DIVISION 07

THERMAL AND MOISTURE CONTROL

SECTION 07100
WATERPROOFING and DAMPPROOFING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
- Protection of all exterior finishes
- Watersealing of exterior wall surfaces
- Waterproofing of roof decks, underground walls and slab, concrete gutters, suspended toilets, cisterns and others
- Watersealing of expansion joints
- Dampproofing of slabs on fill.

B. See drawings and details for location and extent of requirements.

1.02 SUBMITTALS

A. Samples - Submit to Architect samples of materials to be used clearly labeled as to brand name and manufacturer's name to secure approval.
B. Manufacturer's Instructions - Submit to the Architect the manufacturer's complete printed instructions for the application of the material.
C. Warranties - Upon completion, submit to the Architect written warranty that the waterproofing is effective for a period of five years.

1.03 ALTERNATES

No substitution of materials shall be made unless authorized in writing by the Architect prior to starting the work of waterproofing.

2.00 PRODUCTS

Refer to Section 01020 Summary of Materials and Finishes.

3.00 EXECUTION

3.01 GENERAL

A. Waterproofing:

1. Deliver waterproofing materials to the site in original sealed containers or packages bearing the manufacturer's name and brand designation, specification number, type and class.
2. Store and protect waterproofing materials from damage, weather, moisture and extreme temperature with extraordinary care.

3. Clean, free from holes and imperfections, smooth and dry all surfaces to receive waterproofing materials. The Contractor shall perform the necessary surface preparation according to the manufacturer's specifications. Immediately before application of waterproofing, clean surfaces and secure approval. No application of waterproofing is permitted in wet weather.
4. All work under this section shall be performed only by a qualified Contractor trained and approved by the manufacturer. Apply all waterproofing strictly in accordance with manufacturer's specifications.

B. Dampproofing of slabs on fill and basement slabs:

1. Prior to placing the concrete, the hard core should be compacted to smooth, even surface, eliminating all sharp projections or irregularities which may puncture the moisture barrier.
2. Cover the entire area with a layer of dampproofing film, extending past the perimeter of the slab and turning up against walls for the depth of the concrete.
3. Overlapping of sides and ends: 150 mm (6") minimum.

3.02 TESTING

Flood test all applicable waterproofed areas prior to acceptance of job. Plug all drains, build temporary dams at openings so that water will be 250 mm (1") deep at the high point of the waterproofed area. Maintain the water for at least 24 hours. Remedy at once any evidence of leaking.

3.03 GUARANTEE

The Contractor shall guarantee all waterproofing work to be free from defects in materials and in workmanship and free of leaks for a period of five (5) years from the date of final acceptance. Any defect shall be repaired at the Contractor's expense.

3.04 CURING

Where curing of waterproofing is required, cure strictly in accordance to the Manufacturer's specifications. Allow foot traffic only after complete curing.

3.05 TOPPING

Where topping over waterproofing is required, the Contractor shall provide the topping to the thickness indicated in the drawings.

END OF SECTION 07100

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07110
BUILDING INSULATION

1.00 GENERAL

1.01 SCOPE

A. This Section includes the following:

1. Rigid insulation for under slabs-on-grade perimeter.
2. Rigid cavity-wall insulation.
3. Rigid wall insulation
4. Glass-fiber blanket insulation.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
2. Division 7 Section “Damp Proofing” for vapor retarders.
3. Division 7 Section “Self Adhering Sheet Waterproofing” for deck insulation.
4. Division 7 Section “Composite Metal Wall Panels” for wall panels requiring rigid insulation back-up.
5. Division 7 Section "Thermoplastic Membrane Roofing" for roof insulation.
6. Division 9 Sections "Gypsum Board" and "Gypsum Board Shaft-Wall Assemblies" for sound attenuation insulation.

1.02 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.03 SUBMITTALS

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

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.05 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.

2.00 PRODUCTS

2.01 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.

2.02 RIGID BOARD INSULATION – CAVITY-WALL AND WALL APPLICATIONS

A. Extruded-Polystyrene (Foam Plastic) Board Insulation: ASTM C 578, with maximum flamespread and smoke-developed indexes of 75 and 450, respectively:

1. Available Manufacturers:

a. DiversiFoam Products.

b. Dow Chemical Company.

c. Owens Corning.

d. Pactiv Building Products Division.

2. Extruded Polystyrene (Foam Plastic) board insulation is to have the following characteristics:

a. Nominal Density: Type VI, 1.60-lb/cu.ft.

b. Thermal Resistivity: 5.0 Deg. F x h x sq.ft/BTU x in. at 75 Deg. F.

c. Thickness: 25 mm (2 inch) (R-10).

2.3 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.

2. Johns Manville.

3. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrimpolyethylene vapor-retarder membrane on 1 face.

D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:

1. 90 mm (3-1/2 inches) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.

2. 165 mm (6-1/2 inches) thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.

2.04 AUXILIARY INSULATING MATERIALS

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

2.05 INSULATION FASTENERS

A. Insulation-Retaining Washers and Fasteners: Provide type and size as recommended by insulation manufacturer for each application and condition/substrate.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

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

3.02 PREPARATION

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

3.03 INSTALLATION, GENERAL

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

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, 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.

3.04 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.05 INSTALLATION OF RIGID BOARD WALL INSULATION

A. On units of rigid foam-plastic board insulation, install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions; or fit board insulation between framing members when used as wall panel back-up. Press units firmly against inside substrates indicated. Use in locations as noted and permitted by code.

B. On units of rigid fiberglass board insulation, install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit insulation between framing members, with edges butted tightly in both directions. Press units firmly against inside substrates indicated. Use in locations as noted for aluminum panel back-up or where code will not allow use of a foam-plastic insulation.

3.06 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 foam-plastic 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 in location indicated of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Insulation shall be retained by steel impaling pin assemblies with bases fastened to frames with screws, or approved equal. Welded or glued impaling pins are not acceptable. Maintain 1.0 inch nominal air space between insulation and glass. Brace thermal insulation where it contacts safing insulation, to prevent bow of thermal insulation from pressure exerted by safing insulation. Seal edges, joints, punctures and tears in vapor barrier with aluminum foil tape.

3.07 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 two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.

3.08 PROTECTION

A. 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 07110

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07115
BITUMINOUS DAMPROOFING

1.00 GENERAL

1.01 SCOPE

A. This Section includes cold trowel-applied, emulsified-asphalt dampproofing applied to the following surfaces:

1. Exterior face of exterior glass mat gypsum wall sheathing.
2. Exterior face of cast-in-place concrete retaining walls above grade.
3. Exterior face of concrete masonry unit walls above grade.

B. This Section also includes spray-applied, emulsified-asphalt vapor retarder (air barrier) applied to the following surfaces:

1. Exterior face of exterior glass mat gypsum wall sheathing.

C. Related Sections include the following:

1. Division 3 Section “Cast-in-Place Concrete”.
2. Division 7 Section "Building Insulation".
3. Division 7 Section “Self-Adhering Sheet Waterproofing”.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials through one source from a single manufacturer.

1.04 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.

2.00 PRODUCTS

2.01 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Products: Subject to compliance with requirements, provide one of the following products:

1. Karnak Corporation – Karnak 920 Fibrated – Light Trowel.
2. Meadows, W.R., Inc. – Sealmastic, Type III.
3. Sonneborn, Div. of ChemRex, Inc. – Hydrocide 700.

B. Trowel Coat: ASTM D 1227, Type II, Class I.

C. VOC Content: 2.5 lb/gal. or less.

2.02 SPRAY-APPLIED, EMULSIFIED-ASPHALT VAPOR RETARDER (AIR BARRIER)

A. Products: Subject to compliance with requirements, provide one of the following products:

1. Karnak Corporation – Karnak 220AF.
2. Meadows, W.R., Inc. – Sealmastic, Type I.
3. Sonneborn, Div. of ChemRex, Inc. – Hydrocide 700B.

2.03 AUXILIARY MATERIALS FOR VAPOR RETARDER APPLICATION

A. General: Auxiliary materials recommended by vapor retarder manufacturer for intended use and compatible with vapor retarder membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Water-based primer recommended for substrate by manufacturer of vapor retarder material.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor-retarding, 30- to 40-mil- thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Modified Bituminous Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

F. Joint Reinforcing Strip: Vapor retarder manufacturer's glass-fiber-mesh tape.

G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Adhesive and Tape: Vapor retarder manufacturer's standard adhesive and pressure-sensitive adhesive tape.

I. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less

according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

2. Test for surface moisture according to ASTM D 4263.

3.02 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.03 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.

2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.

B. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Extend dampproofing as shown to provide a complete membrane over the area indicated to be dampproofed.

B. On Exterior Face of Inner Wythe of Glass Mat Gypsum Wall Sheathing or Masonry: Trowel apply at a rate of not less than 5.0 gal./100 sq. ft. to produce a dry film thickness of not less than 50 mils.

3.05 SPRAY-APPLIED, EMULSIFIED-ASPHALT VAPOR RETARDER

A. On Exterior Face of Inner Wythe of Glass Mat Gypsum Wall Sheathing: Apply fibrated material in 2 coats, carrying coating in and around joints, grooves, and slots, following reveals and soffits of windows.

B. Allow material to set between coats.

3.06 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

3.07 PROTECTION

A. Protect the completed dampproofing from damage and ultraviolet degradation. Proceed with installation of rigid cavity insulation and the exterior masonry face as soon as possible after the completion of the dampproofing operation.

END OF SECTION 07115

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07131
SELF ADHERING SHEET WATERPROOFING

1.00 GENERAL

1.01 SCOPE

A. This Section includes the following:

1. Modified bituminous sheet waterproofing.
2. Molded-sheet drainage panels.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete".
2. Division 7 Section “Joint Sealants” for joint-sealant materials and installation.
3. Division 7 Section “Bituminous Dampproofing”.

1.02 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials and molded-sheet drainage panels through one source from a single manufacturer.

C. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality. Install pavers and paver supports to demonstrate aesthetic affects and set quality standards for materials and execution.

1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlying construction until mockups are approved.
2. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

D. Pre-installation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the 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 rain, or mist.

2. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.06 WARRANTY

A. Warranty waterproofing Work from defects in materials and workmanship including leakage. Warranty shall provide for prompt repair or replacement of defective materials or workmanship during warranty period.

1. Failure includes, but is not limited to, failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.

2. Warranty Period: Five years from date of final acceptance of the project by the State.

2.00 PRODUCTS

2.01 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous 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 and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Sheet Product Physical Properties:

a. Tensile Strength: 325 psi minimum; ASTM D 412.

b. Ultimate Elongation: 300 percent minimum; ASTM D 412.

c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.

d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.

e. Puncture Resistance: 40 lbf minimum; ASTM E 154.

f. Hydrostatic-Head Resistance: 231 feet minimum; ASTM D 5385.

g. Water Absorption: 0.10 percent weight-gain maximum after 72-hour immersion at 70 deg F; ASTM D 570.

h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.02 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

C. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

D. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 115 mm (4-1/2 inches) wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

2.03 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

3. Verify that compacted subgrade is dry, smooth, and sound; and ready to receive adhesive-coated waterproofing sheet.

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

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

F. Bridge and cover isolation, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips 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, extend liquid membrane each direction from corner or install membrane strip centered over corner.

b. At plaza deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 56 mm (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 range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature

application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

E. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 152 mm (6 inches) beyond repaired areas in all directions.

F. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.05 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.07 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, 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.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07131

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07210
BUILDING AND ROOFING INSULATION

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete works as indicates in Plans.
B. ~~See drawings for location and extent of work required.~~

1. Rigid board insulation at exterior wall behind wall finish.
2. Glass fiber batt insulation in exterior wall, ceiling, and roof construction.
3. Semi-rigid glass fiber insulation on interior side of exterior walls.
4. Semi-rigid mineral fiber insulation in curtain wall construction.

B. Related Sections

1. Section 04200 - Unit Masonry Assemblies, for cavity wall insulation for CMU.
2. Section 09265 - Gypsum Board Assemblies, for acoustical insulation in gypsum board systems.
3. Section 15140 - Mechanical Insulation.

1.02 SUBMITTALS

A. Samples - Submit to the Owner ~~Architect~~ samples of materials to be used and secure approval prior to installation.
B. Manufacturer's Instructions - Submit to the Owner ~~Architect~~ the manufacturer's complete printed instructions for the installation of the material.
C. Product Data: Describe materials and show "R" values.

