SECTION 07115 - BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bituminous dampproofing.

1.2 SUBMITTALS

A. See Section 01330 - Submittals, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

1.3 QUALITY ASSURANCE

1.4 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Henry Company.

B. Karnak Corporation: www.karnakcorp.com.

C. W.R. Meadows, Inc: www.wrmeadows.com.

2.2 FIBERED TROWEL MASTIC

A. Blend of selected asphalts, fibers, stabilizers, fillers and solvents.

B. Project Standard:
1. Henry 793.
2. Karnak 86AF Fibered Trowel Mastic.
3. WR Meadows Sealmastic Trowel Mastic.

C. Characteristics:
1. Solvent-based.
2. ASTM D4586 Type 1 (Non-Asbestos).
3. Perm Rating: 0.25 metric perms @ 40 mils dry film or better.

2.3 FIBERED TROWEL-GRADE EMULSION MASTIC - CONTRACTOR OPTION

A. Blend of refined asphalt, clay emulsifiers and selected non-asbestos fibers.

B. Project Standard:
1. Henry HE 785.
2. Karnak 920AF Fibered Emulsion Mastic.
3. W.R. Meadows Sealmastic Type 3 Trowel-On Grade.

C. Characteristics:
1. Select this option when applying dampproofing to concrete that has cured less than 28 days or contains greater than 5 percent moisture content.
2. Water-based emulsion.
3. ASTM D1227 Type II, Class 1.
4. Permeability: 0.5 mg/sq. cm or better.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items that penetrate surfaces to receive dampproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.3 APPLICATION

A. Prime surfaces in accordance with manufacturer's instructions.

B. Apply in one trowel coat, continuous and uniform, at minimum rate of 4 gal/100 sq ft.; apply free of pinholes or holidays.

C. Seal items projecting through dampproofing surface with mastic. Seal watertight.

D. Allow film to cure at least 48 hours prior to backfilling; backfilling must take place within 7 days of application.

E. Notify Architect at completion of application and offer the opportunity for inspection prior to backfilling.

END OF SECTION

SECTION 07130 - SHEET WATERPROOFING

PART 1 GENERAL

1.03 SECTION INCLUDES

A. Sheet membrane waterproofing.

B. Drainage panels.

1.02 REFERENCE STANDARDS

A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

B. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.

C. ASTM E 96/E 96M - Standard Test Methods For Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. See Section 01330 - Submittals, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.06 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.03 MANUFACTURERS

A. Carlisle Coatings & Waterproofing Inc.; Product CCW MiraDRI 860/861.

B. Grace Construction Products; Product Bituthene 3000: www.na.graceconstruction.com.

C. Henry Company; Blueskin WP 200.

2.02 APPLICATIONS

A. Waterproof for building surfaces:
   1. Exterior face of foundation/building walls where finished grade is above finished floor elevation; waterproofing installed from top of footing to finished grade elevation.
   2. Concealed vertical face of separation of stepped floor elevations.

2.03 MEMBRANE MATERIALS

A. Composite Laminate Membrane: Comprised of 56 mils thickness of rubberized asphalt and a 4 mils thickness of polyethylene film with release liner on adhesive-side; 60 mils total thickness.
   1. Tensile Strength: 325 psi, measured in accordance with ASTM D 412.
   2. Water Absorption: 231 percent increase in weight, maximum, measured in accordance with ASTM D 570, 24 hour immersion.
   3. Water Vapor Permeability: 0.05 perm inch, measured in accordance with ASTM E 96/E 96M.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane Sealant: As recommended by membrane manufacturer.

D. Termination Bars: Aluminum; compatible with membrane and adhesives.

2.04 ACCESSORIES

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.

PART 3 EXECUTION

3.03 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.

E. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions.

B. Roll out membrane. Minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

D. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

G. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.

H. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.04 INSTALLATION - DRAINAGE PANEL

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION 07130

SECTION 07140

FLUID APPLIED WATERPROOFING

PART I GENERAL

1.01 SUMMARY

A. Waterproofing system for split slab construction as detailed on the drawing.

1.02 RELATED SECTIONS

A. DIVISION 3 - Concrete Section 03300 - Substrate
The coordination of this section is necessary to facilitate the successful installation of the waterproofing membrane.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM).

1.04 SYSTEM DESCRIPTION

A. Furnish and install a completed horizontal waterproofing assembly including surface conditioner, Monolithic Membrane and related flashings, protection course, insulation, and drainage course.

1.05 SUBMITTALS

A. Shop drawings showing locations and extent of waterproofing and details of typical conditions.

B. Certification from an approved independent testing laboratory experienced in testing this type material, that the material meets the CGSB-37.50-M89 standard for rubberized asphalt membranes, including applicable ASTM procedures.

C. Certification showing full time quality control of production facilities responsible for the manufacture of the rubberized asphalt and that each batch of material is tested to insure conformance with the manufacturer's published physical properties.

D. Certification showing that all waterproofing components are being supplied and warranted by a single-source manufacturer.

E. Evidence that extruded polystyrene insulation if used is free from CFC's.

F. The plant manufacturing this type material shall have ISO 9001-2000 approval as evidenced by a copy of the official certificate.

1.06 QUALITY ASSURANCE

A. The Waterproofing Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:

1. Certification or license by the membrane manufacturer as a locally based, authorized applicator of the product the installer intends to use, for a minimum of five (5) years.

2. List of at least three (3) projects, satisfactorily completed within the past five (5) years, of similar scope and complexity to this project. Previous experience submittal shall correspond to specific membrane system proposed for use by applicator.

B. Include single-source for all components from the manufacturer.

C. The rubberized asphalt membrane product shall contain an inert clay filler and crumb rubber to enable the product to be resistant to acids (fertilizers, building washes and acid rain) and maintain membrane thickness during application respectively.

D. Membrane Manufacturer shall have available an in-house technical staff to assist the contractor, when necessary, in application of the products and final inspection of the assembly.

E. Membrane Manufacturer Qualification: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

1. Membrane Manufacturer shall show evidence that the specified rubberized asphalt has been manufactured by the same source for thirty five (35) years and successfully installed on a yearly basis for a minimum of thirty five (35) years on projects of similar scope and complexity.

2. Membrane Manufacturer shall not issue warranties for terms longer than they have been manufacturing their hot fluid rubberized asphalt membrane.

F. Pre-Construction Conferences. The manufacturer will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the waterproofing assembly.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened containers of packaging clearly labeled with manufacturer's name, brand name, instruction for use and all identifying numbers.

B. Materials shall be stored in a neat, safe manner, not to exceed the allowable structural capacity of the storage area.

C. Store materials in a clean, dry area protected from water and direct sunlight.

D. Store all adhesives at temperatures between 60°F (15.5°C) and 80°F (26.6°C). If exposed to lower temperatures, restore materials to 60°F (15.5°C) minimum temperature before using.

1.08 PROJECT CONDITIONS

A. Application of the membrane shall not commence nor proceed during inclement weather. All surfaces to receive the membrane shall be free of water, dew, frost, snow and ice.

B. Application of membrane shall not commence nor proceed when the ambient temperature is below 0°F (-17.7°C).

C. Preparation and application of membrane shall be conducted in well ventilated areas.

D. Over its service life, do not expose membrane or accessories to a constant temperature in excess of 180°F (82°C) (i.e., hot pipes and vents or direct steam venting, etc.).

E. Adhesives contain petroleum distillates and are extremely flam-mable. Do not breathe vapors or use near an open fire. Do not use in confined areas without adequate ventilation. Consult container or packaging labels and Material Safety Data Sheets (MSDS) for specific safety information.

F. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, etc.) to come in contact with the waterproofing membrane. Any exposure to foreign materials or chemical discharges shall be presented to membrane manufacturer or evaluation to determine any impact on the waterproof membrane assembly performance.

G. General contractor shall assure that adequate protection is provided after installation of the membrane and accessories to prevent damage from subsequent trade traffic.

1.09 WARRANTY

A. Upon completion of the work, the contractor shall supply the owner with a single-source warranty of U.S. origin direct from the manufacturer.

B. Warranties available from the manufacturer:

1. Material Warranties; excludes labor.

   Duration: 20-year

2. Watertightness Warranties; includes labor and material to maintain watertight condition.

   Duration: 20-year

3. Thermal Warranties; includes 80% retention of the original thermal value.

   Duration: 20-year

4. Total System Warranties; covers components of the waterproofing assembly, including membrane, flashing, and insulation. Includes removal and replacement of the insulation and pedestal installed pavers when installed per Hydrotech's requirements.

   a. Duration of Membrane/Flashing from date of installation: 15-year (watertight condition)

   b. Duration of Insulation from date of Substantial Completion: 15-year (80% of original thermal value)

PART 2 PRODUCTS

2.01 GENERAL

A. All components shall be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.

B. Basis-of-Design Product: American Hydrotech, Inc., www.hydrotechusa.com.

C. Other Acceptable Manufacturers:
1. Carlisle.
2. WR Grace.

2.02 MATERIALS

A. Membrane

1. Membrane shall be a hot, fluid applied, rubberized asphalt membrane meeting the CGSB-37.50-M89 standard and other pertinent physical properties:

a. American Hydrotech, Inc., Monolithic Membrane 6125 FR

PROPERTY	TEST METHOD	TYPICAL RESULT
Flash point	ASTM D-92 CGSB-37.50-M89	502°F* <500°F (261°C) (260°C)
Penetration	ASTM D-5329 CGSB-37.50-M89	98 mm @77°F (25°C) 187 mm @122°F (50°C)
Flow	ASTM D-5329 CGSB-37.50-M89	1.0 mm @ 140°F (60°C)
Toughness	CGSB-37.50-M89	16.0 Joules
Ratio of Toughness to Peak Load	CGSB-37.50-M89	0.069
Water Vapor Permeability	ASTM E-96, PROCEDURE E CGSB-37.50-M89	0.3 ng/Pa(s)M^2
Water Absorption	CGSB-37.50-M89	.11 gram weight gain
Low Temperature Flexibility (-25°C)	CGSB-37.50-M89	No delamination, adhesion loss, or cracking
Low Temperature Crack Bridging Capability	CGSB-37.50-M89	No cracking, adhesion loss, or splitting
Heat Stability	CGSB-37.50-M89	No change in viscosity, penetra-

		tion, flow or low temperature flexibility
Viscosity	CGSB-37.50-M89	11.0 seconds
Water Resistance (5 days/50°C)	CGSB-37.50-M89	No delamination, blistering, emulsification, or deterioration
Softening Point	ASTM D-36	180°F (82°C)
Elongation	ASTM D-5329	1000% minimum
Resiliency	ASTM D-5329	40% minimum
Bond to Concrete	ASTM D-5329	Pass 0°F (-18°C)
Acid Resistance	ASTM D-896 Procedure 7.1 (N-8)	Pass-50% Nitric Acid -50% Sulfuric Acid
Resistance to Hydrostatic Pressure	ASTM D-08.22 Draft 2 (developed: D5385)	100 psi (equals 231 foot of head water)
Resistance to Salt Water	ASTM D-896 similar 20% sodium chloride sodium carbonate calcium chloride	No delamination, blistering, emulsification or deterioration
Resistance to Fertilizer	ASTM D-896 similar undiluted, 15/5/5, nitrogen/phosphorus potash	No delamination, blistering, emulsification or deterioration
Resistance to Animal Waste	3-year exposure	No deterioration
Solids Content		100%-no solvents
Shelf Life		10 years (sealed)
Specific Gravity		1.15 + .02

*102°F more than the application temperature recommended by the manufacturer.

