2) Visible Light Transmittance: 67%.
 - 3) Total Solar Energy Transmittance: 32%.

- 4) Winter Night-time U Value: .29.
- 5) Summer Day-time U Value: .27
- 6) Shading Coefficient: .45.
- 7) Solar Heat Gain Coefficient: .39.
- 8) Light to Solar Gain: 1.72.

b. Insulating Glass Unit Make-up

- 1) Outboard Lite: "Vitro Glass Solarban 60 Clear", 1/4-inch thick.
- 2) Low "E" coating on 2nd. surface.
- 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
- 4) Inboard Lite: 1/4-inch-thick velour acid etched glass on 3rd surface.
- 5) Overall Thickness: 1-inch.

4. **Type IG-4 Insulated Acid Etched Glass:** Insulated glass units consisting of one lite of clear and one lite of acid etched glass, separated by a 1/2-inch sealed air space. Provide insulated units with low "E" coating. Unless otherwise noted, for use in the building's perimeter openings **where noted on Drawings, primarily facing South and West**. Refer to Schedules for applied use.

- a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 70 Clear" or comparable product with the following characteristics:

- 1) Ultra Violet: 6%.
- 2) Visible Light Transmittance: 61%.
- 3) Total Solar Energy Transmittance: 22%.
- 4) Winter Night-time U Value: .28.
- 5) Summer Day-time U Value: .26.
- 6) Shading Coefficient: .31.
- 7) Solar Heat Gain Coefficient: .27.
- 8) Light to Solar Gain: 2.26.

b. Insulating Glass Unit Make-up

- 1) Outboard Lite: "Vitro Glass Solarban 70 Clear", 1/4-inch-thick.
- 2) Low "E" coating on 2nd. surface.
- 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
- 4) Inboard Lite: 1/4-inch-thick velour acid etched glass on 3rd surface.
- 5) Overall Thickness: 1-inch.

5. **Type IG-5 Insulated Silicone-Coated Spandrel Glass:** Insulated glass units consisting of two lites of clear, annealed glass, separated by a 1/2-inch sealed air space. Provide insulated units with low "E" coating. Unless otherwise noted, for use in the building's perimeter openings **where noted on Drawings, primarily facing North and East**. Refer to Schedules for applied use.

- a. Basis-of-Design Product: Subject to compliance with requirements, provide “Vitro Glass Solarban 60 Clear” or comparable product and “ICD High Performance Coatings, Opaci-Coat 300” with the following characteristics.
 - 1) Ultra Violet: 0%.
 - 2) Visible Light Transmittance: 4%.
 - 3) Total Solar Energy Transmittance: 2%.
 - 4) Winter Night-time U-Value: .29.
 - 5) Summer Day-time U-Value: .27.
 - 6) Shading Coefficient: .35.
 - 7) Solar Heat Gain Coefficient: .30.
 - 8) Light to Solar Gain: .13.

- b. Insulating Glass Unit Make-up
 - 1) Outboard Lite: “Vitro Glass Solarban 60 Clear”, 1/4-inch-thick.
 - 2) Low “E” coating on 2nd surface.
 - 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
 - 4) Inboard Lite: 1/4-inch-thick clear glass.
 - 5) Spandrel Coating: On 4th surface (Color to be determined by Architect).
 - 6) Overall Thickness: 1-inch

6. **Type IG-6 Insulated Silicone-Coated Spandrel Glass:** Insulated glass units consisting of two lites of clear, annealed glass, separated by a 1/2-inch sealed air space. Provide insulated units with low “E” coating. Unless otherwise noted, for use in the building’s perimeter openings **where noted on Drawings, primarily facing South and West**. Refer to Schedules for applied use.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide “Vitro Glass Solarban 70 Clear” or comparable product and “ICD High Performance Coatings, Opaci-Coat 300” with the following characteristics.
 - 1) Ultra Violet: 0%.
 - 2) Visible Light Transmittance: 4%.
 - 3) Total Solar Energy Transmittance: 1%.
 - 4) Winter Night-time U-Value: .28.
 - 5) Summer Day-time U-Value: .26.
 - 6) Shading Coefficient: .24.
 - 7) Solar Heat Gain Coefficient: .21.
 - 8) Light to Solar Gain: .19.

 - b. Insulating Glass Unit Make-up
 - 1) Outboard Lite: “Vitro Glass Solarban 70 Clear”, 1/4-inch-thick.
 - 2) Low “E” coating on 2nd surface.
 - 3) 1/2-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
 - 4) Inboard Lite: 1/4-inch-thick clear glass.

- 5) Spandrel Coating: On 4th surface (Color to be determined by Architect).
 - 6) Overall Thickness: 1-inch
- 7. Provide Kind FT (fully tempered) where safety glass is required by the applicable glazing codes.
 - 8. Locations: Insulating glass shall be used in all exterior windows, curtainwalls, storefronts/entrances, windows/vents and doors. At a minimum, insulating glass units in doors and sidelites (below the door head-height) and other locations indicated on Drawings or required by applicable code, shall consist of tempered glass.
- B. Sealing System: Dual seal, with primary and secondary sealants as follows:
- 1. Dual air seal of polyisobutylene (PIB), and secondary seal of silicone.

2.5 LAMINATED GLASS

- A. Laminated Glass – General: ASTM C1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
- 1. Construction: Lamine glass with interlayers to comply with interlayer manufacturer's written recommendations.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated, and as needed to comply with requirements; one or multiple layers, formulated to absorb the majority of all naturally-occurring ultraviolet (UV) radiation from sunlight and provide long-term stability with built-in UV filtering.
 - 3. Basis-of-Design Products: Subject to compliance with requirements, provide the following interlayer products, or comparable interlayer products by other manufacturers that meet the specified standard of quality:
 - a. Polyvinyl butyral (PVB): Kuraray “Butacite.”
 - b. Acoustic: Kuraray “Acoustic.”
 - c. High-Security: Kuraray “SentryGlas.”
 - 4. **Type ILG-1 Insulated Laminated Safety Glass:** Insulated glass units consisting of one lite of 1/4-inch-thick clear tempered glass and one lite of 7/16-inch-thick laminated tempered glass (two 3/16 inch-thick lites of clear, tempered safety glass laminated with a high-security, .060 interlayer equal to Kuraray “SentryGlas”), separated by a 3/8 inch-thick sealed air space. Provide insulated units with low “E” coating. Primarily for use at the building’s primary entrance points **where noted on Drawings primarily facing North and East**. Refer to Schedules for applied use.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with “Vitro Glass Solarban 60 Clear” or comparable product, with the following characteristics:
 - 1) Ultra Violet: 18%.
 - 2) Visible Light Transmittance: 70%.

- 3) Total Solar Energy Transmittance: 34%.
- 4) Winter Night-time U Value: .29.
- 5) Summer Day-time U Value: .27.
- 6) Shading Coefficient: .45.
- 7) Solar Heat Gain Coefficient: .39.
- 8) Light to Solar Gain: 1.79.

b. Insulating Glass Unit Make-up:

- 1) Outboard Lite: "Vitro Glass Solarban 60 Clear," 1/4-inch-thick.
- 2) Low "E" coating on 2nd surface.
- 3) 3/8-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.
- 4) Inboard Lite: 7/16-inch-thick clear laminated glass as follows:
 - a) First Ply: Clear tempered glass, 3/16-inch-thick.
 - b) Interlayer: High-Security, 0.060-inch-thick; clear.
 - c) Second Ply: Clear tempered glass, 3/16-inch-thick.
 - d) Overall Inboard Lite Thickness: 7/16-inch.
- 5) Overall Thickness: 1-1/16-inch.

5. **Type ILG-2 Insulated Laminated Safety Glass:** Insulated glass units consisting of one lite of 1/4-inch-thick clear tempered glass and one lite of 7/16-inch-thick laminated tempered glass (two 3/16-inch-thick lites of clear, tempered safety glass laminated with a high-security, .060 interlayer equal to Kuraray "SentryGlas"), separated by a 3/8-inch thick sealed air space. Provide insulated units with low "E" coating. Primarily for use at the building's primary entrance points **where noted on Drawings primarily facing South and West**. Refer to Schedules for applied use.

a. Basis-of-Design Product: Subject to compliance with requirements, provide units fabricated with "Vitro Glass Solarban 70 Clear" or comparable product, with the following characteristics:

- 1) Ultra Violet: 6%.
- 2) Visible Light Transmittance: 64%.
- 3) Total Solar Energy Transmittance: 24%.
- 4) Winter Night-time U Value: .28.
- 5) Summer Day-time U Value: .26.
- 6) Shading Coefficient: .31.
- 7) Solar Heat Gain Coefficient: .27.
- 8) Light to Solar Gain: 2.37.

b. Insulating Glass Unit Make-up:

- 1) Outboard Lite: "Vitro Glass Solarban 70 Clear," 1/4-inch-thick.
- 2) Low "E" coating on 2nd surface.
- 3) 3/8-inch-thick desiccant filled structural silicone spacer; Quanex Super Spacer TriSeal, GE3, black.