1.03 PRODUCT HANDLING AND PROTECTION

A. Supply and deliver insulation material in its finished form.
B. Store at a place properly protected from rain and sunlight. Extended outdoor exposure is not recommended.
C. The insulation material shall not be in contact with wet concrete.
D. All works shall be performed only by qualified contractor.

2.00 PRODUCTS

2.01 MATERIALS

Refer to the Summary of Materials and Finishes

2.01 RIGID BOARD INSULATION

A. Description: Extruded polystyrene board; ASTM C578, square edge.

B. Minimum aged "R" value per inch thickness, 5.0 at 75 degrees F mean, ASTM C518.

C. Minimum compressive resistance, 25.0 psi, ASTM D1621.

D. Maximum water absorption by volume, 0.3 percent, ASTM C272.

E. Thickness: 50 mm (2 inch).

2.02 GLASS FIBER BATT INSULATION

A. Description: ASTM C665, formaldehyde free preformed glass fiber batt or blanket form; Type III, Class A, Category 1, foil faced, 25 percent minimum recycled content.

B. Vapor Transmission (Perm) Rating: 0.05 or less, ASTM E96.

C. Thermal Resistance "R": 13 for 3 1/2 inch thickness, 19 for 6 1/2 inch thickness.

D. Flame Spread: 25, ASTM E84.

E. Smoke Developed: 50, ASTM E84.

2.03 SEMI-RIGID GLASS FIBER INSULATION

A. Description: ASTM C612, Type 1A, formaldehyde free glass fiber, compression fit, unfaced and faced with low flame spread polypropylene-reinforced-kraft (PSK) facing. Thickness: 2 inches unless otherwise indicated.

B. Density: 3 pcf.

C. Thermal Resistance "R": 8.7 for 2 inch thickness.

D. Flame Spread: 25, ASTM E84.

E. Smoke Developed: 50, ASTM E84.

2.04 SEMI-RIGID MINERAL FIBER INSULATION SYSTEM

A. Description: ASTM A665, Type III, Class A, mineral fiber, 8 pcf; foil faced. Thickness: 3 inches unless otherwise indicated.

B. Thermal Resistance "R": 13.0 for 3 inch thickness.

C. Surface Burning: ASTM E84; flame spread 25; smoke developed O.

D. Use dark color insulation behind spandrel glass.

E. Firestop Sealant: Follow Section 07 84 13.

2.05 ACCESSORIES

A. Nails, Staples, and Other Fasteners: Rust resistant type where exposed to exterior atmosphere. Other Areas: Unfinished.

B. Tape: Polyethylene self-adhering type; 50 mm (2 inches) wide.

C. Spindle Fasteners: Galvanized wire spindle on flat metal base; self-adhering backing.

D. Wire Mesh: Galvanized steel, hexagonal wire mesh.

E. Metal Furring: Galvanized steel; of type to receive specified wall finish.

F. Adhesive: Type recommended by insulation manufacturer for application.

3.00 EXECUTION

A. Install insulation in dry state.
B. Where cutting of material is necessary, use sharp knife and straight edge.
C. Fit tight around all roof protrusions. Fill the gaps with offcuts to avoid heat leakages.
D. Side and end laps shall be 50 mm (2") to 100 mm (4") and adhered by rugby contact adhesive.
E. Install insulation before roofing is fixed.
F. Any accidental punctures and damages shall be repaired and sealed with aluminum tapes.

3.01 INSTALLATION - GENERAL

A. Verify that substrate is clean, dry, and free of honeycombs, fins, or projections that will [impede adhesive bond or] damage insulation board.

B. Verify that waterproofing and dampproofing has cured.

C. Verify that mechanical and electrical services within spaces have been installed, tested, and approved.

D. Install insulation without gaps or voids.

E. Trim neatly to fit spaces.

3.02 INSTALLATION - RIGID BOARD AT FOUNDATION PERIMETER

A. Apply adhesive in three continuous beads per board length.

B. Install boards on foundation wall perimeter, vertically and or horizontally[as shown. Place boards by method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

3.03 INSTALLATION - RIGID BOARD UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base has been compacted.

B. Butt edges and ends tight to adjacent board and to protrusions.

C. Prevent displacement or damage from subsequent construction.

3.04 INSTALLATION - RIGID BOARD AT INTERIOR SIDE OF EXTERIOR WALLS

A. Space furring 600 mm (24 inch) OC vertically and secure to substrate. Coordinate furring location with subsequent wall finish.

B. Install boards with staggered end joints when height of wall exceeds length of board. Butt edges and ends tight to adjacent board and to protrusions.

3.05 INSTALLATION - BATT AND SEMI-RIGID INSULATION

A. Fit insulation tight in spaces, and tight to exterior side of mechanical and electrical services within plane of insulation.

B. Install insulation with vapor retarder on artificially heated side. Lap ends and side flanges of membrane. Staple, tape or nail in place. Retain in place with spindle fasteners.

C. Tape seal butt ends and lapped side flanges of membrane. Tape seal tears or cuts in membrane. Tape around penetrations and around perimeter; or seal semi-rigid mineral fiberboard with firestop sealant.

END OF SECTION 07210

Read and accepted as part of the Contract:

Bidder/Contractor

SECTION 07227
FLUID-APPLIED MEMBRANE AIR BARRIERS

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:

1. Fluid-applied membrane air barrier, vapor permeable.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for embedded flashings.
2. Division 7 Section "Building Insulation" for foam-plastic board insulation.
3. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
4. Division 7 Section "Joint Sealants" for joint-sealant materials and installation.
5. Division 9 Section “Gypsum Board” for exterior glass-matt sheathing.

1.02 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.03 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor- permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air Barrier Assembly Air Leakage: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57 lbf/sq. ft.; ASTM E 783.

1.04 PRECONSTRUCTION TESTING

A. Mockup Testing: Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1. Owner will engage a qualified testing agency.
2. Qualitative Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization.

3. Quantitative Air Leakage Testing: Testing of the mockup for air leakage will be conducted not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage when tested according to ASTM E 783.

4. Notify Owner seven days in advance of the dates and times when mockup testing will take place.

1.05 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.

2. Include details of mockups.

C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

D. Qualification Data: For Applicator.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials 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 and that is an ABAA-licensed contractor, employs certified and registered installers, and complies with ABAA's Quality Assurance Program.

B. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly, 150 sq. ft., incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.

2. Include junction with roofing membrane and foundation wall intersection.

3. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Pre-installation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.

2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during rain, fog, or mist.

2.00 PRODUCTS

2.01 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: synthetic polymer membrane.

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 Synthetic Polymer Membrane.

3. Physical and Performance Properties:

a. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.

b. Membrane Vapor Permeance: Not to exceed 12 perm; ASTM E 96.

2.02 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor-retarding, 30- to 40-mil- thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.

F. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

J. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.

3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

4. Verify that masonry joints are flush and completely filled with mortar.

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

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 6mm (1/4 inch) with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.04 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 76 mm (3 inches) of coverage is achieved over both substrates.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Re-prime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 76mm (3 inches) of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 150mm (6-inch)-wide, modified bituminous counterflashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.05 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties. Vapor-Permeable Membrane Air Barrier: 47-mil minimum dry film thickness.

E. Apply strip and transition strip over cured air membrane overlapping 3 inches onto each surface according to air barrier manufacturer's written instructions.

F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:

1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization.

2. Quantitative Air Leakage Testing: Testing not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage according to ASTM E 783.

D. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days.

2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07227

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07400
SHEET METAL ROOFING

1.00 GENERAL

1.01 SCOPE

A. Furnish all materials, labor, equipment, plant, tools, required to complete:
- fitting and installation of standing seam ribbed metal roofing, flashing components, strap and rivet units
- application of supplementary materials to make the roof unit watertight and leakproof.

~~B. See drawings and details for sizes and location of work required.~~

B. Related Sections:
1. Section 06100 - Rough Carpentry, for wood curbs and blocking.
2. Section 07210 - Roof Insulation.
3. Section 07920 - Joint Sealers.

1.02 SUBMITTALS

A. Submit to the Construction Manager, Owner's Representative and Architect shop drawings and samples of materials to be used and secure approval prior to installation.

Shop Drawings: Show pattern of seams and joints; details of joints, flashings and counterflashings, ridges, corners, Facia and soffit assemblies; type, size and spacing of fasteners; material thickness and finishes; provisions for expansion and contraction; and conditions of interface with other materials. Drawings must be approved by manufacturer. Shop drawings shall specific details between roof and dissimilar wall materials identifying primary and secondary water and air closures.

B. Product Data: List of materials, with data to show compliance with specified requirements. Submit product literature, schedules, and catalog cuts.

C. Informational Submittals:

1. Design Calculations: Signed and sealed by a Professional Engineer registered in the Republic of the Philippines.

2. Special Warranty: Manufacturer's warranty for twenty (20) years from date of Substantial Completion. Warranty shall not be pro-rated, and shall be signed by roofing manufacturer and installer. Warrant the entire roofing system, including:

a. Failure of materials and installation, including failure to resist moisture penetration.

b. Interface of roofing and flashing with roof mounted items specified in other Sections.

1.03 BRANDING

Each sheet shall be branded with the name or trademark of the manufacturer.

1.04 DESIGN AND PERFORMANCE CRITERIA

A. Design roof system to support a 30 psf live load. Determine wind uplift requirements in accordance with ASCE-7, Section 6. Limit deflection to 1/180 of unsupported span. Total deflection at middle of flat pan (sum of lengthwise bending of structural rib and crosswise deflection of flat) shall not exceed 1/140 of unsupported span. Determine panel bending and clip-to-panel strength by testing in accordance with ASTM E1592.

B. Design roof system to support walking loads without excessive distortion or telegraphing of structural supports. For maximum span used, panels shall withstand a 250 pound concentrated load applied to a four square inch pad located at center of panel flat without buckling of rib or noticeable permanent distortion of panel.

C. Thermal Movement: Design roof system to allow for expansion and contraction of system components caused by surface temperature range of 170 degrees F without causing buckling, failure of joint seals, undue stress or structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects.

D. Air Infiltration: Not over 0.09 cfm per square foot at a static air pressure difference of 4.0 lbf/sq. ft. when tested in accordance with ASTM E1680.

E. Water Penetration: No water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. and not more than 12.0 lb/sq. ft..

F. Design roof system in accordance with the following standards:

1. AISC "Specification for the Design of Cold-Formed Steel Structural Members".
2. American Welding Society "Code for Welding in Building Construction, 1".
3. AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, 1969".
4. AISC "Code of Standard Practice, 1970".
5. ASCE 7-88 (formerly ANSI A58.1).

G. Design gutter and downspout system to meet or exceed recommendations of National Plumbing Code. Slope to drain.

1.05 QUALITY ASSURANCE: Comply with:

A. UL: Class A Fire Hazard Classification.

B. FM: Construction Bulletin 1-28, Roof Assembly Classification.

Flame Spread Rating: Class 1.
Wind Uplift Rating: Class 90 in accordance with UL 580.

1.06 PRE-INSTALLATION CONFERENCE:

A. Convene a meeting one (1) week prior to commencing work.

B. Require attendance of parties directly affecting work of this Section.

C. Review conditions of installation, installation procedures and coordination with other Sections.

2.00 PRODUCTS

See Section 01020 Summary of Materials and Finishes.

2.01 MATERIALS

A. Sheet Steel: ASTM A653/A653M Grade A; galvanize to ASTM A653/A653M G90.

B. Panels: 22 gauge minimum thickness, 406 mm (16 inches) wide, with double standing seam at least 64 mm (2-1/2 inches) high. and intermediate longitudinal ribs to minimize oil-canning. Provide full lengths from ridge-to-eave with no horizontal laps.

C. Soffit, Facia, Trim, Battens, Closures, Flashing, Snowguards, Gutters and Downspouts: Same material type, thickness, and finish as roofing. Provide mitered and welded corners and transitions.

1. Temper of flashing may be reduced to facilitate forming.
2. Soffit: Flush style.

D. Finish: Fluoropolymer coating. Standard heavy 2 coat system

E. Apply protective coating to concealed surfaces to be in contact with cementitious materials or dissimilar metals.

F. Provide thermal spacers to compress insulation at girt locations, as required.

2.02 ACCESSORIES

A. Caulking and Gasketing: As required for a complete weather-tight installation. All seams and joints shall be sealed. Caulking shall meet requirements of Section 07 92 00.