B. Surface Conditioner

1. Asphaltic surface conditioner for concrete surfaces.
- American Hydrotech, Inc., Surface Conditioner

C. Flashing/Reinforcing

1. 60-mil (1.5 mm) thick, uncured neoprene flashing/(heavy duty) reinforcing sheet.
   - American Hydrotech, Inc., Flex Flash UN®

2. Woven fiberglass fabric reinforcing sheet (vertical applications only)
   - American Hydrotech, Inc., Flex Flash FV® (vertical)

3. Two-component, liquid applied resin membrane flashing system.

D. Adhesives/Sealant

1. Contact adhesive to bond elastomeric flashing together.
   - American Hydrotech, Inc., Splicing Cement

2. Pressure sensitive butyl tape to bond elastomeric flashing together.
   - American Hydrotech, Inc., Splice Tape

3. Contact adhesive to bond elastomeric flashing to an approved substrate.
   - American Hydrotech, Inc., Bonding Adhesive

4. Sealant to seal elastomeric flashing seam edge.
   - American Hydrotech, Inc., Lap Sealant

E. Protection Course

1. Fiberglass reinforced rubberized asphalt sheet.
   - American Hydrotech, Inc., Hydroflex® 30

2. Extruded polystyrene, rigid, insulating, drainage board (vertical applications only)
   - American Hydrotech, Inc., Thermaflo™

3. Extruded polystyrene, rigid, insulation board (vertical applications only)
   - STYROFOAM® brand insulation as manufactured by The Dow Chemical Company, marketed by American Hydrotech, Inc., Protection Board, SM, RM

F. Prefabricated Drainage Course

1. Composite drainage system consisting of a three-dimensional, crush-proof, drainage core and a filter fabric meeting the following physical properties.
   - American Hydrotech, Inc., Hydrodrain® 1000 series

PROPERTY	TEST METHOD	VALUES
CORE: Compressive Strength	ASTM D-1621	1000 - 30,000 psf (14.66 kg/cm^2)
Thickness	ASTM D-1777	1000 - .25 in (.64 cm)
Flow, Q @ 3600 psf & hydraulic gradient of 1	ASTM D-4716	300/1000 - 7 gpm/ft width (72.00 lpmin/m width)

FABRIC:		
Flow	ASTM D-4491	1000 - 150 gpm/ft^2 (6105 lpmin/m^2)
U.V. Resistance	ASTM D-4355	Fully Stabilized
Apparent Opening Size (EOS)	CW-02215	1000 – 70 (.212mm)
Grab Tensile	ASTM D-4632	1000 - 90 lbs. (0.4 kN)

1. Extruded polystyrene, rigid, insulating, drainage board (vertical applications only) - American Hydrotech, Inc., Thermaflo™

G. Insulation

1. Extruded polystyrene rigid board insulation meeting the following physical properties.
- STYROFOAM® Brand insulation (TYPE) as manufactured by The Dow Chemical Company, marketed by American Hydrotech, Inc. or approved equal.

a. Insulation shall meet ASTM C-578, Type VI.

b. Minimum compressive strength, ASTM D-1621, 40 psi

c. Maximum water absorption by volume per ASTM C-272, 0.3%.

d. Water vapor permeance for 1" product per ASTM E-96, 0.8 perm (max.) (63 ng/Pa/s/m^2).

e. Insulation shall have an R value of 5.0 F ft^2 h/Btu/in. (0.88 K m^2/W) of thickness when tested at 75°F (23.9°C) mean temperature in accordance with ASTM C-518.

f. Product shall be free of CFC's.

H. Filter Fabric

1. Water permeable polymeric fabric.
- American Hydrotech, Inc., Stone Filter Fabric

I. Topping Materials: Concrete per Section 03300.

PART 3 EXECUTION

3.01 INSPECTION

A. The waterproofing contractor shall examine all surfaces to receive the waterproofing assembly to verify it is acceptable and proper for the application of the membrane. Refer to manufacturers Pre-Installation & Application Guidelines.

B. The waterproofing contractor shall not proceed with the installation of the waterproofing membrane assembly until all deck defects have been corrected.

3.02 PREPARATION

A. All surfaces shall be dry, smooth, free of depressions, voids, protrusions, clean and free of unapproved curing compounds, form release agents and other surface contaminants.

1. Cast in-place concrete/Composite deck

a. Poured in place concrete shall be monolithic, smooth, free of voids, spalled areas, laitance, honeycombs, and sharp protrusions.

B. Substrate cleaning

1. Thoroughly sweep the substrate which is to receive the waterproofing membrane.

2. Substrate shall also be blown clean using an air compressor to remove any remaining loose debris.

3. Final check to determine if concrete has been properly cleaned is to apply a test patch of Monolithic Membrane 6125 FR to the surface and check its adhesion.

3.03 INSTALLATION

A. Surface conditioner application (to concrete)

1. Apply the surface conditioner to the concrete using a hand held sprayer evenly at a rate of 300 to 600 SF/gallon (7.4 - 14.7 m^2/L) depending on surface texture. Surface conditioner shall "tan" the surface, not blacken it.

2. Allow sufficient time for the surface conditioner to thoroughly dry prior to the membrane application.

B. Membrane preparation

1. The membrane shall be heated in double jacketed, oil bath or hot air melter with mechanical agitation, specifically designed for the preparation of a rubberized asphalt membrane.

2. Heat membrane until membrane can be drawn-free flowing at a temperature range between 350°F (176°C) and 375°F (190°C).

C. Detailing/Flashing

1. All detailing and flashing shall be done in accordance with the manufacturer's standard guideline details.

2. All detailing and flashing shall be completed before installing the membrane over the field of the substrate.

3. All liquid-applied, resin flashings shall be applied over properly completed membrane flashing details in accordance with the manufacturer’s standard guideline details.

D. Membrane Application

1. Apply the rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 90 mil minimum (approximately 2.3 mm), into which is fully embedded a layer of the spunbonded polyester fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at an average thickness of 125 mil (approx. 3.2 mm). Total membrane thickness shall be 215 mils average (approx. 5.5 mm), 180 mils minimum.

2. Overlap fabric reinforcing sheet 1-2 inches (25.4 mm - 50.8 mm) with membrane between sheets.

3.04 SEPARATION/PROTECTION LAYER INSTALLATION

A. Protection layer shall be installed as follows:

1. Embed the protection sheet/rigid insulation board into the membrane while it is still warm to insure a good bond.

2. Overlap adjoining sheet edges a minimum of 2"-3" (50.8 mm - 76.2 mm) to insure complete coverage. Rigid insulation board materials shall not be overlapped.

3. The completed membrane/protection assembly shall be covered with subsequent topping materials as soon as possible, within 30 days of membrane installation.

3.05 MEMBRANE INTEGRITY TEST

A. The deck area or portions thereof shall be leak tested by means of electronic testing or by ponding water at a minimum depth of 2” (50.8 mm) for a period of 48 hours to check the integrity of the membrane installation.

1. VERIFY that the structure can support the dead load weight of a watertest before testing.

2. If leaks should occur, the water shall be drained completely and the membrane installation repaired.

B. In the event of excessive damage to the membrane assembly, electronic breach detection testing shall be required prior to the placement of subsequent overburden materials.

3.06 DRAINAGE COURSE / INSULATION / FILTER FABRIC

A. General

1. Contractor shall examine the deck area to be covered with subsequent topping materials in order to insure that all deck areas have received the membrane, the membrane is free of damage, it is properly protected, and all flashing has been properly installed, before placing the insulation.

2. The drainage course, insulation, and other subsequent topping materials shall be installed as each section is completed.

B. Prefabricated Drainage Course Placement

1. Install drainage course on horizontal and vertical surfaces in accordance with the manufacturer's recommendations.

2. Layout and position drainage course and allow to lay flat. Cut and fit drainage course to perimeter and penetrations.

3. The geotextile overlapped edges may be bonded to the adjacent drainage course geotextile with an appropriate adhesive to insure continuous geotextile integrity.

4. Place subsequent topping materials as soon as possible.

C. Insulation Placement

1. Loose lay (horizontal applications) in a staggered manner and tightly butt together all insulation boards. The maximum acceptable opening between insulation boards is 3/8" (9.5 mm). Insulation shall be installed within 3/4" (19 mm) of all projections, penetrations, etc.

2. When multi-layer insulation applications are involved the bottom layer of insulation shall be the thickest layer and shall be a minimum of 2" thick (50.8 mm). All layers shall be installed unadhered to each other and all joints staggered in relation to underlying layers.

3. For vertical, multi-layer applications, second layer of insulation board shall be spot adhered to the protection layer with appropriate adhesive or additional rubberized asphalt membrane.

3.07 JOB COMPLETION

A. Contractor and a representative of the membrane manufacturer shall inspect the waterproofing assembly and notify the contractor of any defects. All defects shall be corrected.

B. Clean up all debris and equipment.

END OF SECTION

SECTION 07162 - CRYSTALLINE WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Crystalline waterproofing.

1.2 REFERENCE STANDARDS

A. COE CRD-C 48 - Standard Test Method for Water Permeability of Concrete.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Test data showing hydraulic permeability.
   2. Details for waterproofing at joints, intersections, and other special conditions.

B. Specimen warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of products of the type specified and providing technical representatives to visit project site.

B. Installer Qualifications: Acceptable to manufacturer, with documented experience on at least 5 projects of similar nature within the last 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Take necessary precautions to keep cementitious materials dry.

1.6 FIELD CONDITIONS

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

1.7 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide installer's warranty agreeing to correct leaking waterproofing for 2 years from the Date of Substantial Completion, unless leakage is caused by structural failure, movement of the structure, or other causes beyond the installer's control.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Crystalline Waterproofing:
   1. Anti-Hydro International, Inc.; Hydro Cap.
   2. Conproco Corp.; Super Seal.
   3. Tamms Industries, Inc.; Hey'Di K-11.
   4. ThoRoc, Div. of ChemRex; Tegraproof.
   5. Tremco Incorporated; Permaquik Crystalline Waterproofing.
   6. Xypex Chemical Corporation; Xypex.

2.2 APPLICATIONS

A. Waterproofing for building surfaces:
   1. Outside of elevator pits.

2.3 MATERIALS

A. Crystalline Waterproofing: Portland cement and chemical compound that when applied to the surface of concrete forms insoluble crystals in the capillary pores preventing the passage of liquids, while having no adverse effect on the normal properties of concrete.
   1. Hydraulic Permeability: No measurable leakage or water flow at 200 psi pressure when tested in accordance with COE CRD-C 48, using minimum 2 inch thick sample and 20 days duration.
   2. Toxicity: Non-toxic.
   3. Color: Gray.

B. Patching Compound: Ready-mixed cementitious mortar recommended or approved by waterproofing manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Use sand blasting, water blasting, or acid etching as recommended.

C. Plug water leaks.

D. Patch holes, construction joints, and cracks. Remove defective concrete.

E. Obtain approval of manufacturer's field representative before beginning installation.

3.2 INSTALLATION

A. Install in strict accordance with manufacturer's instructions. Maintain environmental conditions required and recommended by manufacturer. Keep a copy of manufacturer's instructions on site.

B. Coordinate installation with installation of products that must penetrate waterproofed surfaces.

C. Prevent excessive drying of surface.
   1. Cure waterproofing for at least 3 days, or length of time required by manufacturer, with water spray and adequate air circulation.
   2. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.

D. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

END OF SECTION

SECTION 07180 - TRAFFIC COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes traffic coatings for the interior mechanical rooms, pedestrian traffic, and Safety Zone areas noted on lab floors as indicated on the drawings.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. LEED Submittals: Provide documentation of VOC content in g/L for adhesives, sealants, primers and coatings applied within the building waterproofing envelope; comply with Section 01811.

C. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

D. Samples for Initial Selection: For each type of finish indicated.

E. Qualification Data: For Installer.

F. Material Test Reports: For each traffic coating.

G. Material Certificates: For each traffic coating, signed by manufacturers.

H. Field quality-control test reports.

I. Maintenance Data: For traffic coatings to include in maintenance manuals. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.

J. Warranty: Special warranty specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Base Membrane: VOC compliant, high adhesion, liquid polyurethane membrane and shall meet or exceed the following typical performance properties:

	Property	Typical Value	ASTM Method
1.	Composition	Aromatic Urethane	
2.	Solids by Weight	85%	C 1250
3.	Hardness, Shore A	63	D 2240
4.	Tensile Strength	850 PSI	D 412
5.	Ultimate Elongation	625%	D 412
6.	Tear Resistance	140 lb/in	D 624
7.	Adhesion to Concrete	23 PLI	D 903
8.	Low Temp. Flexibility	-650F	D 522

B. Traffic-Resistant Top Coat: VOC compliant, high tensile strength, abrasion-resistant and weather-resistant aliphatic elastomeric polyurethane and shall meet or exceed the following typical performance properties:

	Property	Typical Value	ASTM Method
1.	Composition	Aliphatic Urethane	
2.	Solids by Weight	72%	C 1250
3.	Hardness, Shore A	91	D 2240
4.	Tensile Strength	3200 PSI	D 412
5.	Ultimate Elongation	190%	D 412

6.	Tear Resistance, Die C	300 lb/in.	D 624
7.	Low Temp. Flexibility And Crack Bridging	Pass	C 957
8.	Weather Resistance	No Chalking at 2000 hrs.	G 53
9.	Water Permeability (system)	< 1.0 Perm	E 96 B
10.	Abrasion Resistance (system)	< 50 mg.	C 501

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of traffic coatings required for this Project.

B. Source Limitations:
   1. Obtain traffic coatings from a single manufacturer.
   2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended in writing by primary material manufacturer.

C. Preinstallation Conference:
   1. Before installing traffic coatings, meet with representatives of authorities having jurisdiction, manufacturer's technical representative, Owner, Architect, consultants, independent testing agency, and other concerned entities. Review requirements for traffic coatings. Notify participants at least seven days before conference.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
   1. Manufacturer's brand name.
   2. Type of material.
   3. Directions for storage.
   4. Date of manufacture and shelf life.
   5. Lot or batch number.
   6. Mixing and application instructions.
   7. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

B. Do not install traffic coating until items that will penetrate membrane have been installed.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to repair or replace traffic coatings that deteriorate during the specified warranty period. Warranty does not include deterioration or failure of traffic coating due to unusual phenomena,

failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch in width, fire, vandalism, or abuse by maintenance equipment.