4) Inboard Lite: 7/16-inch-thick clear laminated glass, as follows:

- a) First Ply: Clear tempered glass, 3/16-inch-thick.
- b) Interlayer: High-Security, 0.060 inch-thick; clear.
- c) Second Ply: Clear tempered glass, 3/16-inch-thick.
- d) Overall Inboard Lite Thickness: 7/16-inch.

5) Overall Thickness: 1-1/16 inch.

6. **Type LG-1 Monolithic Two-Ply Laminated Safety Glass:** Glass units consisting of two lites of 1/4-inch-thick clear tempered glass laminated with a .060 clear interlayer equal to Kuraray "SentryGlas". For use in the building's interior openings where noted on Drawings.

a. Overall Thickness: 9/16-inch

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

- 1. Neoprene, ASTM C864.
- 2. EPDM, ASTM C864.
- 3. Silicone, ASTM C1115.
- 4. Thermoplastic polyolefin rubber, ASTM C1115.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rods as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C1281 and AAMA 800.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. VOC Content: For Sealants used inside weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, subpart D.
- C. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- D. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

- E. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where the length plus width is larger than 50-inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Specialty gypsum board.
 - 3. Exterior glass-mat gypsum board.
 - 4. Tile backing panels.
 - 5. Trims and Accessories.
 - 6. Joint treatment materials.
 - 7. Sound attenuation blankets, acoustical sealants and other auxiliary materials.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry (Assemblies)" for gypsum sheathing, and for cavity air barrier installed over gypsum sheathing.
 - 2. Division 5 Section "Cold-Formed Metal Framing" for structural framing and suspension systems that support gypsum board panels.
 - 3. Division 7 Section "Thermal Insulation" for thermal insulation.
 - 4. Division 9 Section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- C. Samples for Initial Selection: For each type of trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. National Gypsum Company.
 - 5. USG Corporation.
- B. Regular Gypsum Wallboard: ASTM C1396.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
 - 3. Applications - General: Offices, conference rooms and similar low impact locations.

4. Applications – Specific: Base and face layers to multi-layer, low impact, non-fire-rated assemblies, and all wall and bulkhead locations 8'-0" and higher above finished floor.
- C. Gypsum Board, Type X: ASTM C1396.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Applications - General: Low impact, fire-rated wall, partition and ceiling applications where another specific type of gypsum wallboard is not required based on defined uses or the requirements of a specific UL Assembly.
 4. Applications – Specific: Base layer of multi-layer, fire-rated wall and partition applications where another specific Type X gypsum board is required based upon defined use or the requirements of a specific UL Assembly.
- D. Gypsum Ceiling Board: ASTM C1396.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Applications: Non-fire-rated ceilings locations.
- E. Abuse-Resistant Gypsum Board: ASTM C1396 gypsum board, tested according to ASTM C1629.
1. Core: 5/8-inch, Type X.
 2. Surface Abrasion: ASTM D4977, meets or exceeds Level 2 requirements.
 3. Indentation: ASTM D5420, meets or exceeds Level 1 requirements.
 4. Soft-Body Impact: ASTM E695, meets or exceeds Level 2 requirements.
 5. Hard-body Impact: ASTM 1629, meets or exceeds Level 1 requirements.
 6. Long Edges: Tapered.
 7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 8. Applications – General: Corridor walls up to 8'-0" (except where wall tile is the finish, use tile backing panels), classroom, small group instruction and other educational type rooms up to 8'-0", and similar locations subject to moderate abuse.
 9. Applications – Specific: Face layer of multi-layer, fire-rated wall and partition assemblies where abuse-resistant gypsum board is required based upon defined use.
- F. Moisture and Mold-Resistant Gypsum Board: ASTM C1396. With moisture and mold-resistant core and paper surfaces.
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 4. Applications - General: Wall and ceiling assemblies in toilet rooms, shower rooms, locker rooms and similar type rooms subject to moisture and humidity where the final wall finish is paint.
 5. Applications – Specific: Face layer of multi-layer, fire-rated wall and partition assemblies where moisture and mold-resistant gypsum board is required based upon defined use.
- G. Flexible Gypsum Board: ASTM C1396; manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
2. Long Edges: Tapered.
3. Applications: Non-fire-rated curved walls and ceilings.

2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C1396. Manufactured to have increased fire-resistive capability.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. American Gypsum.
 - b. CertainTeed Corp.
 - c. Georgia-Pacific Gypsum LLC.
 - d. National Gypsum Company.
 - e. USG Corporation.
 2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 3. Long Edges: Tapered.
 4. Applications: Fire-rated wall, partition and ceiling assemblies where required by a specific UL Assembly.

2.5 EXTERIOR GYPSUM BOARD

- A. Glass-Mat Gypsum Sheathing Board: ASTM C1177, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Georgia-Pacific Gypsum LLC; DensGlass Sheathing.
 - b. CertainTeed Corporation; GlasRoc Sheathing.
 - c. National Gypsum Company; Gold Bond eXP Sheathing.
 - d. USG Corporation; Securock Glass-Mat Sheathing.
 2. Core: 5/8-inch, Type X.
 3. Edges: Square.
 4. Surface+
 5. : Fiberglass mat on face, back and long edges.
 6. Microbial Resistance: ASTM D6329, will not support microbial growth.
 7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 8. Humidity Deflection: ASTM C1177, not more than 1/8-inch.
 9. Permeance: ASTM E96, not less than 17 perms.
 10. Applications: All exterior gypsum board substrate boards.

2.6 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178, with manufacturer's standard edges.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. CertainTeed Corporation; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield.
 - c. National Gypsum Company; Gold Bond eXP Tile Backer.
 - d. USG Corporation; Durock Glass-Matt Tile Backerboard.
 - 2. Core: As indicated on Drawings.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 - 4. Applications: Substrate board for all interior ceramic and porcelain tile finishes.

2.7 TRIMS AND ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - 2. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. United States Gypsum Co.
 - b. National Gypsum Co.
 - c. Georgia-Pacific Corp.
 - d. Fry Reglet Corporation.
 - e. Gordon Inc.
 - f. Pittcon Industries.
 - 3. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint; one-piece, formed with V-shaped slot and removable strip covering slot opening.
- B. Exterior Trim: ASTM C1047.
 - 1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.

- b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Reveals: Where specifically indicated and exposed to view; interior architectural, decorative gypsum board reveal channels and control joints; extruded accessories of profiles and dimensions indicated.
 - 1. Material: Aluminum; alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
 - 2. Finish: Provide corrosion-resistant primer compatible with joint compound and finish materials specified. Provide in manufacturer's standard Class I or II clear anodic finish; reveal trim shall be painted where indicated on Drawings.
 - 3. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon Inc.
 - c. Pittcon Industries.
 - 4. Shapes: Provide the following, where indicated; provide control joints where indicated or as required per standards:
 - a. Standard Reveals: Equal to Fry Reglet Corp. "Channel Screed Reveal;" 1/4-inch width, unless otherwise noted; for use on ceiling and horizontal or vertical (non-control joint) applications.
 - b. Wall-Ceiling Reveals: Equal to Fry Reglet Corp. "'F' Reveal;" 1/4-inch width, unless otherwise noted; for horizontal wall-to-ceiling or vertical wall-to-wall applications.
 - c. Control Joints: Equal to Fry Reglet Corp. "2-Piece Control Joint;" 1/4-inch width, unless otherwise noted; for use on ceiling and vertical control joint applications.
 - d. Provide other shapes if specifically indicated on Drawings.
- D. Drywall Vents: Flush steel vents specifically designed for wall and ceiling drywall applications. Vents to include adjustable air flow blades, a removable, powder-coated tray to be finished (painted) to match the wall, and integral drywall finishing beads.
 - 1. Basis of Design Product: Drywall Pro Vents by Aria Vent.
 - 2. Material: Steel.
 - 3. Color: Satin white.
 - 4. Size: As indicated on Drawings.
 - 5. Locations: Where indicated on Drawings.