B. Stainless steel fasteners and galvanized clips, concealed where possible. Do not use exposed fasteners in roof panels. At other locations, keep exposed fasteners to a minimum; locations must be approved by A/E.

C. Profile Closures: Precut closed cell foam.

D. Steel Subgirts: Zee-shaped, ASTM A653/A653M Grade A; gauge as required to meet requirements for UL rating; galvanize to ASTM A653/A653M G90.

E. Wall Counterflashing Assemblies: Custom profile as shown; roll formed 0.050 inch thick aluminumreglets and counterflashing. Finish: Fluorocarbon coating, color to match roofing.

F. Counterflashing of Mechanical Penetrations:

G. Splash Blocks: Precast concrete, 762 mm (30 inch) size.

H. Provide base sheets, premoulded pipe seals, prefabricated expansion joint covers, and other materials required for a complete warrantable roof installation.

I. Provide Vycor ultra ice and water shield on continuous underlayment to prevent secondary water encroachment.

3.00 EXECUTION

3.01 GENERAL

A. Verify that surfaces to contact roofing are free of debris.

B. Examine conditions which affect work of this Section. Girts shall be in line within tolerances established by AISC.

3.02 INSTALLATION

A. Lay down the ribbed roofing sheet starting from the end opposite the prevailing wind.

B. Lay and install the first sheet with the turned down edge towards the outside of the area covered.

C. Overlay the next sheet in such a manner that the exposed edge is turned down and the covered edge is turned up.

D. Fix the strap according to indications shown in the manufacturer's catalogue.

E. Fasten the roofing sheets to the steel purlins by means of straps riveted to roofing sheets and strapped around purlins.

F. Side lap fasteners shall be done by rivets and washers spaced from 300 mm (12") to 457 mm (18") on centers.

G. Erect work plumb, level and true as applicable.

H. Fasten panels securely to structural steel frame.

I. Where exposed fasteners are necessary, install in neat, straight rows.

J. At penetrations, install weathertight, two-piece, factory formed closures, finished to match roofing unless otherwise shown or specified.

K. Touch-up erection scars and exposed fasteners with material furnished by coating manufacturer. Repairs shall provide metal protection equal in quality to factory applied protective coating.

~~3.02~~ 3.03 RIDGE ROLLS

Minimum lap of ridge roll shall be 300 mm (12") over roofing sheets. Rivet ridge to roofing sheets at top of every fourth corrugation in addition to rivets engaging top line of straps.

~~3.03~~ 3.04 FLASHING & COUNTER FLASHING

A. Provide flashing and counterflashings at all critical points where water may seep through.
B. Where corrugations run parallel to the walls, corrugate one wing of the flashing sheet to match corrugation of roof sheet while other wing shall go up against the walls and counter flash.

~~3.04~~ 3.05 FASCIA

~~See drawings as to the details of the fascia.~~ Provide for fascia using accessory products available from the selected standing seam panel manufacturer.

3.06 MANUFACTURER'S FIELD SERVICES:

A. Arrange for prompt inspection by manufacturer's technical representative, to verify compliance with warranty requirements.

END OF SECTION 07400

Read and accepted as part of the Contract:

Bidder/Contractor

SECTION 07410
EXTERIOR METAL WALL SYSTEM

1.00 GENERAL

1.01 SCOPE

A. This Section includes the following:

1. Steel faced factory foamed-in-place flat and curved panels.
2. Integrated aluminum frame window system.
3. Extruded aluminum trim.
4. Solar shade screens.
5. Sealants and gasketing for panels, windows and their intersections.
6. Steel tube support framing and miscellaneous supports.

B. Related Sections include the following:

1. Division 5 Section “Metal Fabrications”
2. Division 7 Section “Composite Metal Wall Panels”.
3. Division 8 Section “Aluminum-Framed Entrances and Storefronts” for aluminum storefront framing and column covers.
4. Division 8 Section “Glazing” for glass in window system included in this Section.
5. Division 8 Section “Glazed Aluminum Curtain Walls”.
6. Division 10 Section “Louver and Vents” for louvers integrated with metal wall system.

1.02 REFERENCES

A. American Architectural Manufacturer's Association (AAMA):

1. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
2. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings.
3. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 508-05 - Test Method for Pressure Equalized Rain Screen Wall Systems.

B. American Society of Civil Engineers (ASCE):

1. ASCE-7 Minimum Design Loads for Buildings and Other Structures

C. ASTM International (ASTM):

1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

2. ASTM A 755 - Specification for Steel Sheet Metal, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
3. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
4. ASTM C 645 - Specification for Non-Structural Steel Framing Members.
5. ASTM C 920 - Specification for Elastomeric Joint Sealants.
6. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
7. ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.
8. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials.
9. ASTM E 119 - Test Method for Fire Tests of Building Construction and Materials.
10. ASTM E 283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
11. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
12. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, Doors by Uniform Static Air Pressure Difference.
13. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
14. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

D. Factory Mutual Global (FMG):
1. ANSI/FMG 4880 Standard for Evaluating Insulated Wall & Roof/Ceiling Assemblies.

E. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):
1. Architectural Sheet Metal Manual.

F. Underwriters Laboratories, Inc. (UL):
1. UL 263 - Fire Resistance Tests of Building Construction and Materials.
2. Fire Resistance Directory.
3. UL 1715 Room Corner Test.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Capable of withstanding the effects of gravity loads and the following loads and stresses, based on testing according to ASTM E 330:

1. Wind Loads: Design, fabricate and install panel system such that completed system will withstand minimum design wind speed listed below:
   a. Basic Wind Speed: 100 mph (ASCE-7-02)
   b. Exposure Category: C
   c. Importance Factor: 1.15

2. Deflection Limits: Withstand test pressures with deflection no greater than 1/240 of the pan and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.

   a. Test Pressures: 150 percent of inward and outward wind-load design pressures.

3. Calculations supporting structural performance of the wall panels shall be prepared and sealed by a professional engineer and certified by the manufacturer.

B. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

C. Thermal Performance: Provide insulated metal wall panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 236 or ASTM C 518.

D. Thermal Movement: Design, fabricate and install system to withstand expansion and contraction Force resulting from an ambient temperature range of 100 degrees F. (which may result in wall material surface temperature ranges exceeding 150 degrees F.)

E. Building Movement: Design, fabricate and install system to withstand building movements, including thermal movements, loading deflections and similar movements.

F. Design Factor of Safety: Design and fabricate structural components, including members, panel back stiffeners, back-up light gauge steel framing, gaskets, weldments, connections, adhesives and sealants used in adhesives, with a safety factor not less than 1.5, i.e. failure of any structural component shall not occur at less than 1.5 times the design wind pressure. Failure is defined as breakage, component disengagement, or permanent distortion.

G. Erection Clearance: Design panel/support systems to allow for building frame tolerance variation. Notify architect of inadequate clearance prior to fabrication.

H. Leakage of Water and Air Infiltration: Design, fabricate and install the wall system, including joints between system and other work, to effectively prevent leakage of either water or air into the building, under any combination of the foregoing performance requirements when any type or amount of precipitation occurs. Leakage of water is defined as the appearance of uncontrolled water, other than condensation, on any indoor part of the assembly when tested in accordance with ASTM E331 and AAMA 501.2-83 at a pressure differential of 12 psf. Leakage of air is defined as air infiltration

at a rate exceeding 0.06 cu.ft. per minute per sq.ft. on a complete bay of the wall when tested in accordance with ASTM E283 at a pressure differential of 12 psf.

1. In place performance of exterior metal wall system shall be verified by testing per ASTM E1105.

I. Horizontal joint design shall demonstrate pressure equalization in accordance with AAMA 508-5 which includes static and dynamic testing with imperfect air barriers.

1.05 SUBMITTALS

A. Product Data: For each type of metal wall panel, window system and accessory indicated.

B. Shop Drawings: Show layouts of metal wall panels and window system, including plans, elevations, sections, details, and attachments to other work.

1. Include details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories.

2. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Coordination Drawings: Drawn to scale and coordinating metal wall panel installation with penetrations and wall-mounted items.

D. Material certificates.

E. Product test reports including results of in situ tests of ASTM E331 and AAMA 501.2-83.

F. Maintenance data.

1.06 QUALITY ASSURANCE

A. Manufacturer/Source: Provide the metal wall panel system as specified from a single manufacturer.

B. Installer Qualifications: An employer of workers trained and approved by manufacturer with a minimum of five (5) years experience with the indicated system.

1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.

C. Surface-Burning Characteristics: Provide insulated metal wall panels having insulation-core materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

D. Mockup: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Mock-up shall be tested for water penetration per this specification.

2. Approved mockups shall become part of the completed Work once mockup passes Field Testing.
3. Work shall not progress beyond mockup until Field Testing is Complete.

E. Pre-installation Conference: Conduct conference at Project site

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel and window assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.

b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of final acceptance of the project.

B. Special Warranty on Panel and Window Frame Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish Warranty Period: 20 years from date of final acceptance.

2.00 PRODUCTS

2.01 PANEL MATERIALS GENERAL CHARACTERISTICS

A. Wall panels shall be factory foamed-in-place with integral reveals as shown on the drawings. Panel features include:

1. Panel Thickness: 50 mm (2 inches).
2. Exterior Panel Face: Non-directional embossed, flat surface, 22 gauge, to meet ASTM 653, Grade 37.
3. Panel Base Material: G-90 galvanized steel.
4. Panel Modules: Standard widths as shown on drawings.
5. Side Joints: Double tongue and groove.
6. Insulation Material: Urethane foam with R value of 14.
7. Reveals (Standard): 1/2 inch horizontal.
8. Interior Liner: Embossed, planked, 26 gauge, to meet ASTM A653, Grade 37.
9. Installation Accessories and Trim: Clips, fasteners, shop applied sealants, pressure equalizing vent, drip edges, corners, etc.
10. Finish: Kynar 500 color coat equal to:

a. Color 1: 971 Chromium Gray (Match Centria Color #971).

b. Color 2: 181 Slate Gray (Match Centria Color #181).

B. Panel System Design:

1. Panel Joinery:

a. Horizontal Panels: Rain Screen design with equalized pressure chamber.

2. Panel Width and Length: Refer to Contract drawings.

3. Horizontal panel reveal depth to be a minimum of 2-3/16 inches.

4. Horizontal panel reveal width to be as shown on drawings.

5. Horizontally installed foam panels shall submit proof of successfully passing AAMA 508-05 or provide a back-up system consisting of 5/8 inch exterior grade gypsum board and the specified air and water infiltration values.

C. Integrated window system shall be designed to integrate fully with the horizontal wall panel joinery and provide secondary support system using rain screen and pressure equalization. Window features include:

1. Extruded 6560-T5 aluminum frames are to be designed to accept 1 inch insulated glazing to be furnished and installed under Section 8 “Glazing”.

2. Head, sill and jamb extrusions are to be designed with a thermal broken barrier.

3. Furnish frames with glazing gaskets, sealants, fasteners, setting and splice blocks as required for a complete window system.

4. Finish: Clear anodized aluminum to match finish on aluminum members specified in Sections 08411 and 08911.

5. System shall allow glazing to be replaced without complete dismantling of adjacent panels and frames.

2.02 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Fasteners for Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.

2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.03 INSULATION-CORE METAL WALL PANELS

A. Foamed-Insulation-Core Metal Wall Panels: Factory-formed and -assembled, fabricated from two metal facing sheets and insulation core foamed-in-place during fabrication with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Panel Performance:

a. Flatwise Tensile Strength: 30 psi when tested according to ASTM C 297.

b. Fire-Test-Response Characteristics: Class A according to ASTM E 108.

c. Type: Concealed fastener as indicated on Drawings.

d. Interior Facing Finish: Manufacturer's standard white polyester.

2.04 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

1. Metal Soffit Panels

a. Finish: Match finish and color of metal wall panels

b. Sealant: Factory applied within interlocking join

c. Profile: Reveal joint as indicated on Drawings.

d. Materials: Same as Insulation-Core Metal Wall Panels.

e. Manufacturer: Same as Insulation-Core Metal Wall Panels.