1. Deterioration of traffic coatings includes the following:
   a. Adhesive or cohesive failures.
   b. Abrasion or tearing failures.
   c. Surface crazing or spalling.
   d. Intrusion of water, oils, gasoline, grease, or acids into deck substrate.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Traffic Coatings: Complying with ASTM C 957.

B. Material Compatibility: Provide primers; base, intermediate, and topcoats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

C. Traffic Coatings applied within the building waterproofing envelope: VOC content not to exceed 150 g/L.

2.2 TRAFFIC COATING

A. Basis-of-Design: Tremco Incorporated, Sealant/Waterproofing Division; Vulkem 350/351.

B. Other Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Karnak Corporation.
   2. Carlisle Coatings and Waterproofing, Inc.
   3. Neogard.
   4. BASF.

C. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.
   1. Material: Urethane.
   2. VOC content not to exceed 200 g/L.

D. Preparatory and Base Coats: Single- or multicomponent, aromatic liquid urethane elastomer.

E. Topcoat: Single- or multicomponent, aliphatic liquid urethane elastomer.
   1. Color: As selected by Architect from manufacturer's full range.
      a. A custom color may be required for Safety Zones.

F. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):
   1. Base Coat: 32 mils minimum wet film thickness.
   2. Top Coat: 16 mils minimum wet film thickness.

G. Aggregate: Uniformly graded, washed silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.
   1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:
      a. Top Coat: 8 to 10 lb/100 sq. ft., follow with backroll to encapsulate the sand.

2.3 MISCELLANEOUS MATERIALS

A. Joint Sealants: As specified in Division 7 Section "Joint Sealants."

B. Sheet Flashing: Nonstaining.
   1. Minimum Thickness: 60 mils thickness.
   2. Material: Sheet material recommended in writing by traffic coating manufacturer.

C. Adhesive: Contact adhesive recommended in writing by traffic coating manufacturer.
   1. VOC content not to exceed 70 g/L.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of traffic coatings.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
   2. Verify compatibility with and suitability of substrates.
   3. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
   4. Verify that substrates are visibly dry and free of moisture.
      a. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263.
      b. Test for moisture content by method recommended in writing by manufacturer.
   5. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Clean and prepare substrates according to ASTM C 1127 and manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.

B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.

C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.
   1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
   2. Remove concrete fins, ridges, and other projections.
   3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
   4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

3.5 TRAFFIC COATING APPLICATION

A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.
   1. Start traffic coating application in presence of manufacturer's technical representative.
   2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.

B. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated, and omit aggregate on vertical surfaces.

C. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

3.6 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field tests and inspections and prepare test reports:
   1. Testing agency shall verify thickness of coatings during traffic coating application.
   2. If test results show traffic coating materials do not comply with requirements, prepare surfaces and reapply traffic coatings.

B. Final Traffic Coating Inspection: Arrange for traffic coating manufacturer's technical personnel to inspect membrane installation on completion.
   1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

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

3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

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

END OF SECTION

SECTION 07210 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction where indicated, and at perimeter foundation wall.

B. Batt insulation and vapor retarder in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Semi-rigid fiberglass panel insulation in sound-rated wall assemblies.

1.02 REFERENCE STANDARDS

A. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. LEED Submittal:

1. Product data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include statement indicating cost of each product with recycled content.

2. Product data for Credit MR 5: For products having regional material content, documentation indicating location of manufacture and location of extraction, recovery or harvest of primary raw materials. Include statement indicating cost of each product with regional material content.

3. Product data for Credit EQ 4.1: For adhesives applied within the building water proofing envelope, documentation including printed statement of VOC content in g/L.

1.04 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene board.

B. Insulation Inside Masonry Cavity Walls where indicated: Extruded polystyrene board.

C. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder.

D. Insulation in Sound-Rated Wall Assemblies: Semi-rigid fiberglass insulation panels installed between masonry wythes.

2.02 GENERAL

A. Adhesives applied within the building waterproofing envelope: VOC content not to exceed 250 g/L.

B. Recycled Content: Provide insulation with recycled content in the following minimum contents:
1. Fiberglass: Minimum 20% total recycled content, of which at least 10% must be post-consumer recycled-content material.
2. Mineral Fiber: Minimum 75% pre-consumer slag wool material.
3. Cellulose: Minimum 80% post-consumer paper.

C. Regional Materials: Give preference to insulation manufactured and of primary raw materials extracted or recovered within 500 mile radius of project site.

2.03 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C 578, Type X; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
3. Board Edges: Square.
4. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
5. Compressive Resistance: 15 psi.
6. Board Density: 1.3 lb/cu ft.
7. Water Absorption, maximum: 0.3 percent, volume.
8. Manufacturers:
a. Dow Chemical Co: www.dow.com.
b. Owens Corning Corp: www.owenscorning.com.
c. Pactiv Building Products: www.pactiv.com/green-guard/.

B. Adhesive: Provide letters from the insulation manufacturer and vapor retarder manufacturer confirming compatibility of adhesive recommended by insulation manufacturer for applying cavity insulation.

1. Adhesives and sealants applied within the building waterproofing envelope: Comply with low-emitting requirements in Section 01616.

2.04 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E 136, except for facing, if any.
4. Facing: Aluminum foil, flame spread 25 rated; one side.
5. Manufacturers:
a. CertainTeed Corporation: www.certainteed.com.
b. Johns Manville Corporation: www.jm.com.
c. Owens Corning Corp: www.owenscorning.com.
d. Bonded Logic, Inc. (cotton batt)

B. Unfaced Batt Insulation: ASTM C 665, Type I.

C. Semi-rigid Fiberglass Panel Insulation: Foil-Faced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
   1. Nominal density of 3 lb/cu. ft.

PART 3 EXECUTION

3.03 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:
   1. Three continuous beads per board length.

B. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A. Adhere over outer face of block backup.

B. Apply the insulating board to the outer surface of the inner masonry wythe with sufficient manual pressure to assure tight joint and good contact.

C. Locations: At exterior cavity masonry walls where indicated at flashing details.

D. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

E. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap

ends and side flanges of membrane over framing members.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

H. Tape seal tears or cuts in vapor retarder.

I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

END OF SECTION 07210

SECTION 07217 - ENCLOSED CAVITY FOAMED INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foamed-in-place insulation in masonry cavity walls.

1.2 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

C. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

D. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

G. ASTM E 2357 - Standard for Air Barrier Materials.

H. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory test Apparatus.

1.3 SUBMITTALS

A. Product Data: Provide product description, insulation properties, and preparation requirements.

B. LEED Submittals:

1. Product data for Credit EQ 4.2: For primers applied within the building water proofing envelope, documentation including printed statement of VOC content in g/L.

C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

D. ICC-ES Evaluation Report to establish code compliance and R-Value.

E. Submit proof of compliance with NFPA 285 for Masonry as well as Rain Screen wall assemblies if applicable.

F. Submit certification of ASTM E-2357 compliance.

G. Submit proof of ABAA- Assembly Testing and Letter from Manufacturer stating SPF contractor in Approved to install Air Barrier SPF Product.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years of experience.

C. Contractor shall be certified by ABAA for SPF air barrier systems. Contractor shall include ABAA inspection and reports, submitted to Architect at each stage.

D. Contractor shall provide a written Safety Program, written Respirator Program and a written Job Hazard Analysis.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke limitations.

1.6 MOCK-UP

A. Include within mock-up for masonry assemblies.

1.7 PRE-INSTALLATION MEETING

A. Convene prior to mock-up and three weeks prior to commencing Work of this section. Review non-standard details, unusual conditions, and quality control procedures for this project.
   1. The following be in attendance: SPF Contractor, General Contractor, Sheathing and or Masonry Contractors, Owner's representative and Architect.

1.8 FIELD CONDITIONS

A. Do not install insulation when ambient temperature is lower than 40 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design:
   1. Permax 2.0 by Henry Company.

B. The following manufacturer's will be considered as equal providing they meet performance properties specified and current local code requirements:
   1. Ecobay CC by Bayer Materials Sciences.
   2. Walltite by BASF; www.basf-pfe.com
   3. Corobond III by Johns Manville Company.
   4. Spray Foam System (11-017) by NCFI

2.2 MATERIALS

A. Insulation: Polyurethane type.
   1. Thermal Conductivity: When tested in accordance with ASTM C 518:
   2. Initial k value: 0.165.
   3. Water Vapor Transmission: 1.82 perms (1 inch SPF), measured in accordance with ASTM E 96.
   4. Air Permeance: 0.000025 L/s/sq. m. at 75 Pa, when tested in accordance with ASTM E 2178.
   5. Compressive Strength: 22 psi, when tested in accordance with ASTM D 1621.
   6. Density: 2.0 lb/cu ft, when tested in accordance with ASTM D 1622.
   7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25 / 350, when tested in accordance with ASTM E 84 (4 inches SPF thickness).
   8. R-Value: Minimum of R-16.75.
   9. Thickness: 2 1/2 inches.
      a. Variation from thickness will be no more than plus 1/2 inch and no less than minus 1/4 inch.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
   1. Performance Requirements:
      a. Tensile Strength (Membrane): ASTM D412 Die C; 800 psi.

b. Tensile Strength (Film): ASTM D412 Die C; 5,000 psi.
c. Elongation: ASTM D412 Die C; 200 percent miminum.
d. Puncture Resistance: ASTM E154; minimum 134 pound.
e. Tear Resistance-Initial: ASTM D1004; minimum 45 pound.
f. Tear Resistance-Propagation: ASTM D1938; minimum 5.0 lbf/in. width.
g. Permeance: ASTM E96-B; 0.03 perms maximum.
h. Water Absorption: ASTM D570; 0.1 percent maximum.

2. Basis-of-Design Product: Blueskin TWF, Manufactured by Henry.

2.3 ACCESSORIES

A. Primer: As required by insulation manufacturer.
1. Primer VOC content: Not to exceed 200 g/L.

B. Transition Membrane - Compatible with the insulation manufacturer and in locations as detailed in the drawings and at the following:
1. Grade - from face of wall, overlap below grade membrane where applicable.
2. Parapet - from outside face of wall, over top of parapet and under roof membrane.
3. Dissimilar materials.
4. Masonry control joints.
5. Head, jamb, and sills of windows, doors, and other wall openings.
6. Basis-of-Design: Blueskin SA, manufactured by Henry.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.
B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.
B. Apply primer in accordance with manufacturer's instructions.
C. Provide transition membranes between dissimilar materials all instances.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.
B. Apply insulation by spray method, to a uniform monolithic density without voids.
C. Thickness Tolerance: ± 1/4-inch.
D. Clear foam from masonry veneer anchors to permit free movement within full limit of tie slots.
E. Patch damaged areas.

3.4 FIELD QUALITY CONTROL

A. Field inspections and tests to be performed by an independent testing agency.
B. Inspection will include verification of insulation and overcoat thickness and density.

END OF SECTION 07217

SECTION 07269 - MECHANICALLY-ATTACHED AIR AND MOISTURE BARRIER

PART 1 GENERAL

1.1 SUMMARY

A. Section includes air leakage criteria for primary air seal building enclosure materials and assemblies; and air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.

1.2 DEFINITIONS

A. Air Barrier: Continuous network of materials and joints providing air tightness, with adequate strength and stiffness to not deflect excessively under air pressure differences, to which it will be subjected in service. It can be comprised of single material or combination of materials to achieve performance requirements.

1.3 PERFORMANCE REQUIREMENTS

A. Air Penetration: Meeting requirements for Type 1 per ASTM E1677.

B. Water Vapor Transmission: 50 grams per meter square per day or 10 perms, or better, tested in accordance with ASTM E96, Method A or B, or ASTM F1249.

C. Tensile Strength: Minimum 27/24 lbs/in tested in accordance with ASTM D882, Method A.

D. Tear Resistance: Minimum 12/10 lbs. tested.

E. Allowable UV Exposure Time: Not less than three months.

F. Surface Burning Characteristics: Class A per ASTM E84.

1.4 SUBMITTALS

A. Shop Drawings: Indicate special joint conditions and sealing applicable penetrations.

B. Product Data: Submit data on material characteristics and performance criteria, indicating compliance with requirements.

C. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.

D. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative in the direct employ of the manufacturer, indicating observation of air barrier assembly installation.