2.8 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. Joint Tape:

1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; "BOSS 826 Acoustical Sound Sealant."
 - b. Franklin International; "Titebond Acoustical Smoke & Sound Sealant."
 - c. Grabber Construction Products; "Acoustical Smoke & Sound Sealant."
 - d. Hilti, Inc.; "CP 506."
 - e. Pecora Corporation; "AIS-919."
 - f. Specified Technologies, Inc.; "Smoke 'N' Sound Acoustical Sealant."
 - g. United States Gypsum Co.; "USG Sheetrock Brand Acoustical Sealant."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8-inch wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4 to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Abuse-Resistant Type: As indicated on Drawings.
 - 5. Mold-Resistant Type: As indicated on Drawings.
 - 6. Flexible Type: Apply in double layer at curved assemblies.
 - 7. Type C: Where required for specific fire-resistance-rated assembly indicated.
 - 8. Glass-Mat Interior Type: As indicated on Drawings.
 - 9. Acoustically Enhanced Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layer with screws; fasten face layers with adhesive and supplementary fasteners.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.

2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4 inch gap where panels abut other construction or penetrations.
- B. Water-Resistant Backing Board: Install where indicated with 1/4 inch gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings, and if not indicated, according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where required based upon installed condition.
 4. U-Bead: Use where required based upon installed condition.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.
 3. Curved-Edge Cornerbead: Use at curved openings.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Only where indicated on Drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view in the finished project, unless otherwise indicated.
 - 5. Level 5: At panel surfaces that will receive vinyl wall coverings or other similar graphic material finishes.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 – TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Porcelain floor & wall tile.
2. Waterproof membrane.
3. Metal edge strips.
4. Marble thresholds.

- B. Related Sections:

1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Division 9 Section "Gypsum Board" for tile backing panels.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A 108 series of tile installation standards and in ANSI A 137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A 108 Series: ANSI A 108.01, 108.02, 108.1A, 108.1B, 108.1C, 108.4 through 108.6, and 108.8 through 108.17, 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 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

- C. Samples for Initial Selection: Contractor shall provide manufacturer pdf images of tile, grout, accessories & transition strips for review & approval. Actual samples are not required unless specifically requested by the architect/interior designer.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and grouting product.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 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. Waterproof membrane.
 - 2. Joint sealants.
 - 3. Metal edge strips.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of wall tile installation with metal edge strips. Coordinate location with Owner and Architect. Do not order tile and metal edge strips until site mock up is approved by the architect and the owner.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A 108.01 for substrates and for preparation by other trades.

1.8 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 A 137.1 for labeling tile packages.
- B. Store tile and materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A 137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A 108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.2 TILE PRODUCTS

A. Tile - Type (PT):

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Daltile, Articulo
2. Composition: Colorbody Porcelain
3. Module Size: 12 inches by 24 inches.
4. Thickness: 3/8 inch
5. Tile Color/Finish: AR07 Feature Beige
6. Grout Color: As selected by Architect from manufacturer's full range.
7. Installation Pattern: 1/3 Staggered Running Bond.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, which complies with ANSI A 118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Laticrete Hydroban.
 - b. Mapei Mapelastc AquaDefense.
 - c. Custom Building RedGuard Waterproofing and Crack Prevention Membrane.

- B. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.

- C. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

- D. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

2.4 SETTING MATERIALS

- A. Medium-Bed and/or Large N Heavy Tile Mortar, Modified Dry-Set Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. Mapei Corporation.
 - c. Custom Building Products.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A 118.4.

2.5 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A 118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. Mapei Corporation.
 - c. Custom Building Products.
2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 7 Section "Joint Sealants."

1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.7 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-shaped, height to match tile and setting-bed thickness, metallic, designed specifically for flooring and wall applications.

C. 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.

- D. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.8 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.

2.9 THRESHOLDS

- A. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. Do not extend waterproofing or crack isolation membrane] under thresholds set in modified dry-setmortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A 108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with adhesives, bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A 108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A 108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A 108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of Tile Installation Standards for providing 95 percent mortar coverage:
 - a. Tile composed of tiles 8 by 8 inches or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

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.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Porcelain Tile: 1/8 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Comply with TCNA indications for type of installation and comply with their written recommendations for expansion joints for wall and floor applications. Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- I. Metal Edge Strips: Provide strips equal to Schluter System for transitions from tile to adjacent materials on floors, for wall transitions and corner applications. Refer to Drawings for details, and the following:
1. All Vertical Outside Corners of all Wall Tile Types: Schluter Systems "Indec" finish shall be satin nickel anodized aluminum.
 2. All Exposed Top Edges of Wall Tile Types: Schluter Systems "Jolly;" finish shall be satin nickel anodized aluminum.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. Do not extend waterproofing or crack isolation membrane] under thresholds set in modified dry-setmortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.
- 3.4 WATERPROOFING INSTALLATION
- A. Install waterproofing to comply with ANSI A 118.10 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.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-Portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations:
 - 1. Tile Installation W244C: Thin-set mortar on backer units. For Restroom applications, apply waterproof membrane in accordance with ANSI A 118.4 and ANSI A 118.1.
 - a. Tile Type: PT
 - b. Thin-Set Mortar: Latex- Portland cement mortar.
 - c. Grout: Polymer-modified sanded grout.
- B. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation: TCNA F122-21; medium mortar on waterproof membrane (ANSI A118.10).
 - a. Tile Type: PT
 - b. Thinset Mortar: LHT/Medium-bed, modified dry-set mortar.
 - c. Grout: Polymer-modified sanded grout.
- C. Interior Floor Installations, Wood Subfloor:
 - 1. Tile Installation: TCNA F150-21; thinset mortar on exterior-glue plywood with waterproof membrane (ANSI A118.10).
 - a. Tile Type: PT
 - b. Thinset Mortar: LHT/Medium-bed, modified dry-set mortar.
 - c. Grout: Polymer-modified sanded grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mineral-based, factory-painted acoustical ceiling panels.
 - 2. Standard grid suspension systems.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including, but not limited to, the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Panels: Full-size panels equal to 2 percent of quantity installed, in each pattern and color provided.
2. Suspension-System Components: Quantity of each exposed component equal 2 percent of quantity installed, in each color and style provided.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel or FRP ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS – TYPE (ACT)

- A. Manufacturers and Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
1. Armstrong World Industries, Inc.; Ultima No. 1941
 2. USG Interiors, Inc.; Mars High NRC, No. 89600
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type III, mineral base with painted finish.
 2. Color: White.
 3. LR: 0.87
 4. NRC: Not less than 0.80
 5. CAC: Not less than 35.
 6. Edge Detail: Angled Tegular.
 7. Thickness: 7/8 inches.
 8. Modular Size: Nominal 24 by 24 inches.

- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- D. Suspension System Type: Applications and types as indicated on Drawings and Paragraph 2.5.B.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- B. Wire Hangers, Braces, and Ties: Provide the following wire types, based on Project requirements:
 - 2. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
 - a. Hanger wire shall be 12 gauge/.105 (Diameter Range: .105-.107); Carbon: C1006; Length: 12 feet; Tensile: 54/62,000 KSI; Breaking Load Minimum: 475 pounds; Breaking Load Maximum: 540 pounds; Safe Load Maximum: 275 pounds; Finish: Hot Dip Galvanized; Galvanize Coating: Class I, in accordance with ASTM-641/A.
 - 3. Stainless-Steel Wire: ASTM A 580, Type 304, nonmagnetic.
 - a. 1/16" air craft cable shall have a minimum breaking strength of 275 pounds.
 - 4. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 5. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch diameter bolts.
- E. Hold-Down Clips: Provide for all air lock and security applications, including vestibules, restrooms and locker rooms, where occurs; provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

2.5 METAL SUSPENSION SYSTEM

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

1. Armstrong World Industries, Inc.
 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically-zinc-coated, or hot-dip galvanized according to ASTM A 653, not less than G30 (Z90) coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
1. Structural Classification: Intermediate duty system.
 2. End Condition of Cross Runners: Butt-edge type.
 3. Face Design: Flat, flush.
 4. Cap Material: Cold-rolled steel.
 5. Cap Finish: Painted white.
 6. Cap Material @ moisture exposed areas i.e. restrooms, shower etc: Aluminum cold rolled sheet.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Armstrong World Industries, Inc.
 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: If indicated, install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs or any other part of steel deck. Attach hangers to structural members only.