2.05 METAL PANEL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation

1. Metal Wall Panels

a. Finish: Match finish and color of metal wall panels

b. Sealant: Factory applied within interlo

c. Profile: CS-200 by Centria, or equal.

d. Materials: Same as Insulation-Core Metal Wall Panels.

e. Manufacturer: Same as Insulation-Core Metal Wall Panels.

2.06 SUNSHADE

A. General: Provide fixed sunshades as shown on the drawings, as specified, and as needed for a complete and proper installation attaching through panel to supports using concealed fasteners and factory-applied hardware. Include accessories required for structurally sound and weathetight installation.

B. Sunshade: Match finish and color of aluminum window trim.

1. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after product assembly. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemish which will be visible after completing finishing process.

2. Anodized Finish: Provide NAAMM AA-M12C22A31 Class II (mechanical finish, nonspecular as fabricated; chemical etch, medium matte; minimum thickness 0.4 mil) clear, anodic coating and shall match color of mullion caps of curtain wall system specified in Section 08900.

C. Sunshade skin: Aluminum alloy sheet, 3 mm (0.125 inch) thick

D. Outriggers/ end caps: Aluminum alloy with minimal thickness of 6 mm (0.250 inches), in configuration required to provide uniform appearance to overall blade. Outriggers to

be fastened to aluminum window wall bracket with stainless steel fasteners in accordance with manufacturer's engineered requirements.

E. Support tubes and nosing Extruded aluminum allow with tube wall thickness of 3 mm (0.125-inch) nominal. Integrated slot shall be built into configuration, providing required sheet fastening track.

F. Hardware/ fasteners: Stainless steel or aluminum.

2.07 ACCESSORIES

A. Wall Panel Accessories: gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.

2. Closure Strips: Closed-cell, expanded, cellular, premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.0179-inch- thick, metallic-coated steel sheet. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include but are not limited to bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.08 FABRICATION

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

1. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal and other characteristics of item indicated.

D. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.09 INSPECTION

A. The wall system installer is to inspect substrate and alignment of secondary supports for panels and windows prior to starting work. Notify the Contractor in writing of any condition that needs to be corrected.

B. The Installer is to inspect panels and aluminum frames for any damage and to confirm that they are in accordance with the details, specifications and approved shop drawings.

3.00 EXECUTION

3.01 INSTALLATION - GENERAL

A. General: Install metal wall panels and window frames in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and window frames and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels is not permitted.
2. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
3. Install screw fasteners in predrilled holes.
4. Locate panel splices over, but not attached to, structural supports.
5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
6. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Steel Wall Panels: Use stainless-steel fasteners for the exterior and galvanized steel fasteners for the interior.

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

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.

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

3.02 FACTORY-ASSEMBLED METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten insulated metal wall panels to supports with fasteners at each lapped joint at location, spacing, and with fasteners recommended by manufacturer.
2. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation.

3. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.

4. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weatherproof to driving rains.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

3.03 INTEGRAL WINDOW INSTALLATION

A. Install window framing in the same manner as aluminum framing is installed in Sections 08411 and 08911 and in accordance with manufacturer's instructions and approved shop drawings.

B. Install accessories, clips, flashings, trim and related items as required to complete the wall assembly and assure its weathertightness.

C. Coordinate window installation with the wall panels, glazing and other related trades as required to insure proper flashing and seals to adjoining construction.

3.04 SUNSHADE INSTALLATION

A. Inspection: Examine openings to receive the work. Do not proceed until any unsatisfactory conditions have been corrected.

B. Installation: Comply with manufacturer's instructions and recommendations for installation of the work. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure. Anchor sunscreen to building substructure as indicated on architectural drawings.

C. Erection Tolerances: Variation from level shall be 3mm (1/8 inch) maximum in any column to column space or 6096 mm (20'-0") runs, non-cumulative. Offsets in end-to-end or edge-to-edge alignment of consecutive members 0.8 mm(1/32 inch).

D. Corners: Miter sun control fascia assembly at outside corner as shown on drawings.

E. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly as directed.

F. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

G. Set units level, plumb and true to line, with uniform joints.

3.05 ACCESSORY INSTALLATION

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

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

2. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.06 FIELD QUALITY CONTROL

A. Water Infiltration Testing: Test designated areas for water infiltration per ASTM E 1105. Test mockup portions of building exterior prior to construction of adjacent interior walls. Install temporary test chamber, air system, and water delivery system and test with potable water spray.
   1. Pressure Differential: 0.15 inches of water.
   2. Test Type: Procedure A, Uniform Static Pressure.
   3. Test Area: one structural bay width by one story height.

B. After testing, repair leaks if required, and repeat tests, and make further repairs until metal panel installation passes test.

C. First test of each mock-up to be included in contract price. Additional tests required by failure of assembly to be paid for by installer.

3.07 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels and window frames are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel and window frame installation, clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel and window frame installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

END OF SECTION 07410

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07413
COMPOSITE METAL WALL PANELS

1.00 GENERAL

1.01 SCOPE

A. This Section includes the following rout and return exterior and interior wall panels:

1. Aluminum-faced composite wall panels.
2. Sealants of joints in wall panels.

B. Related Sections include the following:

1. Division 5 Section “Cold Formed Metal Framing” for support framing for exterior or load bearing metal wall panels.
2. Division 7 Section "Exterior Metal Wall System" for coordination and finish colors.
3. Division 7 Section "Joint Sealants" for installation of joint sealants installed under this Section.
4. Division 9 Section "Non-Load-Bearing Steel Framing" for support framing for interior metal wall panels.
5. Division 9 Section "Gypsum Board" for exterior sheathing and felt.

1.02 DEFINITIONS

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete system.

1.03 PERFORMANCE REQUIREMENTS

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

B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft..

C. Water Penetration: No water penetration when tested according to ASTM E 331 at a differential pressure of 10 lbf/sq. ft.

1. Water leakage is acceptable only if all of the following conditions are satisfied: water is contained and drained to exterior; there is no wetting of a surface that would be visible to building occupants; there would not staining or other damage to completed building or its furnishings. This definition of water leakage governs over other definitions.
2. Completed portions of the building are required to pass hose tests as specified in Part 3.00 of this Section. There shall be no unacceptable leakage as defined in this Section.

D. Provide internal gutters and weep system to collect and drain water to the exterior. Coordinate gutter and weep systems with other sections.

E. Wind Pressures: Design, fabricate and install panel system such that completed system will withstand minimum design wind speed listed below:

1. Basic Wind Speed: 100 mph (ASCE-7-02)

2. Exposure Category: C

3. Importance Factor: 1.15

F. Thermal Movement: Design panel system joints and connections for unrestrained movement of panel facings based on a material temperature increase of 80 Fahrenheit degrees and decrease of 80 Fahrenheit degrees relative to nominal condition. Assume exterior and interior facings have same temperature. Assume that temperature of supporting structure does not change.

G. Panels shall not experience partial or complete delamination of facings. Partial delamination is defined as any location where loss of bond between facing and core exceeds 4 square inches. Delaminated panels shall not be installed. Panels that delaminate after installation shall be replaced.

1.05 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, closures, and accessories; and special details. Provide elevations, floor plans and wall sections. Provide full size details. Show stud framing and adjacent building structure.

1.06 QUALITY ASSURANCE

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

1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.

B. Fabricator Qualifications: Certified by metal-faced composite wall panel manufacturer to fabricate and install manufacturer's wall panel system.

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

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive

explanatory data to Architect for review within fourteen (14) after the Notice to Proceed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal wall panels and other components so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

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

1.09 COORDINATION

A. Coordinate metal wall panel assemblies with construction of supporting studs and other adjoining work to provide a leakproof, secure, and non-corrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.

b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

c. Delamination as defined in this Section.

2. Warranty Period: Five years from date of project's final acceptance by the State.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following: Color fading when tested according to ASTM D 2244.

Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of project's final acceptance.

2.00 PRODUCTS

2.10 PANEL MATERIALS

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

2.02 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: Refer to Division 5 Section "Cold Formed Metal Framing" for additional requirements.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch nominal thickness.

C. Zee Clip, Angles, Channels: 0.079-inch nominal thickness.

D. Cold-Rolled Furring Channels: Minimum 1/2-inch- wide flange.

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.

2.03 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.04 METAL-FACED COMPOSITE WALL PANELS

A. General: Provide factory-formed and -assembled metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

2.05 FABRICATION

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

B. Provide panel profile for full length of panel.

C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

2.06 FINISHES, GENERAL

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine 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 required by metal wall panel manufacturer.

2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking, that joints are caulked and taped and that installation is within flatness tolerances required by metal wall panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

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

3.02 PREPARATION

A. Clean substrates of substances that may be harmful to the proper installation.

B. Miscellaneous Framing: Install furring and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer’s written recommendations.

3.03 METAL WALL PANEL INSTALLATION, GENERAL

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels by torch is not permitted.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Locate and space fastenings in uniform vertical and horizontal alignment.
4. Seal joints between panels.

B. Fasteners:

1. Aluminum Wall Panels: Use aluminum or 300 Series stainless steel fasteners.

3.04 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as aluminum wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07413

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07540
THERMOPLASTIC MEMBRANE ROOFING

1.0 GENERAL

1.01 SCOPE

A. This Section includes the following:

1. Adhered thermoplastic membrane roofing system.
2. Roof insulation.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry " for wood nailers, curbs, and blocking.
2. Division 7 Section "Roof Accessories" for roof drains, and mechanical supports.
3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
4. Division 7 Section "Joint Sealants."
5. Division 15 sections for pipe connection to roof drains.

1.02 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

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

C. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems", before multiplication by a safety factor.

D. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems", after multiplication by a safety factor.

1.03 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist the factored design uplift pressures calculated according to SPRI's "Wind Load Design Guide

for Fully Adhered and Mechanically Fastened Roofing Systems" for the loads imposed on the roof.

D. Wind Loads: Design, fabricate and install panel system such that completed system will withstand minimum design wind speed listed below:
1. Basic Wind Speed: 100 mph (ASCE-7-02)
2. Exposure Category: C
3. Importance Factor: 1.15

1.04 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Insulation fastening patterns.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

E. Qualification Data: For Installer and manufacturer.

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

G. Warranties: Special warranties specified in this Section.

H. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.

C. Source Limitations: Obtain components for membrane roofing system approved by roofing membrane manufacturer.

D. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.

1.07 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, 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.

1.08 PROJECT 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.

1.09 WARRANTY

A. Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, substrate board, vapor

retarder, roof pavers walkway products, and other components of membrane roofing system.

2. Warranty Period: 20 years from date of project's acceptance by the Owner.

3. Special warranty for the roofing installation:

a. Warranty Period: 2 years from date of project's acceptance by the Owner.

2.00 PRODUCTS

2.01 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible, fabric backed TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by an experienced manufacturer of roofing systems with proven results from similar installations in high-rise buildings and materials testing.

2. Thickness: 60 mils, nominal.

3. Exposed Face Color: White.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

B. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

C. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

D. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

E. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

F. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.03 SUBSTRATE BOARDS

A. Substrate Board: Glass mat gypsum roof board with heat-cured surface treatment, 5/8 inch thick.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening substrate panel to roof deck.

2.04 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VI, 1.8 lb/cu. ft. (29 kg/cu. m) with 2 or 4 edges rabbeted.
1. R-Value: Two layers of insulation shall have a minimum stabilized “R” value of 20 at 75 deg. F. mean temperature and insulate at the rate of R 5.56 per inch.
2. Compressive Strength: Insulation shall have a minimum 25 pounds per square inch compressive strength.
3. Insulation shall have a minimum 25 pounds per square inch compressive strength.
4. Insulation shall be CFC free.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.05 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

2.06 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 24” x 24” x3/16 inch thick, and acceptable to membrane roofing system manufacturer.

3.00 EXECUTION

3.01 EXAMINATION

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

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains 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 comply with requirements in Division 5 Section "Steel Deck."

4. Proceed with installation only after any unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing 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. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.03 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck according to recommendations in FMG's "Approval Guide" for specified Windstorm Resistance Classification.

2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturer's written instructions.

3.04 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install two layers of insulation under area of roofing to achieve required thickness. Install the layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding ¼ inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows.

1. Prime surface of substrate board with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.

2. Install subsequent layers of insulation in a cold fluid-applied adhesive.

3.05 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

F. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

H. Adhesive Seam Installation: Clean both faces of splice areas, applying splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

I. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.06 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean splice areas, applying splicing cement, 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.