1.5 QUALITY ASSURANCE

A. Source Limitations: Provide commercial air barrier and accessory materials produced by single manufacturer.

B. Pre-installation Meeting:

1. Hold a pre-installation conference, two weeks prior to start of air barrier installation. Attendees shall include Contractor, Architect, Installer, and Air Barrier Manufacturer’s Designated Representative.
2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of air barrier assembly materials and components, installer’s training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.6 MOCKUP

A. Construct mock-up of air barrier system, within Project's exterior wall mockup required by other sections.

1.7 SEQUENCING

A. Sequence Work to permit installation of materials in conjunction with related materials and seals.

PART 2 PRODUCTS

2.1 AIR BARRIERS

A. Air Barrier Manufacturers:
   1. Dupont Tyvek CommercialWrap.
   2. WrapShield by VaproShield LLC.
   3. Metro Wrap by Typar.

B. Accessory Manufacturers:
   1. Quickflash Weatherproofing Products, Inc.

2.2 COMPONENTS

A. Sheet: Product listed with manufacturer.

B. Tape: Self adhering type; mesh reinforced and compatible with sheet material.
   1. Provide standard tape of sheet manufacturer.

C. Fasteners: As manufactured or accepted by sheet manufactuer.
   1. Cap screws for cold formed metal frame construction; 2-inch cap or washer.
   2. #4 nails with large 1-inch plastic cap fasteners for wood frame construction.

D. Sealants: Provide sealants complying with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.

E. Primers: Provide manufacturer recommended primer to improve adhesion between substrate and flashing materials.

F. Flashing: Flexible flashing material for openings penetration; dual-sided membrane materials for brick mold and non-flanged windows and doors.

G. Accessories:
   1. Prefabricated accessories for penetration.
   2. Provide the appropriate flashing panel by Quickflash Weatherproofing Products, Inc., for all plumbing, gas, mechanical and electrical penetration.
      a. Flashing panels for A/C line sets (Model A/C 150 C or Model A/C 250 C) to be field painted to match adjacent materials.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean and prime substrate surfaces to receive adhesive and sealants.

3.2 INSTALLATION

A. Install air barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install air barrier prior to installation of windows and doors.

C. Start air barrier installation at a building corner, leaving 6-12 inches of air barrier extended beyond corner to overlap.

D. Install air barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers.

E. Maintain air barrier plumb and level.

F. Sill Plate Interface: Extend lower edge of air barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by air barrier manufacturer.

G. Window and Door Openings: Extend air barrier completely over openings.

H. Overlap air barrier.
   1. Exterior corners: Minimum 12 inches.
   2. Seams: minimum 6 inches.

I. Penetrations:
   1. Install prefabricated flashing panels as directed by manufacturer.
   2. Place air barrier up behind bottom of flashing panel to bottom of protrusion.
   3. Place subsequent layer of air barrier over top of flashing panel to bottom front edge or further down; tape seal bottom edge full length to underlying sheet and tape seal cut edges to flashing panel.
   4. Seal all penetrations of framing attachment fasteners installed over air barrier with seam tape.

J. Air Barrier Attachment:
   1. Attach air barrier to cold-formed metal studs through exterior sheathing.
   2. Secure using air barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

K. Apply 4 inch by 7 inch piece of self-adhering flashing to air barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of air barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by air barrier manufacturer.

3.4 OPENING PREPARATION - NON-FLANGED OPENING FRAMES

A. Flush cut air barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the air barrier at window head to expose 8 inches of sheathing. Temporarily secure air barrier flap away from sheathing with tape.

3.5 FLASHING - NON-FLANGED OPENING FRAMES

A. Cut self-adhering flashing a minimum of 12 inches longer than width of sill rough opening; apply primer as required by manufacturer.
   1. Provide 7-inch wide flashing for 2 by 4 framing.
   2. Provide 9-inch wide flashing for 2 by 6 framing.

B. Cover horizontal sill by aligning self-adhering flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan self-adhering flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9-inch wide strips of self-adhering flashing at jambs. Align flashing with interior edge of jamb framing. Start self-adhering flashing at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install self-adhering flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C 1193.

I. Position air barrier head flap across head flashing. Adhere using 4-inch wide self-adhering flashing over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.6 OPENING PREPARATION - FLANGED OPENING FRAMES

A. Cut air barrier in a modified "I-cut" pattern.
   1. Cut air barrier horizontally along the bottom of the header.
   2. Cut air barrier vertically 2/3 of the way down from top center of window opening.
   3. Cut air barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.
   4. Fold side and bottom air barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the air barrier at window head to expose 8 inches of sheathing. Temporarily secure air barrier flap away from sheathing with tape.

3.7 FLASHING - FLANGED OPENING FRAMES

A. Cut self-adhering flashing a minimum of 12 inches longer than width of sill rough opening.
   1. Provide 7-inch wide flashing for 2 by 4 framing.
   2. Provide 9-inch wide flashing for 2 by 6 framing.

B. Cover horizontal sill by aligning self-adhering flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan self-adhering flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer's instructions.

F. Apply 4-inch wide strips of self-adhering flashing at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of self-adhering flashing as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position air barrier head flap across head flashing. Adhere using 4-inch wide self-adhering flashing over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations.

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C 1193.

3.8 FIELD QUALITY CONTROL

A. Contractor shall notify manufacturer's designated representative to obtain periodic observations of air barrier assembly installation.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit adjacent work to damage work of this Section.

END OF SECTION

SECTION 07412 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes factory-formed and field-assembled wall panels:
   1. Concealed-fastener, metal wall panels.
   2. Exposed-fastener, metal wall panels.

1.2 DEFINITION

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

B. Steel Sheet Thickness: Minimum thickness of base metal without metallic coatings or painted finishes.

1.3 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 1.57 lbf/sq. ft..

C. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.

D. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

E. Wind Loads: International Building Code 2003; Factory Mutual Global and ASCE 7-98.

F. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/180 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span, unless Code requires greater requirements.

G. Seismic Performance: International Building Code.

H. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 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. Qualification Data: For installer, manufacturer and professional engineer; include 5 copies.

C. Shop Drawings: Provide computer generated shop drawings that are prepared by or under the supervision of a qualified professional engineer licensed in the State of Maryland, detailing fabrication and assembly of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory and field-assembled work.
   1. Accessories: Include details of the flashing and trim, at a scale of not less than 1-1/2 inches per 12 inches.
   2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Engineer shall be licensed in the State of Maryland.

D. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
   1. Wall panels and attachments.
   2. Girts or framing.
   3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.

E. Samples for Verification:
   1. For each type of exposed finish required.
   2. Metal Wall Panels: Actual panel width; minimum 12 inch length. Include fasteners, closures, and other metal wall panel accessories.

F. Qualification Data: For installer and Professional Engineer.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
   1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
   1. Metal Wall Panels: Include reports for air infiltration, water penetration, and structural performance.

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

J. LEED Submittals:
   1. Credit MR 4.1 and 4.2: Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
      a. Contributions to this Credit include recycled content of steel and aluminum.

K. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: Manufacturer capable of providing engineering and field service representation during construction and approving acceptable installer.
   1. Engineering Responsibility: Preparation of data for including the following:
      a. Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of Maryland.
   2. Company with a minimum of ten years of continuous experience manufacturing panel material of the type specified and capable of providing the following information.

3. List of five other projects of similar size, including approximate date of installation and name of Architect for each.

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. Refer to Division 1 Section "Product Requirements."
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.
2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
1. Build mockup of typical corner wall panel as shown on Drawings; approximately 48 inches square by full thickness, including insulation, supports, attachments, and accessories.
2. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

F. Preconstruction Conference: Before starting wall framing, sheathing, or girt construction, conduct conference at Project site. Review methods and procedures related to wall construction and metal wall panels including, but not limited to, the following:
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

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

D. 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.

1.7 PROJECT CONDITIONS

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

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

1.8 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 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.
   2. Warranty Period: Two years from date of Substantial Completion.

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

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
   1. Surface: Smooth finish as standard for manufacturer and gage.
   2. Exposed Finishes:
      a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
         1) Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
            a) Colors: Color 1 - “Buff”, Color 2 - “Gray”.
   3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

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

2.2 MISCELLANEOUS METAL FRAMING

A. Subgirts: Fabricated from minimum 16 gage zinc coated steel conforming to ASTM A 653 SQ Grade 37, G90 coating.

B. Zee Clips: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.

C. Base or Sill Channels: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.

D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0379 inch, and depth of 3 inches as detailed on the drawings.

E. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.
   1. Fasteners for Wall Panels: 300 series stainless steel with 5/8-inch bonded neoprene or EPDM and stainless washers.
   2. Concealed fasteners to be cadmium plated carbon steel.

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.

2.4 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by locking joint edges of adjacent panels and mechanically attaching panels to supports using concealed fasteners in joints. Include accessories required for weathertight installation.

B. Tapered-Rib-Profile, Concealed-Fastener Metal Wall Panels (Type 1):
1. Basis-of-Design Product: CENTRIA Architectural Systems; Concept Series, CS-260.
a. Additional Manufacturers - Subject to compliance with Contract Documents and aesthetics of Basis-of-Design:
1) Morin, A Kingspan Group Company, Integrity Series X-12.
2) Fabral; Silhouette HCF Series HCF12-3.
3) Dimensional Metals Inc., equal product.
4) Petersen Aluminum, equal product.
2. Material: Aluminum sheet, .040 inch thick; smooth.
3. Finish: 2-coat fluoropolymer coating.
4. Panel Coverage: 12 inches.
5. Panel Height: 7/8 inches.

C. Flush Profile, Concealed-Fastener Metal Wall Panels (Type 2 and 3):
1. Locations: Wall and soffit as indicated on the drawings.
2. Basis-of-Design Product: CENTRIA Architectural Systems; Profile Series, IW-10A.
a. Additional Manufacturers - Subject to compliance with Contract Documents and aesthetics of Basis-of-Design:
1) Morin, A Kingspan Group Company.
2) Fabral.
3) Dimensional Metals Inc.
4) Petersen Aluminum
3. Material: Aluminum sheet, .040 inch thick; smooth.
4. Finish: 2-coat fluoropolymer coating.
5. Panel Coverage: 12 inches.
6. Panel Height: 1-1/2 inches.
7. Perforated at Type 3 (soffits).

2.5 ACCESSORIES

A. Wall Panel Accessories:
1. Provide components required for a complete metal wall panel assembly including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
3. Continuous Soffit Vent: As detailed on the drawings, provide in same finish and material as metal panels.

2.6 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.
   1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
   2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

B. Provide factory-fabricated mitered corners; field cut and joined corners will not be accepted.
   1. Mitered corner assemblies shall match specified exterior profile panel in shape, general appearance, material and finish.
   2. Mitered corner assemblies shall be notched, bent and structurally bonded.
   3. Mitered corner assemblies shall be factory coil coated to match adjacent panels; paint finish shall meet specified warranty requirements.

C. 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.

D. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Fabricate nonmoving seams in accessories with flat-lock seams.
   3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 FINISHES, GENERAL

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer 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 and that installation is within flatness tolerances required by metal wall panel manufacturer.
   3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal 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.

3.2 PREPARATION

A. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

B. Install fascia and copings to comply with requirements specified in Division 7 Section "Manufactured Roof Specialties."

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

3.3 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. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
   4. Flash and seal metal wall panels with weather closures at eaves and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
   5. Install screw fasteners in predrilled holes.
   6. Locate and space fastenings in uniform vertical and horizontal alignment.
   7. Install flashing and trim as metal wall panel work proceeds.
   8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
   10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:
   1. Aluminum Wall Panels: Use stainless-steel fasteners.

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. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
   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."

3.4 FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

A. Lock-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each joint at location and spacing recommended by manufacturer.
   1. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
   2. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
   3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
   4. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

B. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal wall panel assembly including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

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

of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

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

3.7 FIELD QUALITY CONTROL

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

B. Water-Spray Test: After completing the installation of 75-foot length by full height area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.

D. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.

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

3.8 CLEANING AND PROTECTION

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

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

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

END OF SECTION 07412

SECTION 07464 - VINYL SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Location: Temporary walls at portion of existing bulding to remain.

B. Vinyl siding and trim.

C. Vinyl soffit and trim.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Siding substrate.

B. Section 07920 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.3 REFERENCE STANDARDS

A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

B. ASTM D3679 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding.

C. ASTM D4477 - Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit.

D. ASTM D5206 - Standard Test Method for Windload Resistance of Rigid Plastic Siding.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. VSI (INST) - Vinyl Siding Installation Manual; Vinyl Siding Institute, Society of the Plastics Industry.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Samples: Provide samples in colors specified, not less than 12 inches in length.

D. Color Charts: Where colors are not specified, provide samples of manufacturer's entire color line for selection.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Not less than three years of experience with products specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Alside, Inc: www.alside.com.

B. CertainTeed Corporation: www.certainteed.com.

C. Ply Gem Industries, Inc: www.plygem.com.

2.2 MATERIALS

A. General Requirements:
   1. Siding: Comply with ASTM D3679.
   2. Soffit: Comply with ASTM D4477.
   3. Wind Resistance: Capable of withstanding minimum of 30 psf negative pressure, when tested in accordance with ASTM D5206.