9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as indicated on Drawings.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 5. Paint cut edges of panel remaining exposed after installation; precisely match color of exposed panel surfaces using coating furnished or recommended in writing for this purpose by acoustical panel manufacturer.
 6. Install hold-down clips for all air lock applications, including vestibules, and in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and

touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubber Wall Base.
 - 2. Rubber Accessory Moldings.
 - 3. Rubber Stair Treads & Risers.
 - 4. Rubber Stair Treads.
 - 5. Stair Landing Tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE (RB)

- 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. Johnsonite; A Tarkett Company.
 - 2. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I solid, homogeneous.
 - 2. Style and Location:
 - a. Cove: provide cove base as indicated on the drawings.
- C. Thickness: 0.125 inch
- D. Height: 4 inches
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.

- H. Color: As selected by Architect from manufacturer's full range of colors and patterns produced for vinyl wall base complying with requirements indicated. Provide a minimum of 90 color selections.

2.2 RUBBER MOLDING ACCESSORY

- 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. Johnsonite; A Tarkett Company.
 - 2. Roppe Corporation, USA.
- B. Profile and Dimensions: As indicated.
- C. Locations: Provide rubber molding accessories in areas indicated.
- D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RUBBER STAIR TREADS & RISERS

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Basis of Design: Johnsonite; a Tarkett Company.
 - 2. Roppe Corporation, USA.
- C. Rubber Treads & Riser: ASTM F 2169.
 - 1. Type: Rubber.
 - 2. Class: 2 pattern; Hammered (HTR) surface design, No. VIHTR & VIHMT.
 - 3. Group: 2 (with contrasting grit tap for the visually impaired).
 - 4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
 - 5. Nosing Height: 2 inches.
 - 6. Thickness: 1/4 inch and tapered to back edge.
 - 7. Size: Lengths and depths to fit each stair tread in one piece.
- D. Landing Tile (RBR): Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- E. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 2. Tightly adhere to substrates throughout length of each piece.
 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum horizontal surfaces thoroughly.
 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Luxury Vinyl Tile (LVT)
 - 2. Rubber Tile (RBR)
- B. Related Sections include the following:
 - 1. Division 3 Sections "Cast-in-Place Concrete" for Moisture Vapor Reduction Admixture.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 60 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 Luxury Vinyl Tile (LVT1)

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Mannington Commercial, Uninterrupted
- B. Tile Standard: ASTM F 1700-13 Solid Vinyl Tile.
- C. Wearing Surface: Semi-Textured
- D. Thickness: 4 mm
- E. Wear Layer Thickness: 20 MIL
- F. Size: 7.25 inches by 48 inches
- G. Color(s): Sepia Maple (UN212)
- H. Finish: Quantum Guard Elite
- I. Warranty: 15 year commercial warranty

2.3 Luxury Vinyl Tile (LVT2)

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Mannington Commercial, Nature's Path
- B. Tile Standard: ASTM F 1700-13 Solid Vinyl Tile.
- C. Wearing Surface: Semi-Textured
- D. Thickness: 2.5 mm
- E. Wear Layer Thickness: 20 MIL
- F. Size: 6 inches by 36 inches (Verify in Field to Match Existing)
- G. Color(s): Heritage Cherry Select
- H. Finish: Quantum Guard Elite
- I. Warranty: 15 year commercial warranty

2.4 Rubber Tile (RBR)

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Johnsonite

2. Roppe

- B. Tile Standard: ASTM F 1344, Class I-A, Homogeneous Rubber Tile, solid color
- C. Hardness: Not less than 85 Shore A
- D. Wearing Surface: Molded pattern
- E. Molded-Pattern Figure: Hammered
- F. Thickness: 0.125 inch
- G. Size: 24 by 24 inches
- H. Colors and Patterns: As selected from manufactures full line of color selections.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated. **Product cannot void any portion of the manufacturer's standard warranty.**
 - 1. Adhesives shall comply with the following limits for VOC content:
 - a. Luxury Vinyl Tile Adhesives: Per manufacturer's recommendations.
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Provide adhesive for porous (existing and second applications) and non-porous (new on grade) substrates.
 - a. Substrates without moisture vapor reduction admixture: Porous Adhesive.
 - b. Substrates with moisture vapor reduction admixture: Non-Porous Adhesive.
- C. Floor Polish: Not required on LVT.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Receive Resilient Tile Floor Manufacturer's written approval of substrate required before installation of any tile flooring. The Carpet and Resilient Tile Contractor is responsible for obtaining the Resilient Tile Flooring Manufacturer's written approval of the floor as an acceptable substrate for the installation of manufacturer's tile product specified. If the floor is not acceptable to the manufacturer, the general contractor is responsible for preparing the floor to receive the new tile, as specified in order paragraphs of this specification, including an underlayment or leveling compound where necessary to meet all requirements for a manufacturer's approval of the substrate.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction.
- 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.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 - 1. Finish: Apply 3 coats of liquid floor polish. For LVT product verify maintenance with owner prior to application of floor polish.
- G. Cover floor tile until Substantial Completion.

END OF SECTION 09651

SECTION 096520 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Resilient sheet flooring.
- B. Related Sections include the following:
 - 1. Division 3 Sections "Cast-in-Place Concrete" for Moisture Vapor Reduction Admixture.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.**
 - 1. Show details of special patterns.
- C. Samples for Initial Selection: For each type of resilient sheet flooring indicated.
- D. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for resilient sheet flooring, including base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F in spaces to receive resilient sheet flooring during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet 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. RESILIENT SHEET FLOORING (SV)

- 1. Products: Subject to compliance with requirements, provide the following: Armstrong Commercial.
- 2. Collection: Medintech
- 3. Product Standard: Homogeneous Sheet Flooring
- 4. Thickness: 0.080 inch
- 5. Sheet Width: 6 feet 7 inches.
- 6. Seamless-Installation Method: Vinyl welded Seams.
- 7. Color: 84760 Ixia

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
 - 1. Provide manufacturer's high moisture adhesive up to 95% RH.
 - 2. Substrates without moisture vapor reduction admixture: Porous Adhesive.
 - 3. Substrates with moisture vapor reduction admixture: Non-Porous Adhesive.
- C. Seaming Accessories: Solid Vinyl Weld Rods.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.

D. Integral-Flash-Cove-Base Accessories:

1. Cove Strip/Former: 1-inch radius provided or approved by resilient sheet flooring manufacturer.
 - a. Color: As selected by Architect from manufacturer's full range of colors.
2. Cap Strip: Rubber cap approved by resilient sheet flooring manufacturer.
3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.

E. Accessories: Provide per manufacturer's written recommendations.

1. Drains & Penetrations:
2. Pipes & Penetrations:

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
 1. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

- a. Perform 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.'
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.
 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 1. Maintain uniformity of flooring direction.
 2. Do Not Reverse-Random Match.
 3. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 4. Match edges of flooring for color shading at seams.
 5. Avoid cross seams.
 6. Flooring direction shall be the same at each location.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seam Installation: Vinyl welding rod.
- J. Integral-Flash-Cove Base: Cove resilient sheet flooring 6 inches up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
 - 1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096520

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Requirements:
 - 1. Section 096513 "Resilient Base and Accessories" Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.

5. Pattern of installation.
6. Pattern type, location, and direction.
7. Tile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpet Tile: Full-size units equal to 3 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 1. Build mockups at locations and in sizes shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT 1)

- A. Manufacturer: Mannington Commercial
- B. Pattern Style: Inertia

- C. Color: 14362 Vector
- D. Primary Backing: Infinity Modular
- E. Size: 18 inches x 36 inches
- F. Installation: Horizontal Brick Ashlar

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation on porous and non-porous surfaces. **Product cannot void any portion of the manufacturer's standard warranty.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: 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. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- 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. Concrete Substrates: 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 adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
 - 1. Carpet installation shall begin at the center point of the room and work out to the perimeter walls. Installation pattern to be determined by architect during shop drawings.
- 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 carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive 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's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099123 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will supply a color selection.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Metal toilet enclosures.
 - d. Metal lockers.
 - e. Unit kitchens.
 - f. Elevator entrance doors and frames.
 - g. Elevator equipment.
 - h. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
 - 3. Finished metal surfaces include the following:

- a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
- a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

- 1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
- 2. Division 2 Section "Cement Concrete Pavement" for traffic-marking paint.
- 3. Division 5 Section "Structural Steel" for shop priming structural steel.
- 4. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
- 5. Division 6 Section "Architectural Woodwork" for shop priming interior architectural woodwork.
- 6. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
- 7. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

- 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
- 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
- 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
- 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

- 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification. Submit in same format as specification.
- 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).
- B. Colors: Match Architect's color selections.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Submit 4 sets of samples of each final color and finish.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to be demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Certifications:
1. Furnish a letter from the paint manufacturer or their factory representative certifying that the paint system proposed for this project are equal to or better than the specified systems in appearance and performance levels. Submit proof of equivalency for approval including generic type, descriptive information, VOC content, performance data, solids by volume, and recommended film thickness. Submittals not accompanied by this certification will be returned, "REJECTED."
- F. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Provide mock up of first and second coats of block filler or primer for approval of application.
 - b. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - c. Small Areas and Items: Architect will designate items or areas required.