3.07 WALKWAY INSTALLATION

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

3.08 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

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

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 PROTECTING AND CLEANING

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

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of final acceptance by the state 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 07540

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07620
SHEET METAL FLASHING AND TRIM

1.00 GENERAL

1.01 SCOPE

A. This Section includes the following sheet metal flashing and trim:

1. Formed low-slope roof flashing and trim.
2. Through-wall flashing.
3. Copings.
4. Roof-edge flashings.
5. Conductor heads and downspouts.
6. Reglets and counterflashings.

B. Related Sections include the following:

1. Division 4 Sections “Cast Stone” and “Unit Masonry Assemblies” for cavity walls to receive through-wall flashing.
2. Division 5 Section "Architectural Joint Systems" for manufactured sheet metal expansion joint covers.
3. Division 6 Section “Rough Carpentry” for wood nailers, curbs, and blocking.
4. Division 7 Section “Thermoplastic Membrane Roofing” for installing sheet metal flashing and trim integral with roofing membrane.
5. Division 7 Section “Roof Accessories” for roof hatches and roof drains.
6. Division 7 Section "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.03 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing 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 sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

D. Wind Loads: Design, fabricate and install system such that completed system will withstand design wind speed listed below:

1. Basic Wind Speed 90 mph (ASCE-7-02)

2. Exposure Category C

1.04 SUBMITTALS

A. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.

2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.

4. Profiles of factory-formed thru-wall flashing and fabricated corners and end dams.

B. Mock-Ups:

1. Furnish and install stainless steel through-wall flashing and weeps in exterior wall mockup panel specified in Section 04810.

1.05 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section “Project Management and Coordination”.

1. Meet with Architect, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installer of roofing materials and roof accessories.

Conference can be concurrent with pre-roofing conference.

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. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.07 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

2.00 PRODUCTS

2.01 SHEET METALS

A. Stainless-Steel Sheet: ASTM A 240/A240M, Type 304.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required.

C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

2.02 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Screws, self-locking rivets, and other suitable fasteners designed to withstand design loads.

C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

2.04 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, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. 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.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

D. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Factory form inside and outside corners and end dams as per the approved shop drawings.

2.05 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

2.06 ROOF-EDGE FLASHINGS

A. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of compression-clamped metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.

2.07 ROOF-EDGE DRAINAGE SYSTEMS

A. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout .

E. Splash Pans: Fabricate from the following exposed metal:

F. Aluminum Finish: Two-coat fluoropolymer.

2.08 REGLETS AND COUNTERFLASHINGS

A. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal: Formed aluminum.

B. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall flashing receiver and compress against base flashings with joints lapped, from the following exposed metal: Formed Aluminum.

3.00 EXECUTION

Read and accepted as part of the Contract:

Bidder / Contractor

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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

3.02 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system. 1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. 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. 1. Space cleats not more than 300mm apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing, trim and gutters. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.

END OF SECTION 07620

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07720
ROOF SPECIALTIES AND ACCESSORIES

1.00 GENERAL

1.01 SECTION INCLUDES

A. Copings, gravel stops, and roof perimeter facia.

B. Roof expansion joint covers.

C. Wall-to-roof counterflashing assemblies.

D. Counterflashing of general construction roof penetrations.

E. Roof mounted tieback anchors for exterior maintenance equipment, and for tie-downs for pipe penetrations.

1.02 RELATED SECTIONS

A. Division 6 Section 06100 - Rough Carpentry, for wood curbs and blocking.

B. Section 07620 for base flashing for roof penetrations; rooftop walk pads.

C. Division 15 Section “Basic Mechanical Materials and Methods”, for counterflashing of mechanical roof penetrations.

D. Division 16 Section “Basic Electrical Materials and Methods”, for counterflashing of electrical roof penetrations.

1.03 DESIGN AND PERFORMANCE CRITERIA

A. Vents shall open against a 100 mph wind.

B. Vents and skylights shall resist a 30 psf uplift pressure.

C. Automatic heat shrink fire/smoke vents shall shrink and drop out in less than 5 minutes at 500 degrees F.

D. Explosion vents shall automatically release if subjected to uniform outward pressure of 30 psf.

E. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing 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 sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

1.04 SUBMITTALS: Follow Section 01330.

A. Shop Drawings: Prepare roof layout showing location of roof specialties and accessories. Show general construction; profile or configuration; materials, thicknesses, and finishes; dimensions; jointing methods; provisions for thermal movement and locations; fastening methods and locations; and installation details.

B. Product Data: Show size, type, material and general construction features of each manufactured item.

C. Samples: 30mm (12 inch) long samples of flashing and sheet metal items, illustrating finish and color.

1.05 QUALITY ASSURANCE: Comply with:

A. UL and FM requirements applicable to fire rated automatic fire/smoke explosion vents.

B. NFPA 204 M for automatic fire/smoke vents.

C. NFPA 68 for explosion vents.

D. FM Loss Prevention Data 1-49 for attachment of roof perimeter metalwork.

1.06 MAINTENANCE MATERIALS: Follow Section 01 77 00.

A. Provide one replacement fusible link for each vent with fusible link controls.

2.00 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Manufacturers: Products listed are approved. Substitutions are permitted subject to review and approval by the Owner and Owner's representative.

B. Provide seals, gaskets and other materials as required for a complete weathertight installation at all joints, including joints providing for thermal movement.

C. On curb of each hatch, vent, and skylight provide a weatherproof plastic label warning personnel against risk of fall.

D. Factory prime galvanized steel with zinc-chromate primer.

E. Aluminum shall have mill finish except where specified otherwise.

F. All materials in each assembly shall be compatible with one another and with other specified materials with which they may come in contact. Apply protective coating or isolator material to concealed surfaces in contact with cementitious materials or dissimilar metals.

G. Use only non-corrosivemetal fasteners to assemble and install work of this Section. Conceal fasteners where possible. Where exposed fasteners are required, use flathead countersunk type. Paint fasteners to match adjacent materials.

2.02 FLASHING AND SHEET METAL ITEMS

A. Manufacturer of flashing and sheet metal items shall be the roofing membrane manufacturer if required to obtain specified roofing warranty, subject to approval regarding design and finish. The following manufacturers are also approved if acceptable to membrane manufacturer for inclusion in the warranty.

B. Copings: 0.050 inch thick aluminum; mitered and welded corners; FM approved. Finish [ ].

C. Gravel Stops: Model [ ] by [ ]; [0.050] [0.063] inch thick aluminum; mitered and welded corners; FM approved. Finish [ ].

D. Roof Perimeter Facia: 0.050 inch thick extruded aluminum with extender and SC 336 closure at roof overhangs; FM approved. Finish [ ].

E. Wall Counterflashing Assemblies: extruded aluminum reglets and roll formed counterflashing. Finish [ ].

F. Roof Expansion Joint Covers: Johns Manville "Expand-O-Flash," style [CF] [EJ] [CF-EJ], EPDM bellows; 0.018 inch thick stainless steel flanges. Provide splice materials as furnished by manufacturer for this purpose.

G. Roof Penetration Counterflashing: Stainless steel, ASTM A240, Type 304, soft temper, 26 gauge, NAAMM 2D finish; with stainless steel clamping rings and sealant specified in Section 07920.

2.03 AUTOMATIC FIRE/SMOKE VENTS

A. Type: [Single] [Double] leaf type, labeled as FM approved, UL listed,

B. Size: as required by code.

C. Curb: 760 mm (18 inch) high, 14 gauge galvanized steel, 50 mm (2 inch) rigid insulation retained by 22 gauge galvanized steel inner liner; integral cap flashing to receive roof flashing system; extended mounting flange.

D. Cover: 14 gauge galvanized steel with 25 mm (one inch) glass fiber insulation retained by 22 gauge steel.

2.04 AUTOMATIC HEAT SHRINK FIRE/SMOKE VENTS

A. Size: as required by code.

B. Curb: 30 mm (12 inch) high, extruded aluminum, with integral flashing to receive roof lashing system; insulation and mounting flange.

C. Cover: Skylight of Type 1 PVC (heat shrink) with acrylic overlay; double dome; free form shape, translucent outer dome and clear inner dome; light transmission 50 percent diffusing. Provide aluminum safety structure over dome.

2.05 AUTOMATIC EXPLOSION RELIEF VENTS

A. Manufacturer: APC Corporation; Model XRV-P.

B. Sizes: As shown.

C. Curb: 30 mm (12 inch) high, aluminum, with integral flashing to receive roof flashing system; insulation and mounting flange.

D. Cover: Skylight of Type 1 PVC with acrylic overlay; free form shape; translucent white double dome; light transmission 50 percent diffusing. Provide aluminum safety structure, with restraining tether, over dome.

2.06 FLUOROPOLYMER COLOR COATING FINISH

A. Fluoropolymer coating. Heavy 2 coat system.

B. Provide this finish for the following:

1. Galvanized metal surfaces.

2.07 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

B. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

C. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07920 - Joint Sealers.

D. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including reveted joints.

E. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive applications of flashing sheet.

F. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required by manufacturer.

G. Elastic Flashing Filler: Closed-cell polyethylene or other closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

H. Roofing Cement: ASTM D 2822, asphaltic.

2.08 FABRICATED UNITS – GENERAL

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or other deterioration of the work. Form work to fit substrates. Comply with material manufacturer's instructions and recommendations for forming material. Form exposed sheet work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folding back from hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshed hooked flanges, no less the 1 inch deep, filled with mastic sealant (concealed within joints)..

D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separations of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separations as recommended by manufacturer/fabricator.

F. Aluminum Extruded Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corners.

3.00 EXECUTION

3.01 INSTALLATION

A. Verify that deck, curbs, roof membrane, base flashing and other items affecting work of this Section are in place and positioned correctly. Verify adequacy of support framing.

B. Separate metal surfaces of roof accessories from dissimilar metals, and from wood and cementitious substrates by a thick coating of fabricated bituminous compound or other separation, as recommended by the metal manufacturer, and as required to prevent corrosive action.

C. Bed flanges of set-on accessories in mastic or compound which is compatible with roofing and flashing.

D. Anchor roof accessories permanently to the substrate by methods which are adequate for the sizes and locations of units.

E. Coordinate with installation of roofing membrane, base flashings and sealants, to ensure weathertight installation.

F. Coordinate installation of flashing flanges into reglets.

G. Installation of Gravel Stops:

1. Install continuous cant prior to roofing with 1" lap joints and anchor in place through slotted holes at 18" o.c. at roof flange and 36" o.c. through the cant face.
2. Install fascia in 12 foot lengths with 3/8" expansion allowance for each joint occurring at a compression retainer clips after roof membrane is set and placed over the cant. Secure retainer clips using stainless steel #12 x 1 1/2 screws.
3. Install plumb, level and secure with watertight mitered corners and joints.

H. Installation of Copings:

1. Shop fabricate and finish as per the approved shop drawings to sizes, profiles and arrangements noted in as long lengths as practical.
2. Install hold down clips to wood blocking at three foot on centers using aluminum shank nails and neoprene washers.
3. Locate and install concealed control joint cover plates at ends of abutting section lengths.
4. Place coping corners and lengths over the cover plates and hold down clips interlocking and secure to back side using aluminum ring shanknails and neoprene washers spaced 1" from ends and not over 2'-0" o.c. in between.

5. Provide special end returns at open termination locations.

I. Install metal counterflashing shaped as a rain hood at roof penetrations that are not furnished with integral counter flashing. Overlap base flashing at least 4 inches. Apply clamping ring at top of hood and seal with joint sealant.

J. Touch up items with fluoropolymer finish, using material provided by manufacturer.

3.02 TESTING OF AUTOMATIC FIRE/SMOKE VENTS

A. After installation, test each vent in the presence of the Owner's representative for proper operation. After testing, replace fusible links with new fusible links of same rating.

3.03 CLEANING AND PROTECTION

A. Provide special end returns at open termination locations.

B. Provide all protection and surveillance requirements, to insure that roof accessory units will be without deterioration or damage at the time of acceptance by the Owner.

END OF SECTION 07720

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07810
PLASTIC UNIT SKYLIGHT

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools, required to complete:

- plastic unit skylights and their accessories.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. This Section includes plastic unit skylights.
B. Related Sections:
   1. Division 5 Section “Structural Metal Framing” for roof framing.
   2. Division 7 Section "Roof Accessories" for curbs, roof hatches, and smoke vents.
C. Refer to roofing system Sections for roofing accessories to be built into the roofing system to accommodate Work of this Section.