B. Horizontal Vinyl Siding:
   1. Thickness: 0.046 inch, minimum.
   2. Length: 12 feet, minimum.
   3. Nailing Hem: Single layer, with 1-1/8 inch long nail holes at maximum 18 inches on center.
   4. Finish: Smooth.
   5. Color: As selected by Architect from manufacturers full range of available colors.

C. Vinyl Soffit:
   1. Thickness: 0.038 inch, minimum.
   2. Length: 12 feet, minimum; where available, provide up to 12 foot by 12 foot panels.
   3. Nailing Hem: Single layer, with 1-1/8 inch long nail holes at maximum 18 inches on center.
   4. Finish: Smooth.
   5. Color: As selected from manufacturer's full range of available colors.

D. Accessories: Provide coordinating accessories made of same material as required for complete and proper installation whether or not specifically shown on the drawings.
   1. Color: Match adjacent siding or soffit panels.
   2. Length:
      a. Corner Posts: 10 feet, minimum.
      b. Other Trim: 12.5 feet, minimum.
   3. Profiles: Provide types as indicated on the drawings.

E. Fasteners: Aluminum nails, alloy 5056 or 6110, with minimum tensile strength of 63,000 pounds per square inch; length as required to penetrate framing at least 3/4 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate.

B. Do not proceed with installation until unacceptable conditions have been corrected.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install siding, soffit, and trim in accordance with manufacturer's printed installation instructions.

B. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.

C. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations shown on the drawings. Provide vent area specified.

D. Clean dirt from surface of installed products, using mild soap and water.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before date of Substantial Completion.

END OF SECTION

SECTION 07511 - BUILT-UP BITUMINOUS ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Built-up asphalt roofing system.
   2. Roof insulation.

1.2 DEFINITIONS

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

B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mopping application and 75 centipoise for mechanical application, within a range of plus or minus 25 deg F, measured at the mop cart or mechanical spreader immediately before application.

C. Cap Sheet: The uppermost ply of the built-up roof system.

1.3 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 manufacturer based on testing and field experience.

C. FMG Listing: Provide roofing membrane, base flashings, and a component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable, Identify materials with FMG markings.
   1. Fire/Windstorm Classification: Class 1A-90.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include certifications of solar reflectance (albedo) and emissivity, including test methods.

B. LEED Submittals:
   1. Product data for SSc7.2: For roof surface, documentation indicating Solar Reflectance Index (SRI) value.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
   1. Base flashings, cants, and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Crickets, saddles, and tapered edge strips, including slopes.
   4. Insulation fastening patterns.

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

E. 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.
   2. Submit product and label data and certification with each load of bitumen asphalt to indicate flash point (FP) finished blowing temperature (FBT), softening point (SP), and equiviscous temperature (EVT).
   3. Submit certification of compliance with high-albedo (reflectance) and high-emissivity requirements.

F. Qualification Data: For Installer and manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

H. Research/Evaluation Reports: For components of roofing system.

I. Associated Products Certificate: Provide a letter, on the roofing manufacturer's letterhead and signed by representative of the roofing manufacturer, accepting the products selected by the installer for prefabricated metal edge systems, prefabricated expansion joints, insulation and cover board to be covered within the total system warranty.

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

K. Warranties: Special warranties specified in this Section.

L. Inspection Report: Copy of roofing system manufacturer's inspection reports of roofing installation.

M. Material Safety Data Sheets (MSDS): For all applicable products to MCPS Environmental Health & Safety Division.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty. Firm to have a minimum of 10 years of experience in installing roof systems similar to roof system specified for this Project and have been installing NDL systems for past 10 years.
   1. The installer must have an office, shop, trucks, and a full staff within 50 miles of MCPS main office.

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

C. Source Limitations:
   1. The roofing manufacturer provided the total system warranty for the work of this section must also be the manufacturer providing the system required under Section 07 33 63.
   2. Obtain roof system components through sources acceptable to roofing manufacturer providing total system warranty. Provide a letter, on the roofing manufacturer's letterhead and signed by representative of the roofing manufacturer, accepting the products selected by the installer.

D. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

E. Energy Conservation: Provide roof coating that qualifies for EPA/DOE ENERGY STAR product labeling program.

F. Preliminary Roofing Conference: Within 30 days of Notice-to-Proceed for construction, conduct conference at Project site. Comply with requirements for Preinstallation conferences in Division 1. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
1. Meet with Owner, Architect, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, technical representative or inspector, deck installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review construction schedule and verify availability of materials, installer's personnel and designated superintendent, equipment, and facilities needed to make progress and avoid delays.
3. Review governing regulations and requirements for roofing system during and after installation.
4. Review temporary protection requirements for roofing system during and after installation.

G. Preinstallation Conference: Conduct conference at Project site 2 weeks prior to commencement of roof construction. 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 roofing 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.
9. Review roof observation and repair procedures after roofing installation.

1.6 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 storage.

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.

1.7 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.

B. Kettles are not allowed on site.

C. Asphalt brought to the project site in tankers to include an asphalt additive to neutralize objectionable odors; D-Scent 0119 by ArrMaz Custom Chemicals, or equal.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form, no dollar limit (NDL), in which manufacturer agrees to repair or replace components of 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, and other components of roofing system.
2. The warranty will be a total system warranty; no exclusion of any materials including perimeter metal, metal trim and expansion joints.
3. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Roofing installer's warranty, signed by installer, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products, for the following warranty period:
1. Warranty Period: 5 years from date of Substantial Completion.
2. Warranty Conditions: Provided at end of this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide a 4-Ply PID FR system by one of the following:
1. Johns Manville International, Inc.
2. Firestone.

B. General:
1. Recycled Content: Give preference to recycled content materials.
2. Local Materials: Give preference to products manufactured and of raw materials within 500 miles of Project Site.

2.2 ROOFING MEMBRANE PLIES

A. Ply Sheets (three layers) - ASTM D 2178; Type VI felts.

B. Cap Sheet (one layer) - Basis-of-Design: DynaLastic 180 Roof Cap Sheet by Johns Manville or Firestone approved equal by MCPS.
   1. Type: Mineral surfaced, polyester/glass scrim-reinforced SBS cap sheet.
   2. Physical Properties:
      a. Compliant with requirements of ASTM D6164, Type I, Grade G.
      b. Thickness: 140 mil.
      c. Tensile Strength at 0 degree F:
         1) Machine Direction: 120 lb force/in. width or better.
         2) Cross Machine Direction: 80 lb force/in. width or better.
      d. Elongation at 0 degree F:
         1) Machine Direction: 45 percent.
         2) Cross Machine Direction: 45 percent.

2.3 FLASHING MATERIALS

A. Backer Sheet - Composite Base Sheet: A base ply with reinforcing of balanced construction; reinforcing formed by laminating a polyester mat to each side of a fiber glass scrim core.
   1. Project Standard: ASTM D 2178, Type VI, asphalt-impregnated, glass fiber felt.

B. Bituminous Flashing Sheet: Bituminous Flashing Sheet: Same as Cap Sheet specified in paragraph 2.2.B.

C. Glass-Fiber Mesh: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D 1668, Type I.

D. EPDM Sheet Flashing: 60-mil-thick EPDM, uncured.

2.4 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III.

2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

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

B. Mastic Sealant: Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.

C. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM 4470; designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.
   1. Fasteners must be of length to remain concealed in dovetail design of acoustical steel deck.

D. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."

E. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

F. EPDM Bonding Cement: Manufacturer’s standard bonding adhesive.

G. EPDM Lap Sealant: Manufacturer’s standard single-component sealant.

2.6 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. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, felt or glass-fiber mat facer on both major surfaces; complies with EPA, CEPA and Montreal Protocol; meets Clean Air Act Amendments of 1990.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Johns Manville International Inc.; E'NRG'Y 3 or a comparable product approved by roof system manufacturer.
   2. Nominal Product Thickness: Two layers of 2.3 inch thick polyiso totaling 4.6 inches; areas of tapered insulation is an additional thickness of insulation; roof drains tapered as indicated.
   3. Compressive Strength (ASTM D1621): Minimum 25 psi (170kPa).

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 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.

2.7 INSULATION ACCESSORIES

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

B. Insulation 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.
   1. Fasteners not to exceed length necessary to remain concealed in dovetail design of acoustical roof deck, where that type of roof deck is in place.
   2. Fasteners for cellular roof decks not to exceed length necessary to remain concealed in cells.
   3. Fasteners for other types of roof deck not to exceed an exposed length of 3/4-inch unless otherwise required by code; all fasteners to have same exposed length.

C. Insulation Cant Strips: Same material as cover board.

D. Wood Nailer Strips: Comply with requirements in Division 6 Section "Miscellaneous Carpentry."
   1. Fasteners used for securing roofing perimeter and opening/penetration wood blocking or nailers to be stainless steel or G180 galvanized.

E. Tapered Edge Strips: Same material as cover board.

F. Cover Board (Top Layer): ASTM C 728, perlite board, seal coated.
   1. Thickness: 1 inch.
   2. Representative Product: Fesco Board manufactured by Johns Manville.

G. Cover Board - Vertical Application to Receive Base Flashing:
   1. Project Standard: Plywood sheathing as permissible by roofing manufacturer.

2.8 COATING MATERIALS

A. Coating Material - Basis-of-Design:
   1. Basis-of-Design: Cover roofing surfaces including base flashings.

a. Prime Coats: Top Guard 4000 by Johns Manville; 100% acrylic elastomeric coating; exceed ASTM D 6083 requirements for tensile strength, elongation, wet adhesion and weatherability.
b. Top Coat: Top Guard 5000 by Johns Manville; 100% acrylic elastomeric coating; exceed ASTM D 6083 requirements for tensile strength, elongation, wet adhesion and weatherability.

2. Allow duration of time dictated by roofing manufacturer for asphalt off-gassing prior to application of coating, but not less than 90 days.
3. Solar Reflectance Index: Minimum 78.

2.9 WALKWAYS

A. Cap Sheet Strips - Basis-of-Design: DynaLastic 180 Roof Cap Sheet by Johns Manville.
1. Type: Mineral surfaced, polyester/glass scrim-reinforced SBS cap sheet.
2. Physical Properties:
a. Compliant with requirements of ASTM D6164, Type I, Grade G.
b. Thickness: 140 mil.
c. .060 EPDM under walkways.

B. Walkways at Vegetated Roof - In addition to Cap Sheet Strips:
1. 2” Extruded Polystyrene Board as specified in 07210.
2. 2’ x 2’ x 2” thick concrete stone pavers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
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 unsatisfactory conditions have been corrected.

3.2 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. If building enclosed, temporarily seal penetrations to protect indoor air quality in accordance with Division 1 Section “Construction Indoor Air Quality Management” requirements.

3.3 INSULATION INSTALLATION

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

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

C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of built-up roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.

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

E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

F. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

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

H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

I. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. At acoustical deck locations, layout and install fasteners so that fasteners will be concealed in dovetail design of specified acoustical metal deck; exposed fasteners on underside of metal deck will not be accepted.
   4. Install subsequent layers of insulation in a solid mopping of hot roofing asphalt.

J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.
   1. Not used.
   2. Apply hot roofing asphalt to underside and immediately bond cover board to substrate.

3.4 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."

B. Temporarily seal exterior building and roof penetrations during and immediately following roofing installation to protect indoor air quality in accordance with Division 1 “Indoor Air Quality Management” requirements.

C. Start installation of built-up roofing membrane in presence of roofing system manufacturer's technical personnel.

D. Coordinate installing roofing system components so insulation and roofing membrane sheets are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.
   1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

E. Asphalt Heating: Heat roofing asphalt and apply within plus or minus 25 deg F of equiviscous temperature unless otherwise required by roofing system manufacturer. Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.

F. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.5 ROOFING MEMBRANE INSTALLATION

A. Install ply sheets starting at low point of roofing system. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane without ply sheets touching.

B. Cap Sheet:
1. Unroll sheet and allow sheets to relax as required by roofing manufacturer; Basis-of-Design manufacturer packages the roofing rolls using reverse-wind process, dictating the sheets relax with underside up and then set in solid mopping by "mop and flop" or "fly-in" techniques.
2. Install lapped cap sheet starting at low point of roofing system.
3. Offset laps from laps of preceding ply sheets and align cap sheet without stretching.
4. Lap in direction to shed water.
5. Extend cap sheet over and terminate beyond cants.
6. Embed cap sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer.

3.6 BITUMINOUS FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Backer Sheet Application: Install two backer sheets and adhere to substrate in a solid mopping of hot roofing asphalt.
3. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.
    a. Bond splices between top ply of flashing in three courses - asphalt-mesh-asphalt.
    b. Bond splices between top ply of flashing and roofing membrane in three courses - asphalt-mesh-asphalt.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches (24” at vegetated roof) onto field of roofing membrane.