- D. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface. Where materials are being applied over previously painted surfaces, apply mock up samples and perform field testing to check for compatibility, adhesion, and film integrity of the new materials to existing painted surfaces. Report in writing any condition that may affect application, appearance, or performance of the specified coating system.
1. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 2. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
- C. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver left-over paint materials to Owner.
1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:
 - a. Exterior: 2 gallons of each color applied.
 - b. Interior: 1 case of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, provide products from one of the following manufacturers. Sherwin-Williams is the basis of design and establishes the standard of quality required.
- B. Manufacturers' Names:
1. Sherwin Williams (SW).
 2. Duron.
 3. MAB.
 4. Glidden.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience. Each system should be from the same manufacturer.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Match Architect's samples.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
- C. Where materials are being applied over previously painted surfaces, apply mock up samples and perform field testing to check for compatibility, adhesion, and film integrity of the new materials to existing painted surfaces. Report in writing any condition that may affect application, appearance, or performance of the specified coating system.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning. All surfaces must be clean, dry, and free of all oil, grease, surface contaminants, and substances that could impair adhesion.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - 2. All previously coated surfaces shall clean, dry, dull, and in sound condition prior to coating. All loose paints (either visible or not) shall be removed to expose a sound surface for repainting. All smooth, glossy surfaces shall be abraded to impart a surface profile that will promote adhesion of the subsequent coating system. A test-patch shall be applied prior to a full installation to assure adequate adhesion will be achieved.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze.

If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

- a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
- a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, back-prime with spar varnish.
 - d. Back-prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
- a. Power Tool Clean steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
6. Interior Grilles, Louvers and Sprinkler Escutcheons shall be painted in the field to match adjacent material color. Contractor shall prep and prime factory finished items to receive new paint finish in the field.
7. Existing Glazed Tile: Clean surfaces to remove all dirt, grease, cleaning agents and contaminants. Apply a test sample over tile and grout using Multi-Purpose Interior/Exterior Latex Primer/Sealer. Allow to dry and perform an adhesion test per ASTM D3359. Provide a report with the results. If adhesion is not satisfactory, clean and abrade the surface and apply a sample and perform an adhesion test per ASTM D3359. Provide a report with the results.
8. Interior Brick Previously Painted: Surface Prep: Remove any loose, peeling, or poorly adhering paint by hand tool and/or power tool cleaning. Followed by Solvent Cleaning

with a commercial cleaner/degreaser (such as Extra Muscle) to remove all surface contaminants, Rinse thoroughly and allow to dry. As with all previously painted surfaces we would highly recommend a field applied mock-up be applied and evaluated for adhesion and compatibility per ASTM D3359 after one week of drying/curing. Proved architect with results of adhesion testing. If results are satisfactory then full installation may proceed. If results are unsatisfactory then additional surface preparation may be required.

- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 - 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 - 10. Sand lightly between each succeeding enamel or varnish coat.

- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Exposed uninsulated metal piping.
 2. Exposed uninsulated plastic piping.
 3. Exposed pipe hangers and supports.
 4. Tanks that do not have factory-applied final finishes.
 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
 2. Panel boards.

3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. All interior and exterior exposed gypsum wallboard, including any bulkheads and soffits to be painted.
- I. All interior and exterior ferrous metal to be painted including any lintels, railings, grilles, and louvers (does not include factory or pre-finished items).
- J. All hollow metal doors and frames, interior and exterior, to be painted.
- K. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- L. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- M. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- N. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 1. Provide satin finish for final coats.
- O. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- P. Marking and Identification: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 1. Be located in accessible concealed floor, floor-ceiling or attic spaces;
 2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.
 - a. Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

B. Pre-installation Meetings:

1. Schedule a conference and inspection to be held on-site before field application of coating systems begins.
2. Conference shall be attended by Contractor, Owner's representative, Engineer, Construction Manager, coating applicators, and a representative of coating material manufacturer.
3. Topics to be discussed at meeting shall include:
 - a. A review of Contract Documents and accepted shop drawings shall be made and deviations or differences shall be resolved.
 - b. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, and protection following application.
 - c. Establish which areas on-site will be available for use as storage areas and working area
4. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work should be completed before coating application can begin.
5. Prepare and submit, to parties in attendance, a written report of pre-installation conference report shall be submitted with 3 days following conference.
6. Field Samples:
 - a. Provide a full coating system to the required sheen, color, texture, and

recommended coverage rates. Simulate finished lighting conditions for reviewing in-place work.

7. The Architect, Construction Manager or Owners Representative will select one room, area, or combination of areas and surfaces and conditions for each type of coating and substrate to be coated. Apply coatings in this room, area, combination of areas and surfaces according to the schedule, or as specified. After finishes are accepted, this room, area or combination of areas and surfaces will serve as the standard of quality and for evaluation of coating systems of similar nature.
8. A manufacturer's representative shall be available upon request by the General Contractor or Painting subcontractor, to advise applicator on proper application technique and procedures.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
 1. Semi-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
 - a. Primer: SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Finish Coats: SW, Waterbased Acrolyn 100 Waterbased Urethane Gloss.

3.8 INTERIOR PAINT SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 1. Flat Acrylic Finish (Ceiling and Bulkhead Applications): Two finish coats over a primer.
 - a. Primer: SW, ProMar 200 Zero VOC Latex Primer, B28W600.
 - b. Finish Coast: SW, ProMar 200 Zero VOC Latex Flat, B30W2650 series.
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.

2. Low Luster Acrylic-Enamel Finish (Wall Application): Two finish coats over a primer.
 - a. Primer: SW, ProMar 200 Zero VOC Latex Primer, B28W600.
 - b. Finish Coats: SW, ProMar 200 Zero VOC Latex Eg-Shel, B20W2650 series.
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.

- B. Previously Painted Gypsum Board: Provide the following finish systems over previously painted interior gypsum board surfaces. *Note: Mock-Up with adhesion test per ASTM-D3359 is required prior to installation of this system.
 1. Flat Acrylic Finish (Ceiling & Bulkhead Application): Two finish coats over an adhesion promoting primer.
 - a. Primer: SW, Extreme Bond Interior/Exterior Bonding Primer, B51-1150.
 - b. Finish Coat: SW, ProMar 200 Zero VOC Latex Flat, B30W2650 series.
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.
 2. Low Luster Acrylic-Enamel Finish (Wall Application): Two finish coats over an adhesion promoting primer.
 - a. Primer: SW, Extreme Bond Interior/Exterior Bonding Primer, B51-1150.
 - b. Finish Coats: SW, ProMar 200 Zero VOC Latex Eg-Shel, B20W2650 series.
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.

- C. Gypsum Board Epoxy Finish (EPX1): Provide the following epoxy finish systems over interior gypsum board surfaces:
 1. Eg-Shel Waterbased Epoxy Finish: Two finish coats over a primer.
 - a. Primer: SW, ProMar 200 Zero VOC Latex Primer, B28W600.
 - b. Finish Coats: SW, Pro-Industrial Waterbased Catalyzed Epoxy Eg-Shel, B73-360 series.
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.

- D. Ferrous Metal: Provide the following finish systems over ferrous metal:
 1. Gloss Finish: Two finish coats over a primer.
 - a. Primer: SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Finish Coats: SW, Pro-Industrial Waterbased Catalyzed Epoxy Gloss.

- E. Previously Painted Ferrous Metal: Provide the following finish systems over previously painted ferrous metal. *Note: Mock-Up with adhesion test per ASTM-D3359 is required prior to installation of this system.
 1. Gloss Finish: Two finish coats over an adhesion promoting primer.
 - a. Spot Primer (for bare or rusty areas): SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Primer: SW, Extreme Bond Interior/Exterior Bonding Primer, B51-1150.
 - c. Finish Coats: SW, Pro-Industrial Waterbased Catalyzed Epoxy Gloss, B73-300.

- F. Galvanized Metal: Provide the following finish systems over galvanized metal:
 1. Gloss Finish: Two finish coats over a primer.