1.04 SUBMITTALS

A. General: Submit the following according to the Conditions of Contract and Division 1 Specification Sections.
B. Product data for each type of skylight specified, including details of construction relative to materials, dimensions of individual components, profiles, finishes, and glazing light transmission and thermal characteristics.
C. Shop drawings showing fabrication and installation of skylights, including plans, elevations, sections, details of components, and attachments to other units of Work.
D. Samples for verification purposes in full-size units or a representative section of each type of skylight indicated for each color, texture, shape, and sizes specified.

1.05 SYSTEM DESCRIPTION

A. General: Provide PVC roofing system that has the following capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:

B. Fire-Test-Response Characteristics: Provide plastic sheets identical to those tested for the following fire-test-response characteristics, per ASTM test method indicated below, by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction.

Identify plastic sheets with appropriate markings of applicable testing and inspecting organization.

1. Self-Ignition Temperature: 650 deg F (343 deg C) or greater when tested per ASTM D 1929 on plastic sheets in the thickness intended for use.
2. Smoke density of 75 or less when tested per ASTM D 2843 on plastic sheets in the thickness intended for use.
3. Relative-Burning Characteristics: As follows, when tested per ASTM D 635:
   a. Polycarbonate: Burning extent of 1 inch (25 mm) or less when tested on plastic glazing indicated below with a nominal thickness of 0.060 inch (1.5 mm) or the thickness intended for use.

C. Wind Loads: Provide PVC roofing system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction over the area.

1.06 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Hire a professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of PVC roofing that are similar to those indicated for this Project in material, design, and extent.

B. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in PVC roofing systems similar to those required for this Project , who is acceptable to manufacturer and who can submit a currently dated License Certificate which shall verify the installer's qualifications to properly install PVC roofing sheets and accessories and shall commit the manufacturer to the acceptance of the installer as a co-signer under a joint responsibility agreement.

1. Engineering Responsibility: Prepare design data for PVC roofing systems, including signed and sealed shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Source Limitations: Obtain each type of PVC roofing sheets and accessories from one source and by a single manufacturer.

D. 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.

E. Preconstruction Testing: Comply with the following requirements:

1. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the preconstruction testing indicated.

F. Mockups: Prior to installing PVC roofing systems, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.
   1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify the Owner and Owner's representative 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 start of Work.
   5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. When directed, demolish and remove mockups from Project site.
      b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

G. Preinstallation Conference: Conduct conference at Project site prior to installation of PVC roofing sheets.

H. Wind Loads: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7,

1.07 WARRANTY

C. General: Warranties specified in this Section 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.

D. Plastic Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work that has or develops defects in the plastic. "Defects" is defined as abnormal aging or deterioration.
   1. Warranty Period for PVC: 5 years from date of Substantial Completion against breakage.

E. C. Finish Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work with finish defects. "Defects" is defined as peeling, chipping, chalking, fading, abnormal aging or deterioration, and failure to perform as required. Failures include, but are not limited to, the following:
   1. Structural failures including, but not limited to, excessive deflection.
   2. Air infiltration and water penetration.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Failure of operating components to function normally.
   5. Plastic breakage, wearing, tearing.

   Warranty Period: 2 years from date of Substantial Completion.

2.00 PRODUCTS

2.01 MATERIALS

F. Extruded Aluminum: ASTM B 221 (ASTM B 221M) alloy 6063-T52 or alloy and temper required to suit structural and finish requirements. Mill finish unless indicated otherwise.

G. Plastic Sheets:

1. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
    1. Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

I. Operable Skylight Gaskets: Manufacturer's standard tubular or fingered design of neoprene or EPDM, or block design of sponge EPDM or neoprene.

J. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

K. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces. ASTM C 920; Type S; Grade NS; Class 25; and Uses NT, G, A, and (as applicable to joint substrates indicated) O.

2.02 FINISHES General: Comply with NAAMM "Metal Finishes Manual" recommendations for application and designations of finishes.

B. Finish designations prefixed by AA conform to the system for designating aluminum finishes established by the Aluminum Association.

2.03 PLASTIC SKYLIGHT UNITS

C. General: Factory-assembled unit consisting of plastic glazing, extruded aluminum glazing retainer, gasketing, inner frame that may be incorporated into the curb, and integral curb with self-contained roof flashing flanges.

B. Curb: Manufacturer's standard formed or extruded aluminum, including cants or flashing flange to receive roof flashing and counterflashing.

C. Curb: Self-flashing, self-supporting double-wall, formed or extruded (or combination) aluminum curb, minimum 0.040-inch (1.0- mm) wall thickness, enclosing minimum 1-inch (25-mm) glass-fiber board (or equivalent) insulation and with minimum 3-inch (75-mm) roof flanges, with welded or sealed mechanical joints at corners.

1. Height: 8 inches.
2. Taper: Where roof deck slopes more than 1/4 inch per foot (1:50), provide tapered curb heights to match slope and result in level dome installation.

D. Thermal Break: Fabricate skylight units with thermal barrier separating interior metal framing from materials exposed to outside temperature.

E. Operable Skylight Vent: Equip unit with hinges, operating hardware, and weather sealing gaskets.

1. Provide manually operated opening device with extension crank.

F. Shape and Size: 600mm x 1200mm

G. Glazing: Thermoformed PVC.

1. Sheet Thicknesses: Provide glazing plastic sheet thickness required for 40 lbf/sq. ft. (1.9 kPa) positive (external) loading and 20 lbf/sq. ft. (0.95 kPa) negative or uplift (internal) loading as recommended by the skylight manufacturer for unit size and shape.
2. Glazing Gaskets: Manufacturer's standard glazing system of EPDM or neoprene, closed-cell sponge neoprene, or EPDM, or of partially vulcanized butyl tape or liquid-applied elastomeric sealant.

3.00 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive skylight units. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
   a. Prepare sash. Clean sash surface and prime if necessary. Rabbet should be free of burrs.
   b. Prepare PVC sheets. After measuring sash opening carefully, determine recommended edge engagement and expansion allowance. Cut sheet to exact size required. Edges should be clean and free of notches.
   c. Glaze PVC sheets. Sealants and tapes with sufficient extensibility to accommodate thermal expansion and contraction without loss of adhesion to either frame or sheet must be use.

B. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide another permanent separation.

C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

D. Cap Flashing: Where cap flashing is required as component of the skylight, install to provide an adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

E. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.02 CLEANING AND PROTECTION

A. Remove glazing compound and masking paper by applying naphtha (VM&P) or kerosene with a soft cloth, followed immediately with a thorough soap and water cleaning. DO NOT USE GASOLINE. Adherence to regular and proper cleaning procedures is recommended to preserve appearance.

B. Wash PVC sheets with a mild soap or detergent (e.g. Joy Dishwashing Liquid) and lukewarm water, using a clean sponge or a soft cloth. Rinse well with clean water. Dry

thoroughly with a chamois or moist cellulose sponge to prevent water spots. Do not scrub or use brushes on the sheets; their coating is UV-resistant, not mar-resistant.

C. Remove fresh paint splashes, grease and smeared glazing compounds before drying by rubbing lightly with a good grade of VM&P naphtha or isopropyl alcohol. Afterward, a warm final wash should be made, using a mild soap or detergent solution and ending with a thorough rinsing with clean water.

D. Minimize scratches and minor abrasions by using a mild automobile polish, (e.g. Johnson Paste Wax). Test selected product on a sample of a PVC sheet and follow manufacturer's instructions.

END OF SECTION 07810

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07811
SPRAYED FIRE RESISTIVE MATERIALS

1.00 GENERAL

1.01 SCOPE

A. This Section includes the following:

1. Sprayed fire-resistive materials (SFRM).

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for surface conditions required for structural steel receiving SFRM.
2. Division 7 Section "Through-Penetration Firestop Systems" for fire-resistance-rated firestopping systems.
3. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.

1.02 DEFINITIONS

A. SFRM: Sprayed fire-resistive material.

B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed and have not been defined as exposed.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain SFRM through one source from a single manufacturer.

C. SFRM Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.

1. SFRMs are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Testing is performed on specimens of SFRMs that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.

D. Compatibility and Adhesion Testing: The Contractor is to engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.

E. Fire-Test-Response Characteristics: Provide SFRM with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing SFRM with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for SFRM serving as directapplied protection tested per ASTM E 119.

2. Surface-Burning Characteristics: ASTM E 84.

F. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

G. Mockups: Apply mockups to and set quality standards for materials and execution.

1. Extent of Mockups: Approximately 100 sq. ft. of surface for each product indicated.

2. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to SFRM including, but not limited to, the following:

1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.

2. Review and finalize construction schedule and verify sequencing and coordination requirements.

3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM during and after installation.

4. Review surface conditions and preparations.

5. Review field quality-control testing procedures.

1.04 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.

b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

B. Warranty Period: Two years from date of final acceptance of the project.

2.00 PRODUCTS

2.01 SFRM

A. Products: Subject to compliance with requirements, provide one of the following:

1. Cementitious SFRM as required to meet the UL assemblies shown on the drawings.

a. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.

b. Grace, W. R. & Co. - Conn., Construction Products Div.; Monokote Type MK-6.

c. Isolatek International Corp.; Cafco 300.

d. Southwest Vermiculite Co., Inc.; Type 5.

B. Material Composition: Manufacturer's standard product, as follows:

1. Cementitious SFRM: Factory-mixed, dry formulation of gypsum or portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

2. Thickness: Minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605: a. Where the referenced fire-resistance design lists a thickness of 1 inch or more, the minimum allowable individual thickness of SFRM is the design thickness minus 0.25 inch.

b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of SFRM is the greater of 0.375 inch or 75 percent of the design thickness.

c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft..

1. Bond Strength: 150 lbf/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.
2. Compressive Strength: 5.21 lbf/sq. in. minimum per ASTM E 761. Minimum thickness of SFRM tested shall be 0.75 inch and minimum dry density shall be as specified but not less than 15 lb/cu. ft..
3. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
4. Deflection: No cracking, spalling, or delamination per ASTM E 759.
5. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
6. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of SFRM is 0.75 inch, maximum dry density is 15 lb/cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
7. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 0.

2.02 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
   1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of SFRM.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work.

B. Verify that concrete work on steel deck has been completed.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.

D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

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

F. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total paint system for various substrates. If requested, furnish information on characteristics of finish materials to ensure use of compatible primers.

3.02 PREPARATION

A. General: Remove hardware, 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 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. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

C. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

D. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

E. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

F. 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 color of finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire resistance ratings indicated.

B. Apply SFRM that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Install metal lath and reinforcing fabric, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath and fabric to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by SFRM manufacturer. Attach accessories where indicated or required for secure attachment of lath and fabric to substrate.

D. Coat substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by SFRM manufacturer for material and application indicated.

E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.

F. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.

3.04 APPLICATION, SFRM

A. Apply SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "SFRM" Article.

B. Cure SFRM according to product manufacturer's written recommendations.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Contractor is to engage a qualified testing agency to perform tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.

C. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

D. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

3.06 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect SFRM according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Final Acceptance.

C. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.

D. Repair or replace work that has not successfully protected steel.

END OF SECTION 07811

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07841
THROUGH PENETRATION FIRESTOP SYSTEMS

1.00 GENERAL

1.01 SECTION INCLUDES

A. Through-penetration firestop systems designed and installed to prevent spread of fire, smoke, and hot gases through openings made in fire resistance rated floors and walls for through penetrations of electrical, mechanical, plumbing, environmental, and communication systems, and at other voids and openings in the building construction.

1. At openings where ductwork, conduits, piping, or other work penetrates fire resistance rated floor, roof, and wall assemblies. Unless otherwise specified or shown, assume that all floor slabs are fire resistance rated, and all walls having, or which are part of an enclosure having fire rated doors, are fire resistance rated.
2. Blank or empty openings in fire resistance rated floor, roof, and wall assemblies.
3. Perimeter openings at each floor level in shafts or stairwells.
4. Other locations where shown or specified in other Sections.

B. Single membrane penetration firestop systems where required by applicable code at openings through one side of a fire resistance rated wall, roof/ceiling, or floor/ceiling assembly, made to accommodate electrical, mechanical, plumbing, environmental, and communication systems.