C. Mechanically fasten at 6 inches o.c., top of base flashing securely at terminations and perimeter of roofing. Seal top termination of base flashing.

D. Install stripping, according to roofing system manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
   1. Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt applied at not less than 425 deg F, and extend onto roofing membrane.

E. Roof Drains: Set 30-by-30-inch metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with stripping and extend a minimum of 4 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring. Install flashing-sheet stripping by same method as installing base flashing.

3.7 EPDM BASE FLASHING INSTALLATION

A. For high parapet walls, install EPDM sheet flashings 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 cured or uncured sheet flashing.

D. Clean splice areas, apply 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.

E. Terminate and seal top of sheet flashings.

3.8 COATING APPLICATION

A. Apply two coats of specified prime coat to roofing surfaces and flashing according to manufacturer's written instructions, after 90 days of roofing application or greater duration as may be required by roofing manufacturer.

B. Apply one coat of specified top coat over prime coats, after manufacturer's recommended recoat times.

3.9 WALKWAY INSTALLATION

A. Cap Sheet Strips: Install one layer of cap sheet strip, approximately 36 inches wide continuous in lengths indicated; without interruption or breaks. Adhere in hot roofing asphalt.

B. At Vegetated Roof: Over cap sheet walkway strips, set 2’ x 2’ x 2” thick concrete pavers on top of loose laid 2” thick extruded polystyrene board.

3.10 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 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.

3.11 PROTECTING AND CLEANING

A. Protect 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

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

D. Comply with requirements in Division 1 “Construction Waste Management” for recycling waste roofing materials.

PART 4 - INSTALLER'S WARRANTY CONDITIONS

WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

Owner: _____

Address: _____

Building Name/Type: _____

Address: _____

Area of Work: _____

Acceptance Date: _____

Warranty Period: _____

Expiration Date: _____

AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

This Warranty is made subject to the following terms and conditions:

Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

lightning;
peak gust wind speed exceeding 74 mph;
fire;

failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work not installed by this installer;

vapor condensation on bottom of roofing; and

activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

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

During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this _____day of _____, 200__.

Authorized Signature: _____

Name: _____

END OF SECTION 07511

SECTION 07513 - VEGETATED ROOFING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes extensive vegetated roof assembly.
   1. Protection/root barrier sheet.
   2. Engineered soil and pre-planted trays.
   3. Single Source Full System Warranty.

B. Work of this Section to be provided over a completed roofing system as specified under Section 07511 and under contract by the same roofing contractor, in areas designated by Drawings.
   1. NOTE: Roof coatings to be eliminated in areas receiving the Work of this Section.

1.2 DEFINITIONS

A. Vegetated Roof: An area of planting and landscape, built up on a waterproofed substrate at any level that is separated from the natural ground by a man-made structure.

B. Vegetated Roof System: The complete system of materials that functions to provide a watertight protected membrane and an Extensive vegetated roof design to assist in storm water management, energy conservation and a long-term life-cycle expectation.

C. Extensive Green Roof: Low to no maintenance landscaping consisting of shallow soil depths (<6 inches) with plant varieties that are restricted primarily to sedums, mosses, herbs and grasses that can withstand harsh conditions and are an adaptive species to the area of planting.

1.3 PERFORMANCE REQUIREMENTS

A. Installer must have a history of installing specified modular pre-planted tray system and approval of modular tray manufacturer to install the product.

1.4 SUBMITTALS

A. Any substitution must also comply with the LEED requirements listed for the specified item.

B. The Contractor and their sub-contractors shall submit the LEED building certification items listed herein. LEED Building submittals shall include the following:
   1. A completed Environmental Building Materials Certification Form. Information to be supplied for this form shall include:
      a. Cost breakdowns for the materials included in the contractor's or sub-contractor's work. Cost breakdowns shall include total cost plus separate labor, equipment, and material costs. A materials only cost must be identified.
      b. The amount of post-consumer and/or pre-consumer recycled content in the supplied product(s).
      c. The manufacturing location for the supplied product(s).
      d. The location (source) of the raw materials used to manufacture the supplied product(s).

C. Product Certificate: Submit notarized certificate, indicating complete list of products intended for use under Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

D. Product Data: For each type of roofing material indicated.

E. Shop Drawings: Show locations and extent of roofing. Include plans, sections and details.

F. Samples for Verification: For each of the following products:
1. 12-by-12-inch square of protection/root barrier sheet.
2. Two modules of engineered soil, sedums and plants, in pre-planted tray with 95 percent or greater coverage; deliver to job site and notify Architect.

G. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

H. Maintenance Data and Training Materials: For roofing system to include in maintenance manuals and Owner's training library.

I. Warranties: Warranties and service agreements specified in this Section.

J. Source Limitations:
1. The roofing manufacturer provided the total system warranty for the work of this section must also be the manufacturer providing the system required under Section 07511.
2. Obtain roof system components through sources acceptable to roofing manufacturer providing total system warranty. Provide a letter, on the vegetative roofing manufacturer's letterhead and signed by a representative of the vegetative roofing manufacturer, accepting the products of the vegetative roof and the installation of the roof.

K. Closeout Submittals: Contractor to provide as-built drawings of vegetative roof system to Architect's civil engineer consultant for DPS Submission.

L. Project Meetings: Comply with requirements for pre-installation conferences in Division 1 Section "Project Management and Coordination."
1. Pre-installation Conference: Participate as specified under Section 07511.
2. Progress Meetings: Participate as specified under Section 07511.
3. Leak Testing:
a. Testing to be conducted and observed prior to placement of vegetated system; notify Architect and Owner when testing is scheduled.
b. Attendance: Architect and Owner's Representative, General Contractor, installer, manufacturer representative and Technical Inspector.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to manufacturer recommendations.

B. 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 storage.

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

1.6 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Plant Establishment and Tray Module Warranty on growing media and plantings are covered separately under the terms of the warranty agreement.
1. Extensive type plantings:
a. Duration of Warranty: 2 years.

b. The Warrantor guarantees that sedum plantings selected, approved and provided by the Warrantor or its certified representatives will propagate from the initial planting, and plantings will be alive, growing and cover the planted roof area at an approximate minimum rate of 95% coverage at Substantial Completion and no less than 85% coverage after three full years.

2. Tray Module Warranty Duration: 20 years.

3. Plant and Growing Media establishment services for two years are as follows:
   a. Removal of all plantings that have not successfully established, conducted twice annually each of the first two years. All debris will be disposed of at the Owner's approved on-site location. Debris left by other trades or the owner(s) is not included.
   b. Weeding of invasive plant species will be conducted once per month for the first full year and at least once per season for the last year.
   c. Fertilizer, if required, will be completed once per year.
   d. Replacement of dead plant material, as required, to meet the prescribed coverage rates will be included. Plant materials destroyed through acts of negligence, owner modifications, wind events greater than 50mph or destructive acts of native (otherwise known as acts of God), are not covered.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Same as provided for Section 07511.

2.2 PROTECTION/ROOT BARRIER SHEET

A. Reinforced roofing membrane, flashing and protection mat.

B. Material: EPDM, ASTM D4637, Type I, Grade 1; non-reinforced, 45 mil thickness.
   1. Johns Manville.
   2. Firestone Building Products.

C. Seams: Soldered.

2.3 AUXILIARY MATERIALS

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

B. Edging: L-shaped extruded aluminum edging with perforations for drainage. Edging is 4¼" x 3¼" with a minimum gauge of 210 mil. Edging must allow for adequate drainage via sufficient drain perforations at the bottom of the edging, with sidewalls tall enough to cover the modules and contain the soil.

2.4 MODULES FOR PRE-PLANTING

A. Basis-of-Design: LiveRoof LLC.

B. Additional Acceptable Module Manufacturers: Subject to compliance with the Contract Documents:
   1. Firestone Skyscape.

C. Characteristics:
   1. Material: 100 percent post-industrial recycled polypropylene with 100 mil wall thickness.

2. Design to include removable soil elevators that allow final growing media surface to be a greater height than tray walls following removal; tray wall design to allow root expansion into adjacent trays.
3. Positive drain holes located at lowest point of module.
4. Water dispersal via drain channels of approximately 7 gallons per minute per lineal foot.
5. Sharing of water and nutrients to be accomplished with tray design via subterranean moisture portals uniting soil from module to module.
6. Modules are to be customizable.

2.5 GROWING MEDIA

A. Reference FLL 2002 Guidelines, ASTM E 2396-05 and ASTM E 2399-05 for design standards; maximum 7 percent organic content.

B. Mix specifically designed to meet project requirements based on climatic region and plant requirements.

2.6 SEDUM PLANTINGS

A. Reference ASTM E 2400-06 for design standards.

B. The selection of the plants to be sedum varieties accepted by the warrantor. The species will be in accordance with the known varieties that have been successfully incorporated into extensive roof design for the particular plant hardiness zone of the Project. Plant selection that varies from the plant species recommended by the warrantor will not be warranted in any fashion.
1. Green roof plants that are nursery grown within 300 miles of Project and by a nursery specifically engaged in the propagation of green roof plants.
2. Verify mix design with grower/horticulturist during bidding or submittal phase and verify species are correct based on construction schedule, project site, installation conditions, and any other applicable factors in selecting the correct plants for the project.
3. Planting Schedule
   a. Mix Type 1: Sedum Spurium ‘Fuldaglut’, Sedum Spurium ‘Voodoo’, Sedum Spurium ‘Dragons Blood’ (Red/Bronze Foliage, Red/Pink Flowers); Sedum Album “Coral Carpet”.

C. Wind Erosion Control: As recommended for use with specified system by vegetative roofing system manufacturer.

D. Plant selected should be low growing (less than 4 inches) and require minimum maintenance by Owner.

2.7 ROOF PAVERS

A. Roof Pavers: Heavyweight, hydraulically pressed, concrete units, square edged, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:
1. Size: 24 by 24 by 2 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
2. Compressive Strength: 7500 psi, minimum; ASTM C 140.
3. Colors and Textures: To be selected by Architect from manufacturers’ full range of standard colors.
4. Paver Supports: 2 inch rigid polystyrene.
5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Hanover Architectural Products, Inc.

b. Sunny Brook Pressed Concrete Co.
c. Wausau Tile, Inc.; Terra-Paving Div

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements and other conditions affecting performance.

3.2 VERIFICATION OF MEMBRANE INTEGRITY

A. General: After installing roof horizontal membrane and before placing overburden, verify installed membrane is waterproof. Provide testing to verify membrane is free of any holes, open seams and capillary defects that will allow water to penetrate the building envelope.
1. Utilize flood testing.
2. Repair and retest areas discovered to have defects.

3.3 PROTECTION/ROOT BARRIER SHEET INSTALLATION

A. Unroll roofing membrane over adhered membrane roofing and allow to relax before seaming.

B. Seam all joints same as waterproofing membrane.

C. Seal all laps of the slip sheet to prevent gravel or root growth between waterproofing membrane and slip sheet and all T joints in the cap sheet prior in installing the EPDM root barrier sheet.

3.4 TRAY SYSTEM INSTALLATION

A. Supply vegetation in strict accordance with warrantor requirements or with the instructions, plans and good practice.

B. Pre-planting and Delivery:
1. Standards:
a. Tray modules shall remain structurally intact and unbroken following placement.
b. Verify that all plant materials in the tray modules are well-rooted and cover 80-95% of the surface area of each tray, depending on propagation technique.
c. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project unless otherwise specifically authorized.
d. Vigor: Plants shall be sound, healthy and vigorous, and densely foliated. They shall be free of disease, insect pests, eggs, or larvae. Fine root hairs shall be visible on 5 sides of the tray.

C. Storage and Handling:
1. Tray modules shall be installed as soon as possible upon delivery.

D. Preparation and Planting:
1. Layout: Layout planting trays as required by the plans.
2. Watering: Immediately water all plants after completion of planting Work to the extent that the root mass is moist and wicking water into the living roof soil below.
3. Fertilizer: Apply organically certified fertilizer at the rate of 10 lbs per 1,000 sq. ft. if recommended by tray supplier only upon installation. Fertilization shall not be a part of regular roof maintenance.

3.5 FIELD QUALITY CONTROL

A. Coordinate with Technical Inspector provided under Section 07511.

B. Flood test each roof deck area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing, but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
   2. Flood each area for 48 hours.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installation is watertight.

C. Final Roof Inspection: Arrange for roofing system manufacturer's representative to inspect roofing installation on completion of roofing membrane and flashing and at completion of total system.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

3.6 PROTECTING AND CLEANING

A. Protect roofing according to manufacturer written recommendations to prevent damage and wear during application and remainder of construction period.