- a. Primer: SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Finish Coats: SW, Pro-Industrial Waterbased Catalyzed Epoxy Gloss, B73-300.
- G. Previously Painted Galvanized Metal: Provide the following finish systems over previously painted galvanized metal. *Note: Mock-Up with adhesion test per ASTM-D3359 is required prior to installation of this system.
- 1. Gloss Finish: Two finish coats over an adhesion promoting primer.
 - a. Spot Primer (for bare or rusty areas): SW, Pro-Industrial Pro-Cryl Universal Metal Primer, B66-310 series
 - b. Primer: SW, Extreme Bond Interior/Exterior Bonding Primer, B51-1150.
 - c. Finish Coats: SW, Pro-Industrial Waterbased Catalyzed Epoxy Gloss, B73-300.
- H. Concrete Masonry Units: Provide the following finish systems over primer for wall applications.
- 1. Semi-Gloss Finish: Two finish coats over a primer.
 - a. Filler: SW, PrepRite Block Filler, B25W25.
 - b. Finish Coats: SW, ProMar 200 Zero VOC Latex Semi-Gloss, B31W2650 series
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.
- I. Previously Painted Concrete Masonry Units: Provide the following finish systems over an adhesion promoting primer for wall applications. *Note: Mock-Up with adhesion test per ASTM-D3359 is required prior to installation of this system.
- 1. Semi-Gloss Finish: Two finish coats over a primer.
 - a. Primer: SW, Extreme Bond Interior/Exterior Bonding Primer, B51-1150.
 - b. Finish Coats: SW, ProMar 200 Zero VOC Latex Semi-Gloss, B31W2650 series.
*Zero VOC, Anti-Microbial, *Product remains Zero VOC when tinted.

END OF SECTION 099123

SECTION 101112 - SPECIALTY BUILDING PRODUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Division 0 - Bidding and Contract Requirements and Division 1 General Requirements apply to this Section.

1.2 SUMMARY

- A. Provide the following specialties as shown on the drawings and specified herein:
 - 1. Resin Wall Panels and hardware.
 - 2. Fabric Wrapped Tack Boards.
 - 3. Pamphlet Rack.

1.3 DESCRIPTION

- A. Work Included:
 - 1. Furnish labor, materials, tools, equipment, services and supervision required to complete specialty building products work, including all incidental and complementary work shown, specified or necessary to complete work.
 - 2. All final connections for all specialty building products included in this Section shall be made by the respective equipment suppliers and installers.

1.4 QUALITY ASSURANCE

- A. Regulations, Standards and Publications:
 - 1. FS - Federal Specifications
 - 2. ASTM - American Society for Testing and Materials
 - 3. NAAMM - National Association of Architectural Metal Manufacturing
- B. Quality Control: Materials and products shall be made in strict accordance with regulations and standards listed herein.
- C. Product Handling: Deliver all materials in good condition. Store in dry place, off ground; keep dry at all times. Handle materials to prevent damage to product or structure.

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. Contractor shall submit Shop Drawings for review in accordance with Conditions of Contract.

2. Indicate locations, dimensions, anchorage, types and gauges of metals or materials being used, features included, elevations, etc.
- B. Product Data: Submit manufacturer's latest publications of descriptive literature and product date.
- C. Manufacturer's full range of colors and textures, including standard and premium options where indicated.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Resin Wall Panels (RP1)

1. Manufacturer: 3-Form.
2. Provide Class-B panels.
3. Provide thickness as required by manufacturer to prevent detectable deflection (minimum 3/8-inch thickness).
4. All panel edges to be eased.
5. Hardware: Provide top support hardware systems with vertical bracing for extra panel rigidity as manufactured by 3Form.
6. Sizes: Refer to Drawings:
7. Pattern: Locations and installation methods are as follows:
 - a. Location: 102 Lobby
 - b. 3/8" Thick Panel – Varia.
 - c. Hardware – Ready To Go System No. 200.52
 - d. Finish: Sandstone (Front and Back)
 - e. Color: Luster Orbit
 - f. Edge: Flame Polished

B. Fabric Wrapped Frameless Tack Boards.

1. Core: Composed of 100 percent post-consumer and post-industrial waste, or 100 percent naturally-sustainable; 1/4-inch fiberboard laminated to 1/4-inch natural cork.
2. Covering Material: Provide Carnegie-Xorel, Pattern: Meteor. 16-oz-per-linear-yard, 100% IRP Xorel. Provide fabric with a flame-spread rating of 25 or less when tested according to ASTM E 84. Provide color and texture as selected by Architect from manufacturer's full range of (80) colors. Refer to Drawings for locations and sizes.

C. Pamphlet Rack

1. Peter Pepper Products
 - a. Model 606, 10 Pocket.
 - b. Contractor shall provide & install as indicated on drawings for Room 102.

PART 3 - EXECUTION

3.1 INSTALLATION

- D. Specialty building products, build into place by appropriate trade on work. Erect work to lines and levels, plumb and true, in correct relation to adjoining work. Secure parts in rigid, substantial manner; attachment concealed wherever practicable.
- E. Install all specialty building products in accordance with manufacturers' written instructions.
- F. All items shall be complete with manufacturer-supplied or –recommended hardware and fasteners, ready to install.
- G. Make all final connections to mechanical, electrical and plumbing equipment where required and in accordance with manufacturer's written instructions.

3.2 CLEAN UP

- A. All work shall be left in clean condition, and all debris and rubbish cleaned up and removed from site by Contractor.

END OF SECTION 101112

SECTION 101115 – CUSTOM VINYL WALL GRAPHICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Custom digital print wrap film to be applied to GWB as indicated. Refer to drawings for all locations of images/verbiage.

1.3 REFERENCES

- A. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. DIN EN ISO 527 (Vinyl Graphics) – Tensile Strength and Elongation at Break.

1.4 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
 - 1. Digital Vinyl Media: Fire rating: Class A; fire behavior, per DIN 75200: self-extinguishing when adhered to steel.
- B. Dimensional Stability (Vinyl Graphics): Per FINAT TM-14; adhered to steel, no shrinkage in cross direction; in length, <.008 inch.
- C. Adhesive Power (Vinyl Graphics): Per FINAT TM-1; after 24-hour average, adhered to stainless steel at 4.1 lbs./in.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Full-color replication of graphic designs and layouts indicated. Include overall dimensions and seam locations of graphics, if any, as well as special attachment requirements. Minimum scale shall be no less than 1-1/2 inches per foot.

- C. Samples: For each type of film specified, representing manufacturer's film type, adhesives, colors and patterns for the Project.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this Section will be supplied by a single manufacturer with a minimum of ten years experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of similar type and scope as specified.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this Section.
 - 2. Provide a commercial building reference list of 5 properties where the installer has applied products specified. This list will include the following information:
 - a. Name of building and management contact information.
 - b. Type of substrate.
 - c. Type of product.
 - d. Amount of product installed.
 - e. Date of completion.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship for each type of product required.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, pattern and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- A. At Project close-out, provide to Owner an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

2.1 CUSTOM VINYL GRAPHICS

- A. General: Vinyl digital print shall be a high-performance graphic media capable of permanently and accurately printing images indicated on Drawings, and in greatest practical overall dimensions to minimize seams. Printing equipment, inks and printing software shall be fully compatible with media and approved by media manufacturer.
- B. Basis-of-Design Product: Product shall be equal to 3M Company, Envision Print Wrap Films
- C. Vinyl Graphic Properties:
 - 1. Thickness: 2 mils
 - 2. Gloss: Matte finish.
 - 3. Adhesive: Solvent-based, repositionable, permanent, pressure-sensitive type.
 - 4. Liner: 80-lb. strength, pre-coated silicone paper.
 - 5. Substrate: Painted gypsum wallboard.
 - 6. Tensile Strength: Minimum 11-13 lbs per inch, along and across surface.
 - 7. Size: Refer to drawings for extents and images/verbiage. A minimum of (2) colors shall be utilized per image.
 - 8. Location:
 - a. (1) @ 102 Lobby.
 - 9. Apply print wrap film per manufacturers written recommendations for nonporous gypsum wallboard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. If preparation of surfaces or substrates is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - 1. Window film products shall be located on the interior face of the glass of the room that is being obscured from view. Glass surfaces receiving film shall first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.

- B. Do not proceed with installation until surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the Project conditions.
- C. Proceed with installation upon acceptable conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the Project conditions.
- C. Vinyl Graphics Substrate Preparation: Vinyl graphic shall be applied to smooth, non-porous surfaces and to CMU, shrink wrapped for all application. Painted surfaces shall use priming and painting products of the same manufacturer. Freshly-painted surfaces must be permitted to stand for a minimum of three weeks after complete curing prior to application of film, unless otherwise directed by manufacturer.
 - 1. Test compatibility of lacquers and paints prior to vinyl graphic installation; only proceed when substrates are determined to be compatible. Report any deficiencies to the Architect.
 - 2. Clean substrate surfaces of which vinyl graphic materials will be applied to be free of dust, grease or other contaminants.