C. Fire resistive joint systems:

1. At joint between fire resistance rated partitions and underside of deck.
2. At joint between such partitions and structural steel or concrete framing.
3. At joint between structural steel or concrete framing and underside of deck.
4. At openings where floor slabs meet fire resistance rated exterior walls.
5. At expansion joints in fire resistance rated floor slabs and walls. Coordinate with Section 07 95 13.

D. Firesafing insulation where shown, and at openings where floor slabs meet non-rated exterior walls. Include inside of hollow curtain walls. Coordinate with Section 07 21 00.

1.02 PERFORMANCE CRITERIA

A. Systems shall be capable of preventing passage of smoke, flame, and hot gases sufficient to ignite cotton waste, when tested in accordance with ASTM E119.

B. Where systems are exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to such conditions.

1. At piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. At floor penetrations with annular spaces exceeding 4 inches wide and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads, by installing floor plates or by other means.
3. At penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

C. Materials shall be compatible with one another and with other items with which they may come in contact, and shall not cause corrosion of penetrating items.

D. Materials shall be free of solvents, asbestos or PCB's, and non-toxic to human beings at all stages of application and during fire conditions.

E. Materials shall remain sufficiently flexible after installation to accommodate expected vibration and movement between penetrating items and rated building components or assemblies; or between adjacent building components or assemblies at joint systems. Materials shall not shrink noticeably after installation.

F. Caulk, foam, mortar, and putty materials shall be autobonding to permit changes to penetrating items.

G. Through penetration firestop systems provided shall be listed in the UL Fire Resistance Directory, or other approved testing agency, and shall be appropriate for intended use.

1.03 SUBMITTALS: Follow Section 01330.

A. Shop Drawings: Show construction details for each condition with proposed material, reinforcement, anchorage, fastenings, protective covers or devices where applicable, and method of installation. Show test numbers and fire resistance ratings.

B. Schedule of Through-Penetration Firestop types, conditions and locations.

C. Product Data: Describe each product showing characteristics, performance and limitations. Where available, include:

1. L rating indicating tested air leakage for products used in through-penetration systems.
2. Aging data for intumescent products.

1.04 QUALIFICATIONS

A. Installer: Company specializing in the work of this Section with minimum 5 years experience, approved by manufacturer.

1.05 REGULATORY REQUIREMENTS

A. Except where more stringent requirements are specified, conform to local code or to International Building Code, whichever is more stringent, for performance and testing requirements.

B. Where required by code, firestopping shall conform to Flame (F) and Temperature (T) ratings as tested by nationally accepted test agencies in accordance with ASTM E814 or UL 1479.

C. Flame rating shall be a minimum of one hour but not less than the fire resistance rating of assembly being penetrated.

D. Temperature rating shall be based on temperature rise of penetrating item.

E. Material shall have passed fire test with minimum positive pressure differential of 0.01 inch of water column.

1.06 MOCK-UPS: Follow Section 01390.

A. Provide mock-ups of each type and condition of firestopping.

B. In coordination with Section 07210, provide a mock-up showing typical treatment at interface between floor slab and curtain wall.

C. Approved mock-ups may remain part of the work.

1.07 DELIVERY, STORAGE AND HANDLING: Follow Section 01600.

A. Packages shall show manufacturer's name, product identification, lot numbers, test or rating labels, shelf life if applicable, curing time and mixing instructions.

2.00 PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with performance requirements in this section.

2.02 FIRESTOPPING MATERIALS

A. FS-1; Firestop Mortar: Prepackaged dry mix of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.

B. FS-2; Non-Intumescent Firestop Sealants and Caulks: One part elastomeric sealant.

C. FS-3; Firestop Foam: Two part liquid product. After dispensing, foam shall be fully expanded in 5 minutes, and fully cured in 24 hours. Approximate density 16 pcf, with uniform cell structure.

D. FS-4; High Temperature Firestop Caulk: One part product.

E. FS-5; Intumescent Sealants and Caulks: One part product.

F. FS-6; Intumescent Putty or Mastic: One component moldable compound.

G. FS-7; Intumescent Pipe Wrap.

H. FS-8; Intumescent Sheet: Self-supporting board or panel.

I. FS-9; Intumescent Sleeves, Collars, and Plastic Pipe Devices: Shop or field fabricated; heavy gauge galvanized steel with intumescent liner.

J. FS-10; Intumescent Seal Bags: Not permitted, except where specifically shown.

2.03 FIRESAFING, ACCESSORIES, AND OTHER MATERIALS

A. Firesafing and Backing Material:

1. Unfaced Mineral Fiber: 4 pcf, suitable for friction fit in voids. Melt point 1200 degrees F minimum; ASTM C24. Ceramic or cementitious-blend fiber is also approved. Do not use glass fiber.
2. Foil Faced Mineral Fiber: Same as unfaced mineral fiber, but with aluminum foil facing on one side.
3. Other Forming and Backing Materials: As recommended by firestopping manufacturer(s). Use fire resistive materials where possible.

B. Primers, Sealers, and Solvent Cleaners: As recommended by firestopping manufacturer(s) for specific substrate surfaces.

C. Provide galvanized steel fasteners, expansion bolts with washers, clamps, collars, and clips as required to hold firestopping, firesafing, and backing materials firmly in place.

D. Provide protective covers or devices for soft firestopping and firesafing products which will be exposed in finished construction.

3.00 EXECUTION

3.01 INSPECTION

A. Verify that penetrating items are in place, tested and approved, and ready to receive through-penetration firestopping.

3.02 PREPARATION

A. Clear surfaces of openings, substrates, and penetrating items of foreign materials that could interfere with adhesion of through penetration firestop systems.

3.03 INSTALLATION

A. Install backing materials, forms, clips, and other items as required to hold firestopping and firesafing in place.

B. Firestopping or firesafing shall completely fill void spaces, regardless of geometric configuration.

C. Use mineral fiber to fill gaps at fire resistive joint systems, as a backing material for firestopping sealants and caulks, and elsewhere as permitted by code. Pack mineral fiber snugly into voids. Install firestopping sealant to completely cover backing material. Do not use unfaced mineral fiber by itself for firestopping purposes.

D. Use foam, sealant, mortar, or ceramic fiber putty to firestop duct, conduit, and metal pipe penetrations at fire resistance rated construction.

1. Firestop ceiling penetrations from exposed side only. Firestop wall penetrations on both sides.
2. Fill voids behind firestopping with mineral fiber backing material.
3. Firestop space between penetrating element and sleeve or collar. Also, seal space between sleeve, collar, or penetrating element and adjacent construction.
4. Where sealant is used, install as specified in Section 07 92 00.
5. [Use firestopping mortar or high temperature caulk at penetrations by high temperature items such as steam piping, flues, and chimneys.]

E. Intumescent Firestopping:

1. Use intumescent materials or devices where non-metal and insulated piping penetrates fire resistance rated construction.
2. Where non-metal pipe penetrations are too large to be firestopped by other means, [or where polypropylene pipe penetrates fire resistance rated construction,] use intumescent devices or intumescent strip in telescoping configuration.
   a. If annular space is larger than UL approved system consult firestop manufacturer for engineering judgment.

b. Seal to penetrating element and to adjacent construction with intumescent or firestop caulk.

3. Intumescent materials are approved for use in lieu of or in addition to other firestopping products in other locations when appropriate.

F. Make surfaces of firestopping and firesafing that are exposed to view reasonably smooth and flush, without open cell of rough texture.

G. After curing, remove backing materials which are not fire resistive.

H. Install protective covers or devices where applicable.

END OF SECTION 07841

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07842
FIRE-RESISTIVE JOINT SYSTEMS

1.00 GENERAL

1.01 SCOPE

A. This Section includes fire-resistive joint systems for the following:
   1. Floor-to-floor joints.
   2. Floor-to-wall joints.
   3. Head-of-wall joints.
   4. Wall-to-wall joints.
   5. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.
   6. Fire barrier for fire-resistant floor wall expansion joints.

B. Related Sections include the following:
   1. Division 5 Section “Architectural Joint Systems” for non-fire-resistive joints.
   2. Division 7 Section "Building Insulation" for floor-to-wall joints indicated as perimeter fire-containment systems between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated exterior curtain walls.
   3. Division 7 Section "Through-Penetration Firestop Systems" for systems installed in openings in walls and floors with and without penetrating items.
   4. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.02 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint 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 in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by UL 2079.

   1. Load-bearing capabilities as determined by evaluation during the time of test.

C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.

1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.03 SUBMITTALS

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

B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Field quality-control test reports.

F. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.

G. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fireresistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance 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 fire-resistive joint systems acceptable to authorities having jurisdiction.

2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

   a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.

   b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.07 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until General Contractor’s independent inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

2.00 PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Fire-Resistive Joint System Schedule at the end of Part 3.

2.02 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

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

3.02 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint 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.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system 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 fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.03 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.

2. Apply fill materials so they contact and adhere to substrates formed by joints.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 FIELD QUALITY CONTROL

A. Inspecting Agency: General Contractor shall engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.

B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.

1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

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

E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.05 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint 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 fire-resistive joint systems are without damage or deterioration at time of Final Acceptance. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.06 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.

B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly and an Exterior Curtain-Wall Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG:

1. Safing Insulation: Fill void at floor and roof edges. Cut safing insulation wider than opening to provide compression fit recommended by manufacturer.

2. Safing Insulation Supports: Provide galvanized steel impaling clips that bear on top surface of floor structure, spaced at maximum 300mm (12 inches) on center.

3. Smoke Seal: Coat top surface of safing insulation. Coating shall overlap floor and wall a minimum of 12 mm (0.5 inch). Provide minimum wet thickness 6 mm (0.125 inch). Comply with manufacturer requirements for temperature and condition of substrates.

C. Fire Barrier Expansion Joint Filler

END OF SECTION 07842

Read and accepted as part of the Contract:

Bidder / Contractor

SECTION 07900
JOINT SEALANTS

1.00 GENERAL

1.01 SCOPE

Furnish all materials, labor, equipment, plant, tools, required to complete:

- application of caulks and sealants for panel joints, expansion joints construction joints, glazing of doors and windows, acoustic control and others.

1.02 SUBMITTALS

A. Samples
Submit to the Owner ~~Architect~~ samples of materials to be used and secure approval.

B. Manufacturer's Instructions
Submit to the Owner ~~Architect~~ the manufacturer's complete printed instructions for the application of the material.

C. Product Data: Indicate product chemical characteristics, performance criteria and limitations.

D. Informational Submittals; Special Warranty: Warrant for three years from Date of Substantial Completion, that sealants and accessories which fail to achieve airtight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure, will be replaced. Warranty shall cover labor and materials, and shall not be pro-rated.

1.04 PRODUCT HANDLING

A. Materials shall be delivered to the site in the original sealed containers or packages bearing manufacturer's name and brand specification.

B. Materials stored on jobsite shall be protected from weather moisture and extreme temperature with extra ordinary care.

1.05 PROJECT CONDITIONS

Temperature and relative humidity conditions for a period before, during and after application shall be as recommended by the manufacturer. If rain occurs, allow surfaces to dry before proceeding with the applications.

1.06 DEFINITIONS

A. "Joint Sealers", "caulk", "caulking", or "sealant" are synonymous, and mean "Joint Sealers" as herein described.

B. "Paving" - Joints in floor slabs, sidewalks, steps, ramps, curbs.

1.07 QUALITY ASSURANCE

Prior to application of any sealant, and notwithstanding the specifying of various sealant types and locations of usage, investigate and verify compatibility of the sealant with joint surfaces, joint fillers and other sealants. Provide only materials which are known to be fully compatible with actual installation conditions.

1.08 MOCK-UPS: Follow Section 01450.

Install sealers in unit masonry mockup specified in Section 04200, and in other specified mock-ups as requested.

2.00 PRODUCTS

2.01 MATERIALS

Refer to the Summary of Materials and Finishes.

2.02 SEALANTS: Products listed are approved. Substitutions are permitted. Color(s) will be selected from manufacturer's standard and premium line.

A. JS-1: Urethane Architectural Sealant; 2 part, non-sag, movement capability plus or minus 50 percent. ASTM C920, Type M, Grade NS, Class 50.