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

END OF SECTION 07513

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sheet metal flashing and trim:
   1. Formed roof drainage system.
   2. Formed low-slope roof flashing and trim.
   3. Formed steep-slope roof flashing and trim.
   4. Formed equipment support flashing.
   5. Formed roof perimeter assemblies.

B. Related Sections include the following:
   1. Division 4 Section "Unit Masonry Assemblies" for installing embedded flashing, and other sheet metal flashing and trim.
   2. Division 5 Section "Architectural Joint Systems" for manufactured sheet metal expansion-joint covers.
   3. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
   4. Division 7 Section "Asphalt Shingles" for installing sheet metal flashing and trim integral with roofing.
   5. Division 7 Section "Metal Wall Panels" for factory-formed metal wall panels and flashing and trim not part of sheet metal flashing and trim.
   6. Division 7 Section "Built-up Asphalt Roofing" for installing sheet metal flashing and trim integral with roofing membrane.
   7. Division 7 Section "Manufactured Roof Specialties" for manufactured roof specialties not part of sheet metal flashing and trim.
   8. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, and other manufactured roof accessory units.
   9. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.2 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. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
   1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.

C. 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 deg F, ambient; 180 deg F, material surfaces.

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

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: 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.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal Flashing: 12 inches long. Include fasteners, clips, closures, and other attachments.
2. Trim: 12 inches long. Include fasteners and other exposed accessories.

D. Material Safety Data Sheets (MSDS): For all applicable products to MCPS Environmental Health & Safety Division.

1.4 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. Review methods and procedures related to sheet metal flashing and trim.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 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.

1.6 COORDINATION

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

1.7 WARRANTY

A. Special Project Warranty: Submit sheet metal flashing and trim Installer's warranty, signed by Installer, covering Work of this Section, including all components of flashing system such as metal finish, underlayment, and joint connections, for the following warranty period:
   1. Warranty Period: 20 years finish, 5 years labor from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, having maximized recycled content and finished as follows:
   1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
         1) Color: To be selected from manufacturers full range.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, having maximized recycled content.
   1. Finish: No. 2D (dull, cold rolled).

C. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet having maximized recycled content.

2.2 UNDERLAYMENT MATERIALS

A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

2.3 MISCELLANEOUS MATERIALS

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

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
   1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
   3. Blind Fasteners: High-strength stainless-steel rivets.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.

E. Burning Rod for Lead: Same composition as lead sheet.

F. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

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

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

I. 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.

J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
   1. Available Manufacturers:
      a. Fry Reglet Corporation.
      b. Heckmann Building Products Inc.
      c. Hickman, W. P. Company.
      d. Keystone Flashing Company, Inc.
      e. Sandell Manufacturing Company, Inc.
      f. Dimensional Metals, Inc.
   2. Material: Stainless steel, 0.0387 inch thick.
   3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   4. Masonry Type: Provide with top flange to set in mortar joint; bent leg to resist pull-out.
   5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 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.
   1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

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

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal. Thickness as recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.6 FORMED ROOF PERIMETER ASSEMBLIES

A. Fabricate and install roof edge flashing and copings capable of resisting forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 and as required by International Building Code 2012; as required by code, submit testing documentation and certification that machine used in fabricating tested assemblies will be same as used in fabricating assemblies for this Project.

B. Copings: Fabricate in minimum 96-inch long, but not exceeding 10-foot long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
1. Coping Profile: SMACNA figure designation 3-4A.
2. Joint Style: Double lock standing seam.
3. Fabricate from the following materials:
   a. Aluminum: Minimum 0.040 inch thick.
4. Finish: Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; colors will custom as follows:
   a. Color 1: Match brick color.
   b. Color 2: Match Centria 181 Slate Gray.
   c. Color 3: Match high density masonry units.
5. Texture: Embossed.

C. Roof Edge and Roof to Wall Transition Flashing: Prefabricated assemblies; refer to Section 07710.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Furnish with 6-inch-wide joint cover plates.
1. Joint Style: Butt, with 12-inch-wide concealed backup plate.

B. Counterflashing: Stainless steel, 0.0387 inch thick.

C. Flashing Receivers: Stainless steel, 0.0356 inch thick.

D. Roof-Penetration Flashing: Lead, 4.0 lb/sq. ft.

E. Roof-Drain Flashing: Lead, 4.0 lb/sq. ft.

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Stainless steel, 0.0356 inch thick.

B. Drip Edges: Stainless steel, 0.0356 inch thick.

C. Eave, Rake, Ridge, and Hip Flashing: Stainless steel, 0.0356 inch thick.

D. Counterflashing: Stainless steel, 0.0387 inch thick.

E. Flashing Receivers: Stainless steel, 0.0356 inch thick.

F. Roof-Penetration Flashing: Lead, 4.0 lb/sq. ft.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Stainless steel, 0.0387 inch thick.

2.10 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12 foot long, sections, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high end dams. Solder all joints. Fabricate from the following material:
1. Stainless Steel: 0.0356 inch thick.

2.11 FINISHES

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

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, 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.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. 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.

1. Coat side of uncoated stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

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. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

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

G. Fasteners: Use stainless-steel 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.

H. Seal joints with elastomeric sealant as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
1. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
2. Where surfaces to be soldered are lead coated, do not tin edges, but wire brush lead coating before soldering.
3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where

possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant. Solder all joints in stainless steel reglet flashing.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
1. Turn flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

E. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for appropriate wind zone and as indicated.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.

3.4 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 CLEANING AND PROTECTION

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

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

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

3.7 WASTE MANAGEMENT

A. Recycle waste metal materials in accordance with Division 1 “Construction Waste Management” requirements.

END OF SECTION 07620

SECTION 07710 - MANUFACTURED ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following manufactured roof specialties:
   1. Roof edge flashings.
   2. Prefabricated roof expansion joint covers.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for installing reglets.
   2. Division 4 Section "Unit Masonry Assemblies" for installing reglets.
   3. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
   4. Division 7 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
   5. Division 7 Section "Gutters and Downspouts" for perimeter drainage systems.
   6. Division 7 Section "Roof Expansion Assemblies" for manufactured roof expansion-joint cover assemblies.
   7. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   8. Division 7 Section "Joint Sealants" for field-applied sealants.

1.2 PERFORMANCE REQUIREMENTS

A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. FMG Listing: Manufacture and install copings and roof edge flashings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1- 90. Identify materials with FMG markings.

C. Thermal Movements: Provide manufactured roof specialties 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 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.

D. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Qualification data for manufacturer and qualified professional engineer licensed in the State of Maryland.

C. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer (licensed in Maryland); show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:

1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
2. Details for expansion and contraction.
3. Shop drawings must be computer-generated; hand prepared drawings will not be accepted.

D. Samples for Initial Selection: For each type of manufactured roof specialty indicated with factory-applied color finishes.

E. Fabrication Samples: For copings, roof edge flashings, and roof edge drainage systems made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of copings and roof edge flashings with performance requirements.

G. Warranty: Special warranty specified in this Section.

H. Material Safety Data Sheets (MSDS): For all applicable products to MCPS Environmental Health & Safety Division.

1.4 QUALITY ASSURANCE

A. 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 sightlines, 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, and in-service performance.
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.

B. Manufacturer Qualifications: Manufacturer capable of providing engineering and field service representation during construction.
1. Engineering Responsibility: Preparation of data for including the following:
a. Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of Maryland.
2. Company with a minimum of ten years of continuous experience manufacturing specified systems.
3. List of five other projects of similar size, including approximate date of installation and name of architect for each.

1.5 COORDINATION

A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Recycled Content: Give preference to maximized recycled content materials.

2.2 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.
b. Color: Custom to match Centria 181 Slate Gray.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.
b. Color: Custom to match Centria 181 Slate Gray.

2.3 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

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

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. 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.

2.5 COPINGS

A. Refer to Section 07620.

2.6 ROOF EDGE FLASHINGS

A. Canted Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on compression-clamped metal fascia cover in section lengths not exceeding 12 feet and a continuous formed aluminum sheet cant dam, 0.050 inch thick, minimum, with integral drip edge cleat.
   1. Fascia Cover: Fabricated from 0.050 inch thick aluminum sheet.
   2. Provide matching mitered and soldered corner units; field verify actual constructed angles for factory-fabricated project-specific prefabricated corners.
   3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

B. Fabricate and install roof edge flashing and copings capable of resisting forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 and as required by International Building Code 2012; as required by code, submit testing documentation and certification that machine used in fabricating tested assemblies will be same as used in fabricating assemblies for this Project.

2.7 PREFABRICATED ROOF EXPANSION JOINT COVER

A. Metal-Flanged, Bellows-Type Roof Expansion Assemblies: Provide manufacturer's standard assemblies of sizes and types indicated, with prefabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, coatings, and other components as recommended by roof expansion assembly manufacturer for complete installation. Fabricate expansion joints in continuous runs, without splices, where possible.

B. Provide assemblies consisting of exposed polymeric sheet over foam bellows, securely anchored at both edges to 3- to 4-inch wide sheet metal nailing flanges, either flat or angle

formed to fit cant or curbs as required. Insulate bellows with closed-cell, flexible rubber or plastic foam not less than 5/16 inch thick; adhere bellows to underside of polymeric sheet.

1. Available Products:
   a. Johns Manville; Expand-O-Flash.
   b. The roofing manufacturer.
2. Polymeric Sheet: EPDM, 60 mils thick, black.
3. Metal Flanges: Stainless steel, minimum 0.035 inch thick.
4. Moisture Barrier: Manufacturer's standard, flexible, continuous, polymeric moisture barrier looped under roof expansion assemblies at locations indicated. Fill space with blanket-type, mineral-fiber insulation.
5. Fire Barrier: Provide manufacturer's standard fire barrier at required locations.
   a. Device designed for dynamic structural movement without material degradation or fatigue when tested according to ASTM E 1399.
   b. Provide roof expansion assemblies with manufacturer's continuous, standard, flexible fire-barrier seals in back of joint system at locations indicated to provide fire-resistance rating not less than rating of adjacent construction.

2.8 FINISHES

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

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.
   1. Install manufactured roof specialties with provisions for thermal and structural movement.
   2. Torch cutting of manufactured roof specialties 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 manufacturer.
   1. Coat concealed side of uncoated aluminum manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.

D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but 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.

G. Seal joints with sealant as required by manufacturer of roofing specialties.

3.3 ROOF EDGE FLASHING INSTALLATION

A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.4 CLEANING AND PROTECTION

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

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07710

SECTION 07714 - GUTTERS AND DOWNSPOUTS

PART1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pre-fabricated aluminum gutters and downspouts.

B. Related Sections include the following:
   1. Division 7 Section "Sheet Metal Flashing and Trim" for flashings and other sheet metal work.
   2. Division 7 Section "Manufactured Roof Specialties" for fasciae and copings.
   3. Division 7 Section "Metal Roof Panels" for metal roofing systems.
   4. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. ASTM International: ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. Federal Specification Unit: FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

D. Sheet Metal and Air Conditioning Contractors' National Association, Inc.: SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

B. Product Data: Submit data on manufactured components, materials, and finishes.

C. Samples: Submit two samples, 24 inches long illustrating component design, finish, color, and configuration.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA Manual; maintain one copy of manual on site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack products to prevent twisting, bending, and abrasion, and to provide ventilation; slope to drain.

B. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 GUTTERS AND DOWNSPOUTS

A. Available Manufacturers:
   1. Berger Building Products Corp.

2. Metal-Era.
3. W.P. Hickman Company.

B. Product Description:
1. Gutters: SMACNA Rectangular style profile; Figure 1-2, Style F.
2. Downspouts: SMACNA round profile; Figure 1-32A.
3. Conductor Heads: SMACNA profile; Figure 1-25F.

2.2 COMPONENTS

A. Pre-Finished Aluminum Sheet:
1. ASTM B209, manufacturer's standard alloy and temper for specified finish; shop pre-coated with three coat PVDF (polyvinylidene fluoride) coating.
a. Gutters: 0.050 inch thick.
b. Downspouts: 0.050 inch thick.
2. Color: Match Architect's sample.

2.3 ACCESSORIES

A. Anchors and Supports: Profiled to suit gutters and downspouts.
1. Anchoring Devices: In accordance with SMACNA requirements.
2. Gutter Supports: Provide hidden brackets sized per SMACNA Table 1-8.
3. Downspout Supports - Typical: Brackets; SMACNA Figure 1-35E.

B. Strainers: 15 gage stainless steel wire baskets.

C. Fasteners: Aluminum or Stainless steel, with EPDM washers.

D. Protective Backing Paint: FS TT-C-494, Bituminous.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated.

B. Fabricate with required connection pieces.

C. Form sections to shape indicated on Drawings, square, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance; allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.5 FACTORY FINISHING

A. PVDF (polyvinylidene fluoride) Coating: Multiple coat, thermally cured, fluoropolymer system conforming to AAMA 2605.

B. Color: Custom to match Architect's sample.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready to receive gutters and downspouts.