3.3 VINYL GRAPHICS FABRICATION

- A. Stock Material Storage: Carefully follow digital print vinyl graphic media manufacturer's written instructions for storing and processing printing media. Store rolls of media by suspending or standing on end using roll blocks; do not store material lying on its side. Store media in cool, dry location, following manufacturer's guidelines for temperature and relative humidity. Do not store near direct sunlight or adjacent to heat sources, including radiators or space heaters.
- B. Printing: Handle printing media with extreme care and caution, following manufacturer's published instructions. Handlers shall wear lint-free gloves to prevent oils and other contaminants from damaging printing surfaces. Ensure the proper printing devices, inks and software profiles are being used, depending on media type. Consult manufacturer if any discrepancies are suspected. Do not proceed with printing until all required criteria are verified.
- C. Printed Material Curing: Whenever possible, to help avoid the risk of delamination, edge curling or adhesive failure, allow printed film to dry for a period of 48 to 72 hours, but not less than 24 hours, and at a temperature of approximately 70 deg F, to allow for proper out-gassing; prints that are heavily saturated with ink shall dry for the maximum amount of time recommended by manufacturer. Store materials on a flat surface or lightly rolled, as directed by manufacturer, to ensure solvent gasses of the ink properly escape and do not affect the adhesive layer.

3.4 VINYL GRAPHICS INSTALLATION

- A. Install custom digital print vinyl graphics in accordance with media manufacturer's written instructions. Install vinyl material only by using dry application method; do not use any liquids as part of the installation.
- B. Lay the graphic onto a flat surface with image side down. Pull back the adhesive liner approximately 3 inches. Sharply crease the liner while holding it away from the adhesive. Align the graphic on the wall and use finger pressure to tack into place onto the wall substrate. Greater lengths of material shall be temporarily tacked to surface with masking tape; verify the tape adhesives will not mar the film surface or adjoining material surfaces.
- C. Using a squeegee, work from the center to the edge, and then return to the center and work to the opposite edge. Use overlapping strokes while applying a small portion of the graphic at a time. Keep material taught as tooling progresses to avoid creasing the graphic surface; work short horizontal and vertical increments to ensure precise alignment along corners and material transitions. Ensure adequate pressure is applied over graphic to guarantee appropriate bonding to substrate. Work material surface to ensure air bubbles are removed.
- D. If graphic consists of multiple panels, avoid using horizontal seams whenever possible. Whenever horizontal seams cannot be avoided, carefully align edges so that seams appear as inconspicuous as possible.
- E. When the entire graphic has been applied to the wall, re-squeegee the edges of the surface to ensure a strong bond. Carefully trim off excess material from edges and corners.

3.5 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 101150

SECTION 101423 – PANEL SIGNS

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.
- B. This Section includes the following:
 - 1. Interior panel signs.
- C. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities & Controls" for temporary project identification signs.
 - 2. Division 10 Section "Plaques" for building dedication plaque and exterior graphic plaque.
 - 3. Division 10 Section "Dimensional Letter Signage" for dimensional letter signs.
 - 4. Division 10 Section "Vinyl Graphics" for digital printed vinyl graphics.

1.2 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 - 1. Provide message list, typestyles, graphic elements and layout for each sign required, including large-scale details of wording and lettering layout.
 - 2. Floor plans shall include sign locations for all signs including directional arrows for accessible means of egress, accessible drinking fountains & all other signs required by code. Signage subcontractor shall coordinate with the local code official to review floor plans and signage locations required prior to submitting shop drawings to the architect. **Shop drawings will not be approved without these floor plans.**
 - 3. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
 - b. Sample full size dimensional letter in the font, style and finish specified.
 - c. Manufacturer color charts for field-applied vinyl graphics, including both solid color and translucent selections.

1.3 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.5 WARRANTY

- A. When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.
 - 1. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - a. Failures include, but are not limited to, the following:
 - 1) Deterioration of finishes beyond normal weathering.
 - 2) Deterioration of embedded graphic image.
 - 3) Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Manufacturers of Panel Signs:
 - a. 4Sign Solutions
 - b. Best Manufacturing
 - c. Bayuk Graphics
 - d. Alpine Signs

2.2 VANDAL-RESISTANT FRAMED PANEL SIGNS

- A. Cast Acrylic Sheet: ASTM D 4802; non-extruded, non-continuous-cast polymethyl methacrylate monomer (PMMA) or extruded polyvinyl chloride (PVC)-acrylic alloy sheet, Type UVF (UV filtering); in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F, and of the following general types:
1. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored, solid acrylic sheet in colors and finishes as selected from the manufacturer's full range of standard colors and textures.
 2. Colored Coatings: Use colored coatings, including inks and paints for copy and background colors that are recommended by acrylic manufacturer for optimum adherence to acrylic surface and are non-fading for the application intended.
- B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to and compatible with the sign material and mounting surface.
- C. **Vandal-Resistant Framed Panel Signs:** Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction. (REVISED per Addendum No. 8, 11-6-18)
1. Construction: Fabricate smooth, flush panel surfaces, capable of remaining flat with no noticeable distortions, while subjected to installed environmental conditions, within a tolerance of plus or minus 1/16 inch, measured diagonally.
 2. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
 3. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply-formed edges.

- a. Copy Depth: Character, graphic and Braille copy shall be raised 1/32 inch, unless otherwise indicated.
 - b. Lettering Style: Upper- and lower-case letters; as selected by Architect from manufacturer's full range of standard typefaces.
4. Characters and Graphics: Unless otherwise indicated, fabricate signs with 1-inch-high room numbers and 3/4-inch-high room identification lettering. Standard grade Braille shall be located 1/2 inch below copy.
 - a. Accessibility Standards: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs. All signage shall comply with accessibility requirements, including International Symbol of Access, Braille, and provisions for mounting.
 - b. Final room numbering and verbiage designations for all signs shall be approved by Owner prior to fabrication.
 5. Edge Condition: Square, non-beveled.
 6. Edge Color: Same as background.
 7. Frame Material: Plastic
 8. Corner Condition: Square, non-rounded.
 9. Blank Panels: Where panel signs are indicated or required to be installed on glass sidelites or similar transparent surfaces, provide blank panel signs to the opposite side of the glass, matching size, profile and color, to conceal the adhesives.
 10. Extra Signs: Provide an additional quantity of (25) 8"x8" signs.
 11. Note: Where panel signs are to be installed on exterior side of building, provide drill & countersink mechanical fasteners mounted to conical anchors.
- D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
1. All panel signs shall comply in all regards with ADA requirements, including raised copy and braille message.
 2. Signs indicating entrances to men's and women's toilet rooms shall include the manufacturer's standard symbol for men and women.
 3. Provide signs at the entrances to all toilet rooms that are not accessible directing people needing handicapped accessible facilities to the closest accessible toilet facilities.
- E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert.

2.3 FINISHES

- F. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance,

provide colors as selected by the Architect from the manufacturer's full range of standard colors and textures.

1. Manufacturer shall offer no less than 25 colors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall-Mounted Framed Panel Signs: All signs shall be mounted per ADA guidelines. Attach panel signs to wall surfaces using the methods indicated below:
 1. Vinyl-Tape Mounting: Use double-sided foam tape with silicone added to back of frame to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 101423

SECTION 102600 - WALL PROTECTION

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. Accent rail.
 - 2. Crash rails.
 - 3. Abuse-resistant wall coverings (FRP).
 - 4. Corner Guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
 - 1. Include plans, elevations, sections, and attachment details. Show handrail design and support spacing required to withstand structural loads.
- C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.
 - 1. Include Samples of accent strips and accessories to verify color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of handrail.
- B. Material Certificates: For each type of exposed plastic material.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.2 ACCENT RAILS

- A. Manufacturers: Interior surface protection specified herein and included on the submittal drawings shall be manufactured by Construction Specialties, Inc.
- B. Engineered PETG High Impact Acrovyn 4000 Model FR451N.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. InPro Corporation (IPC).
 - c. Nystrom, Inc.
 - d. Pawling Corporation.
2. High Engineered PETG: As indicated on Drawings 4-1/2-inch high accent rail, nominal thickness .040 with suede texture.
 - a. Backing: Medium density fiber board, 3/4" with no added urea formaldehyde.
 - b. Acrovyn solid colors.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Mounting: Adhesive with mitered ends.
4. Accessories: Acrovyn wall protection shall be furnished as a complete packaged system, including appropriate standard adhesive.
5. Location: Lobby Room 102, As Per Drawings.