1. Pecora; Dynatrol II.
2. Tremco; Dymeric 240FC.

B. JS-2: Urethane Self Leveling Paving Sealant; Traffic Bearing, 2 part, movement capability plus/minus 25 percent. ASTM C920, Type M, Grade P, Class 25. USDA approved.

1. Sonneborn; SL 2.
2. Tremco; THC-900.
3. Pecora; Urexpan NR-200.

C. JS-3: Urethane Non-Sag Paving Sealant, Slope Grade; Traffic Bearing, movement capability plus or minus 25 percent. ASTM C920, Type M, Grade NS, Class 25.

1. Pecora; Dynatred.
2. Sonneborn; Sonolastic SL-2 Slope Grade.
3. Tremco;[Vulkem 45 or 116].

D. JS-4: Silicone Architectural Sealant; one part, movement capability plus 100 percent minus 50 percent. ASTM C920, Type S, Grade NS, Class 100/50.

1. Dow Corning; 790.
2. Tremco; Spectrem 1.
3. GE; SilPruf LM SCS2700.

E. JS-5: Paintable silicone Sealant; one part, movement capability plus or minus 25 percent; ASTM C920, Type S, Grade NS, Class 25.

1. GE; SCS7000.
2. Pecora AC-20 + Silicone.

F. JS-6: Silicone Sanitary Sealant; one part, movement capability plus or minus 25 percent, fungus resistant; ASTM C920, Type S, Grade NS, Class 25. FDA approved or USDA approved]

1. GE; Sanitary 1700.
2. Dow Corning; 786 Mildew Resistant.
3. Tremco; Tremsil 200.

G. JS-7: Acrylic Latex Sealant; one part, fungus resistant, paintable; ASTM C834, Type P, Grade NF. USDA approved.

1. Pecora; AC-20 + Silicone.
2. Sonneborn Sonolac.

H. JS-8: Silicone Sanitary Sealant; one part, no bacterial growth; ASTM C920, Type S, Grade NS, Class 50. USDA approved.

1. Pecora; 898.

I. JS-9: Pre-compressed Expanding Foam Sealant; movement capability of plus or minus 25 percent. Color: Black.

1. Emseal; 25V Expanding Foam Sealant.
2. Illbruck, Inc.; Will-Seal 150.

J. JS-10: Pre-compressed Expanding Foam Sealant; high density polyurethane, impregnated with polymer modified acrylic and faced with factory applied silicone. Movement capability plus or minus 25 percent; Emseal; ColorSeal.

K. JS-11: High Containment Shrink Wrap: Heat shrink tubing, medium duty tubing, NP-700md, medium duty polyolefin tubing. Coordinate locations and lengths with High Containment penetration details.

L. JS-12: High Containment Structural Silicone Sealant: one component high strength, neutral cure silicone sealant GE SilPruf SCS2000.

2.03 ACCESSORIES

A. Joint Primers and Cleaner: Non-corrosive and non-staining.

B. Joint Backing: Pre-formed compressible type, ASTM C 1330, Type C, closed-cell material with a surface skin. Open-cell material is not acceptable. Size joint backing so that when installed, backing will compress approximately 30 percent. Backing shall not out-gas when punctured or ruptured.

C. Bond Breaker: Pressure sensitive tape.

D. Joint Insulation: Glass fiber for friction fit in voids.

3.00 EXECUTION

3.01 SURFACE PREPARATION

A. Surface to be bonded should be free of oil, grease and dust. Scrub off soap residue with water, then clean with solvent. Surface must be completely clean and dry. Any trace of old sealant should be removed.
B. Concrete should be fully cured.
C. Wood surfaces should be lightly sanded and free from dust.
D. Metal must be free of corrosion, mill scale, oil tar or peeling paint.
E. Iron and steel surfaces should be painted to protect against rusting.

3.02 APPLICATION

A. Apply sealant evenly in a continuous, steady flow pushing sealant ahead of nozzle to achieve a filled, void-free joint.
B. Do not apply too thick. A thin bead of sealant will accommodate more joint movement than a thick bead. Ideally, sealant depth should be no more than 12 mm and no less then 6 mm. Use backing material to reduce depth.
C. If necessary, widen joints by cutting sides or removing rigid filler. Wider joints accommodate more movement than narrow joints.
D. Use masking tape for neat appearance. Remove soon after smoothing before sealant cures.
E. Smooth with spatula for heat appearance, and to force sealant into joints and ensure proper contact onto sides of joint.
F. Clean up spills before sealant cures with suitable solvent-soaked cloth.
G. Remove cured sealant by scraping or wire brushing.
H. Read product instructions carefully and follow them to the letter.
I. Install joint backing so that width to depth ratios allow optimum sealant movement capability.
J. Install bond breaker where joint backing is not used, or where backing material may bleed through into face sealant.
K. Install sealant without air pockets, embedded matter, ridges and sags.
L. Tool joints concave or as detailed.
M. At traffic joints, slightly recess sealant to avoid direct contact with wheeled traffic.
N. At paintable silicone sealant joints do not paint until a firm skin has formed on the sealant. If painting does not occur within 48 hours, re-coat joint with a fresh film of sealant.
O. Mechanical and Electrical Penetrations (Not Fire Rated):
    1. Seal ceiling penetrations from exposed side only. Seal wall penetrations on both sides.
    2. Seal space between penetrating element and sleeve or collar. Also, seal space between sleeve, collar, or penetrating element and surrounding construction.
    3. Fill voids behind joint backer with joint insulation.
P. Repair and clean, or replace damaged adjacent finishes.

3.03 SCHEDULE

A. JS-4: Other Exterior joints except paving.

B. JS-2: Exterior and interior paving joints, level.

C. JS-2: Floor joints, control and expansion joints.

D. JS-3: Exterior and interior paving joints, sloping.

E. JS-1 or JS-4: Interior joints, unpainted, located in or adjacent to unpainted materials or surfaces.

F. JS-1 or JS-4: Interior control joints in unpainted masonry and gypsum board.

G. JS-5: Interior control joints in painted masonry and gypsum board.

H. JS-5: Interior joints, (other than control joints), painted, located in or adjacent to painted materials or surfaces.

I. JS-6 or JS 8: Interior joints - Sanitary; joints in ceramic tile, around toilet room vanities, around plumbing fixtures and kitchen equipment, ceramic tile to hard/suspended grid ceilings.

J. JS-7: Interior joints - Special Areas, office areas, and laboratories; All crevices, spaces, gaps and openings, including but not limited to the following, to ensure sealing of any space that will promote vermin or bacterial growth, to provide for pressurization of spaces, and to maintain acoustic separation.

1. Joints around door/window frames.
2. Wall/wall joints (dissimilar materials).
3. Wall joints.
4. Wall/deck joints where walls extend above ceilings to the structure above.
5. Wall and ceiling penetrations, including penetrations above ceilings where walls extend to the underside of structure.
6. Wall corner guards.
7. Wall guard support brackets.
8. Ceiling/wall joints (hard ceilings).
9. Ceiling/diffuser and grill joints (hard ceilings).
10. Ceiling/light fixture joints (hard ceilings).
11. Electrical or plumbing fixtures or devices.
12. Electrical switch and receptacle cover plates.
13. Electrical and control device backboxes at all conduit and wire openings.
14. Electrical panels.
15. Door kick/armor plates.
16. Door glazing stops.
17. Water fountains.
18. Exposed water pipe support brackets.
19. Control joints.
20. gaps where wood base is against wall.
21. gaps where millwork is against wall.
22. Gaps between doors frames and floor.
23. Lab casework against wall.
24. gaps where bench top / backsplash is against other sections of casework (i.e. fumehood).
25. NOTE:
    Install all fixtures and cover plates in full bead of sealant unless device is gasketed. Do not seal fixtures and cover plates after installation.

a. Tool excess sealant to a neat and continuous finish, free of bubbles, pinholes, cracks.
b. Apply a finish bead of sealant around devices where required to provide a smooth sealed surface finish between the device and the adjacent finish surface.
c. Schedule ALL room areas by number, not by general room types. Do not list in this format: BSL-2, Vivarium ABSL-2 and ABSL-3,and BLS3 areas

26. Room Schedule:
a. Room No. [ ] – [Name]

A. JS-8: Interior joints - All crevices, spaces, gaps and openings (other than control joints), unpainted, located in or adjacent to unpainted materials or surfaces in special areas noted below:

1. Fixtures and receptacles of similar material.
2. Laboratory Casework.
3. Unpainted FRP door kick and armor panels.
4. Factory finished or factory painted surfaces.
5. Wall and ceiling penetrations, including penetrations above ceilings where walls extend to the underside of structure.
6. NOTE:
a. Install all fixtures and cover plates in full bead of sealant unless device is gasketed. Do not seal fixtures and cover plates after installation.
b. Tool excess sealant to a neat and continuous finish, free of bubbles, pinholes, cracks.
c. Apply a finish bead of sealant around devices where required to provide a smooth sealed surface finish between the device and the adjacent finish surface.
d. Room Schedule:
1) Room No. [ ] – [Name]

C. JS-9: Primary or secondary seal in concrete or masonry joints.

D. JS-10: Primary seal in metal substrates, masonry, or concrete joints.

E. JS-11 and JS-12: In all openings of walls and ceilings of BSL3, ABSL-2 and ABSL-3 laboratories and animal rooms to provide airtight seal, including electrical conduits.

1. Room No. [ ] – [Name]

END OF SECTION 07900

Read and accepted as part of the Contract:

Bidder/Contractor

SECTION 07951
EXPANSION JOINT COVER ASSEMBLIES

1.00 GENERAL

1.01 SECTION INCLUDES

A. Control and expansion joint devices for floor, wall and ceiling interior surfaces.

1.02 SUBMITTALS:

A. Shop Drawings: Indicate joint device profiles, dimensions, locations in building, affected adjacent construction, anchorage devices and locations of splices.

B. Product Data: Describe each product.

C. Samples: 300 mm (12 inches) long of joint cover assembly.

2.00 PRODUCTS

2.01 DESIGN STANDARD MANUFACTURER: Construction Specialties, Inc. (C/S). Substitutions subject to review and approval by Owner and Construction Management are:

A. Architectural Art Manufacturing, Inc.

B. Balco Metalines.

C. MM Systems Corporation.

D. Watson Bowman Acme.

E. Other substitutions are permitted.

2.02 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B221; 6063 alloy, T5 temper.

B. Elastomeric compression seal covers; exterior wall expansion joints

C. Polyurethane expansion strips; interior wall and ceiling expansion joints

D. Fire barriers; expansion jointsd in fire rated walls and floors

E. Resilient Filler: Dual durometer PVC.

F. Threaded Fasteners: Stainless steel.

2.03 FABRICATION

A. Paint components in contact with cementitious materials to prevent electrolytic reaction.

B. Galvanize concealed ferrous metal anchors and fastening devices.

C. Shop assemble components. Package with anchors and fittings.

D. Provide joint components in single lengths wherever practical. Minimize site splicing.

2.04 FACTORY FINISHING

A. Exposed Extruded Sections on Floors: Mill finish.

B. Exposed Extruded Sections on Walls and Ceilings:

1. Anodic Coating: AA-M10-C22-A31, clear.
2. Fluoropolymer coating. Standard 2 coat system.
3. Prime Coat: For field painting.

C. Resilient Filler: Black.

3.00 EXECUTION

3.01 INSTALLATION

A. Align work plumb, level and true, flush with adjacent surfaces.

B. Rigidly anchor to substrate.

3.02 SCHEDULE OF DEVICES

A. Floor Joints at Ceramic Tile Floor Finish: C/S Model Number [ ].

B. Floor Joints at Resilient Carpet Glued DownFloor Finish [Include Drip Trough]: C/S Model Number [ ].

C. Floor Joints at Concrete Topping Floor Finish: C/S Model Number [ ].

D. Wall Joints at Masonry Walls; Surface Mounted: C/S Model Number [ ].

E. Wall Joints at Gypsum Wallboard on Studding; Recessed]Mounted: C/S Model Number [ ].

F. Wall Joints at Ceramic Tile on Cementitious Bed; Surface Mounted: C/S Model Number [ ].

G. Ceiling Joints at Suspended Acoustic Ceiling Finish: C/S Model Number [ ].

H. Ceiling Joints at Gypsum Board Ceiling Finish: C/S Model Number [ ].

END OF SECTION 07951

Read and accepted as part of the Contract:

Bidder / Contractor