2.3 CRASH RAILS

- A. Manufacturers: Interior surface protection specified herein and included on the submittal drawings shall be manufactured by Construction Specialties, Inc.
- B. Engineered PETG High Impact Acrovyn 4000 Model RS-40N.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. InPro Corporation (IPC).
 - c. Nystrom, Inc.
 - d. Pawling Corporation.
 2. High Engineered PETG: As indicated on Drawings 12-inch high crash rails, nominal thickness .040 with suede texture.
 - a. Acrovyn solid colors.
 - b. Color: As selected by Architect from manufacturer's full range.
 3. Mounting: Adhesive with mitered ends.
 4. Accessories: Acrovyn wall protection shall be furnished as a complete packaged system, including appropriate standard adhesive.
 5. Location: Exam 112, Exam 113, Exam 114, Exam 115, Exam 116, As Per Drawings.

2.4 ABUSE-RESISTANT WALL COVERINGS (FRP)

- A. Abuse-Resistant Sheet Wall Covering: Fabricated from semi rigid, plastic sheet wall-covering material.
 - 1. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.
 - 2. Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D-1308.

- B. Basis of Design: C/S Acrovyn .040" Rigid Sheet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. InPro Corporation (IPC).
 - c. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - d. Nystrom, Inc.
 - e. Pawling Corporation.
 - 2. Sheet Thickness: 0.040 inch.
 - 3. Color and Texture: As selected by Architect from manufacturer's full range.
 - 4. Height: See Room Finish Schedule.
 - 5. Mounting: Adhesive.
 - 6. Materials: Provide color-matched caulk & plastic trim pieces as needed for joints & transitions.
 - 7. Location: Custodial 118, Custodial 218.

2.5 CORNER GUARDS (@GWB WALLS IN CORRIDORS)

- A. Surface-Mounted, Plastic-Cover Corner Guards: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.

- B. Basis of Design: C/S Acrovyn 4000 Model VA-200N
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. InPro Corporation (IPC).
 - c. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - d. Nystrom, Inc.
 - e. Pawling Corporation.

2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness as follows:
 - a. Profile: 1-1/2" Legs
 - b. Height: 6 feet.
 - c. Color and Texture: As selected by Architect from manufacturer's full range.
3. Self Adhesive tape backing.
4. Location: All corridors and Lobby Room 102, As Per Drawings.

2.6 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.7 FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
 - 3. Adjust end and top caps as required to ensure tight seams.
- D. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.
- E. Door-Frame Protectors: Install on both door jams.
- F. Fire Doors: Install protection according to the listing of each item.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 108000 TOILET ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Work of this Section includes the following:
 - 1. Supply and install Toilet and Bath Accessory items as scheduled.
 - 2. Installation of Owner supplied Toilet and Bath accessories as scheduled.
- B. Toilet compartments and related accessories are specified in another Division 10 Section.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
- D. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- E. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
- B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY

- A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.
- B. Warranty Period: 5 years from date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Toilet Accessories
 - a. Bobrick Washroom Equipment, Inc.
 - b. American Specialties, Inc.
 - c. Bradley Corporation

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.
- B. Sheet Steel: Cold-rolled, commercial quality ASTM A366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 527, G60.
- D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- E. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

- F. Galvanized Steel mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 TOILET ACCESSORY SCHEDULE

- A. A Toilet Accessory Schedule on the drawings lists the types of accessories required. The schedule includes model numbers of specific items as manufactured by Bobrick. The inclusion of these model numbers is to provide a guide as to the quality, function, size, and materials of the intended products, not to be exclusionary or proprietary. Equal products by other manufacturers specified are acceptable.

2.4 FABRICATION

- A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation.
- D. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theft proof installation, as follows:
 - 1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 108000

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Manually operated roller shades with single rollers.
- 2. Manually operated roller shades with double rollers.

- B. Related Requirements:

- 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
- 2. Division 7 Section "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

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

- 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

- C. Samples: For each exposed product and for each color and texture specified, 10 inches long.

- D. Samples for Initial Selection: For each type and color of shadeband material.

- 1. Include Samples of accessories involving color selection.

- E. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Certificates: For each type of shadeband material, signed by product manufacturer.
- C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than 2 units.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following and not limited to:
 - 1. Draper Inc. Manual Flexshade
 - 2. Hunter Douglas Contract. (Equal to Draper)
 - 3. MechoShade Systems, Inc. (Equal to Draper)
 - 4. Jacksons Window Shoppe
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: Right side of inside face of shade
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
 - 1. Shadeband Material: Light-filtering Series
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material
 - b. Color and Finish: As selected by Architect from manufacturer's full range
- F. Installation Accessories:

1. Front Fascia – Surface Mounted Applications: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than **3 inches**.
2. Headbox – Recessed Applications: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than **3 inches**.
 - b. Refer to section drawings for details.
3. Endcap Covers: To cover exposed endcaps.
4. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MANUALLY OPERATED SHADES WITH DUAL ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under
 2. Inside Roller:
 - a. Drive-End Location: Right side of interior face of shade
 - b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller
 3. Outside Roller:
 - a. Drive-End Location: Left side of interior face of shade
 - b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller
 4. Shadeband-to-Roller Attachment: Manufacturer's standard method
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Inside Shadebands:
 1. Shadeband Material: Light-filtering fabric
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material
 - b. Color and Finish: As selected by Architect from manufacturer's full range

- F. Outside Shadebands:
 - 1. Shadeband Material: Light-blocking fabric
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material
 - b. Color and Finish: As selected by Architect from manufacturer's full range

- G. Installation Accessories:
 - 1. Front Fascia – Surface Mounted Applications: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than **3 inches**.
 - 2. Headbox – Recessed Applications: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than **3 inches**
 - b. Refer to section drawings for details.
 - 3. Endcap Covers: To cover exposed endcaps.
 - 4. Installation Accessories Color and Finish: As selected by Architect from manufacturer's full range.
 - 5. Back Covers for Interior Roller Shades: Provide and install back cover for all interior shades.

2.4 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701 Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: SheerWeave 2500
 - 2. Type: Vinyl Coated polyester
 - 3. Weight: 13.9 oz per yard.
 - 4. Openness Factor: 1 percent.
 - 5. Color: As selected by Architect from manufacturer's full range.

- C. Blackout Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: Indiana Coated Fabrics (ICF), Apagon Style III
 - 2. Type: Vinyl Coated polyester.
 - 3. Weight: 12.8 oz per square yard
 - 4. Color: As selected by Architect from manufacturer's full range.

2.5 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F.
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. **Hardware shall be mounted to jamb or head of window opening. Mounting to the frame is NOT approved.**

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123661 - SIMULATED STONE FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-surface-material countertops & backsplashes.
 - 2. Solid-surface-material window stools.
 - 3. Solid-surface-material wall caps.

1.3 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment, provisions and coordination requirements with adjacent work.
- B. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- C. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL FABRICATION

- A. Configuration: Provide countertops with the following front and backsplash style:
 - 1. Front: Straight, slightly eased at top and bottom.
- B. Countertops: 1/2-inch-thick, solid surface material, adhesively joined with inconspicuous seams with built-up front edge with slight radius with same material. Refer to drawings for details.
 - 1. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - a. Fabricate with loose backsplashes for field assembly.
- C. Window Stools: 1/2-inch thick, solid surface material, adhesively joined with inconspicuous seams with built-up edge with slight radius. Refer to drawings for details.
- D. Wall Caps: 1/2-inch thick, solid surface material, adhesively joined with inconspicuous seams with built-up edge with slight radius. Refer to drawings for details.

2.2 MATERIALS

- A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Adhesives: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 - 1. Manufacturers: Subject to compliance with requirements, provide the following
 - a. Dupont, Corian Solid Surface
 - 2. Colors: Up to three colors, As selected from Group 4.
 - a. Countertops and Backsplashes: As selected by Architect from manufacturer's full range.
 - b. Window Stool: As selected by Architect from manufacturer's full range.
 - c. Wall Caps: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install solid-surface-materials level to a tolerance of 1/8 inch in 8 feet
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface. Refer to drawings for additional details.
 - 1. Seal edges of cutouts in plywood subtops by saturating with varnish.
- C. Install all solid-surface-materials to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

END OF SECTION 123661