3.2 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mils.

3.3 INSTALLATION

A. All gutters to be seamless.

B. Support Spacing:
   1. Gutters:
      a. Brackets: 36 inch o.c.
      b. Straps: 36 inch o.c. offset 18 inches o.c. of bracket locations.
   2. Downspouts: SMACNA Figure 1-35.

C. Flash and seal gutters to downspouts and accessories.

D. Slope gutters minimum 1/16 inch per foot.

E. Set downspouts plumb and not less than 1 inch from the wall.

F. Provide leaders to connect gutters on overhanging eaves to downspouts; set leaders with a slope not less than 1/16 inch per foot or more than 30 degrees below a horizontal line.

G. Fit leaders over the outlet tube in gutter bottom riveted to the downspout; rivet spacing shall be not more than 2 inches.

H. Set strainers loosely in the outlet tube opening in gutter.

I. Make joints between lengths of downspouts by telescoping the end of the upper lengths at least 3/4 inch into the lower length.

END OF SECTION

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Roof curbs.
   2. Equipment supports.
   3. Hatch-type heat and smoke vents; acoustical.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

D. Material Safety Data Sheets (MSDS): For all applicable products to MCPS Environmental Health & Safety Division.

1.3 QUALITY ASSURANCE

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

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

1.6 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
   1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes and roof expansion joints.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755.
   1. Galvanized Steel Sheet: ASTM A 653, G90 coated.
   2. Exposed Finishes:
      a. Roof Curbs, Equipment Curbs and Pipe Supports: Manufacturer's standard prime coat for field finish.

B. Steel Shapes: ASTM A 36, hot-dip galvanized to comply with ASTM A 123, unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

A. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.

C. 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.

D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

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

G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.

2.3 ROOF CURBS AND EQUIPMENT SUPPORTS

A. Roof Curbs and Equipment Supports: Provide metal roof curbs and equipment supports, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
   1. Load Requirements: As indicated on Drawings.
   2. Material: Galvanized steel sheet, 0.079 inch thick.
      a. Finish: Powder coat.
   3. Liner: Same material as curb, of manufacturer's standard thickness and finish.
   4. Factory install wood nailers at tops of curbs.
   5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   6. Factory insulate curbs with 1-1/2-inch- thick, glass-fiber board insulation.

7. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
8. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.4 HEAT AND SMOKE VENTS - ACOUSTICAL

A. Hatch-Type Heat and Smoke Vents: Manufacturer's standard double-leaf, hatch-type heat and smoke vents with integral double-wall insulated curbs and frame, with welded or sealed mechanical corner joints, integral condensation gutter, and cap flashing. Fabricate with insulated double-wall lid, continuous weathertight perimeter lid gaskets, and equip with automatic self-lifting mechanisms, UL-listed fusible links rated at 165 deg F, and corrosion-resistant or hot-dip galvanized hardware including hinges, hold-open devices, and independent manual-release devices for inside and outside operation of lids; unit to be provided with winch operated manual remote to be located on Stage - final location to be coordinated.
1. Available Manufacturers:
   a. Basis-of-Design: Nystrom; SVG 96 x 48 DX45W.
   b. Milcor; Model U-LP STC-45.
   c. Bilco Company (The); Type ACDSH.
2. Loads: Fabricate heat and smoke vent to withstand a minimum 40-lbf/sq. ft. external live load and 30-lbf/sq. ft. uplift.
   a. When release is actuated, lid shall open against 10-lbf/sq. ft. snow or wind load and lock in position.
3. Regulatory Requirements: UL 793 and NFPA 204.
4. Heat and Smoke Vent Compliance: Provide units that have been tested and UL listed.
5. Fire Resistance of Lids: UL Class A rating.
6. Integral Curb, Framing, and Lid Material: Galvanized steel sheet, 0.079 inch thick.
   a. Finish: Powder coat.
7. Insulation: Glass-fiber board.
8. Fabricate integral curbs to minimum height of 12 inches, unless otherwise indicated.
9. STC Rating: Minimum 45.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Curb Installation:
   1. Set roof curb so top surface of roof curb is level.

F. Equipment Support Installation:
   1. Set equipment support so top surface of equipment support is level.

G. Roof Hatch Installation:
   1. Check roof hatch for proper operation.
   2. Adjust operating mechanism as required.
   3. Clean and lubricate joints and hardware.

H. Seal joints with elastomeric or butyl sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

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

END OF SECTION 07720

SECTION 07815 - SPRAYED-ON FIREPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fireproofing of interior structural steel.

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

C. ASTM E736 - Standard Test Method For Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

D. ASTM E760 - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members.

E. ASTM E761 - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members.

F. ASTM E937 - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Shop Drawings: Structural framing plans indicating the following:
   1. Locations and types of surface preparations required before applying sprayed fire-resistive material.
   2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
      a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
      b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
      c. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified professional engineer.
   3. Treatment of sprayed fire-resistive material after application.

D. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, for:
   1. Bond Strength.
   2. Bond Impact.
   3. Density.
   4. Fire tests using substrate materials similar those on project.

E. Manufacturer's Certificate: Certify that sprayed-on fireproofing products meet or exceed requirements of contract documents.

F. LEED Submittals:

1. Credit EQ 4.2: Documentation of VOC content for primers and overcoats applied within the waterproofing envelope.
2. Credit MR 4: Documentation indicating percentages by weight of postconsumer and preconsumer recycled content; include statement indicating cost of each product having recycled content.

G. Manufacturer's Field Reports: Indicate environmental conditions under which fireproofing materials were installed.

1.4 FIELD CONDITIONS

A. Do not apply spray fireproofing when temperature of substrate material and surrounding air is below 40 degrees F.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.5 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.
1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carboline Company: www.carboline.com.
1. Concealed Applications: Pyrolite 15.
2. Exposed Applications: Pyrocrete 22.

B. Grace Construction Products: www.na.graceconstruction.com.
1. Concealed Applications: Monokote Type MK-6/CBF.
2. Exposed Applications: Monokote Type Z106.

C. Isolatek International Inc: www.isolatek.com.
1. Concealed Applications: Cafco 300.
a. Contractor Option: Cafco Blaze-Shield II.
2. Exposed Applications: Cafco 400.
a. Contractor Option: Cafco Blaze-Shield HP.

2.2 FIREPROOFING ASSEMBLIES

2.3 MATERIALS

A. Sprayed Fire-Resistive Material for Interior Applications: Manufacturer's standard factory mixed material, which when combined with water is capable of providing the indicated fire resistance, and conforming to the following requirements:
1. Bond Strength: 150 psf, minimum, when tested in accordance with ASTM E736 when set and dry.
2. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760.
3. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937.

4. Surface Burning Characteristics: Maximum flame spread of 0 and maximum smoke developed of 0, when tested in accordance with ASTM E84.

B. Provide UL fire-rated assemblies to hourly ratings as follows:
1. Interior columns: 2 hours.
2. Interior girders: 2 hours.
3. Interior floors: 2 hours.
4. Interior roof deck: 2 hours.

2.4 MATERIALS

A. Low Density Sprayed Fire-Resistive Material: Factory mixed, cementitious material blended for uniform texture with vermiculite or lightweight synthetic aggregate, and conforming to the following requirements:
1. Bond Strength: ASTM E 736, 200 psf when set and dry.
2. Bond Impact: ASTM E 760, no cracking, flaking or delamination.
3. Dry Density: ASTM E 605, minimum average density of 14 lb/cu ft, with minimum individual density of any test sample of 13 lb/cu ft.
4. Compressive Strength: ASTM E 761, minimum 7.0 psi.
5. Surface Burning Characteristics: Maximum flame spread of 0 and maximum smoke developed of 0, when tested in accordance with ASTM E 84.
6. Location: Concealed locations.

B. Medium Density Sprayed Fire-Resistive Material: Factory mixed, Portland cement blended for uniform texture with mineral aggregates or mineral fibers and additives, without chlorides, approved for exterior use and conforming to the following requirements:
1. Location: Exposed interior locations.

2.5 ACCESSORIES

A. Primer Adhesive: Of type recommended by fireproofing manufacturer; VOC content not to exceed 200 g/L.

B. Overcoat: As recommended by manufacturer of fireproofing material, VOC content not to exceed 200 g/L.

C. Metal Lath: Expanded metal lath; 3.4 lb/sq ft, galvanized finish.

D. Water: Clean, potable.

E. Paint at exposed structure/ceilings: Products accepted by manufacturer without detriments to required rating; two coats.

1. Basis-of-Design: Once coat Carboline A/D TC-55 sealer; one coat Carboline Carbocryilic 3359.

2. Apply as accepted by sprayed fire-resistive material manufacturer.

3. Color to be tinted to black at exposed structure at Auditorium.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.2 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in situations where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could affect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

E. Close off and seal duct work in areas where fireproofing is being applied.

3.3 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer adhesive in accordance with manufacturer's instructions.

C. Apply fireproofing in thickness and density necessary to achieve required ratings, with uniform density and texture.

D. Apply fireproofing in sufficient thickness to achieve required ratings, with as many passes as necessary to cover with monolithic blanket of uniform density and texture.

E. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

3.4 FIELD QUALITY CONTROL

A. The Construction Manager will provide independent third-party inspection of the installed fireproofing after application and curing for integrity, prior to its concealment. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.

B. Independent third-party inspector to re-inspect the installed fireproofing for integrity of fire protection, after installation of subsequent Work.

C. Repair or replace any damaged areas of fireproofing.

3.5 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems in compliance with local building codes and with the following ratings determined per ASTM E 814:
   1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
   2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
      a. Penetrations located outside wall cavities.
      b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

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

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Proposed through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For Installer.

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

F. LEED Report: Submit VOC content documentation for all adhesives, sealants and primers.

G. Material Safety Data Sheets (MSDS): For all applicable products to MCPS Environmental Health & Safety Division.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
b. Through-penetration firestop systems to correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
1) UL in its "Fire Resistance Directory."
2) Or another agency’s directory acceptable to authorities having jurisdiction.

D. Information Available On-Site: Maintain a complete file of project-specific Firestopping Shop Drawings and System Schedule on-site and available for inspection by Owner's testing agency, the Architect, and local authorities of jurisdiction.

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

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

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems required. Accessories include, but are not limited to, the following items:
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-/rock-wool-fiber insulation.

b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.2 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials required by firestop systems proposed for each condition. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
1. Comply with low-emitting requirements specified in Section 01616.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Fire Resistive Joint Sealants: Provide joint sealants with fire resistance ratings indicated, as determined per UL 2079 or (ASTM E1399, E1966 and E2307), but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions, VOC content not to exceed 200 g/L.

2.3 MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
   1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07841

SECTION 07842 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

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. Smoke seals.

B. Related Sections include the following:
   1. Division 1 Section “LEED Summary, Requirements and Goals” for additional LEED requirements.
   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.

1.2 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.

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.

1.3 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. LEED Submittals:
1. Credit EQ 4.1: Manufacturers' product data for sealant primers and sealants used on the interior of the building, including printed statement of VOC content.

F. Material Safety Data Sheets (MSDS): For all applicable products to MCPS Environmental Health & Safety Division.

1.4 QUALITY ASSURANCE

A. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

B. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

C. 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.

1.5 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 multi-component 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.

1.6 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.

1.7 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. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 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:
1. 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.
a. Sealants and Sealant primers: VOC content not to exceed 250 g/L.
2. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.
3. Holding Clips: Minimum 30 gage by 1 inch wide galvanized sheet steel Z-shaped clips to support safing insulation.

2.2 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BOARD INSULATION

A. Available Manufacturers:
1. Fibrex Insulations Inc.
2. Owens Corning.
3. Thermafiber.

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics.
1. Nominal minimum density of 4 lb/cu. ft
2. Fiber Color: Regular color, unless otherwise indicated.
3. Fiber Color: Darkened, where indicated.
4. Uses: Where indicated and as fire safing insulation.

C. Foil-Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612; faced on 1 side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5.
1. Nominal minimum density of 4 lb/cu. ft.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner may 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.

3.5 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 Substantial Completion. 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.

END OF SECTION 07842

SECTION 07900 - JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

1.02 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM C 834 - Standard Specification for Latex Sealants.

B. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications.

C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM C 1193 - Standard Guide for Use of Joint Sealants.

E. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell).

1.04 SUBMITTALS

A. See Section 01330 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

F. Qualification Data: For Installer.

G. LEED Report: Submit VOC content documentation for all sealants and primers.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.07 WARRANTY

A. Correct defective work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

C. Products shall provide manufacturer's maximum warranty offered for each product listed**.**

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sealants:
1. Bostik Inc: www.bostik-us.com.
2. Pecora Corporation: www.pecora.com.
3. BASF Construction Chemicals-Building Systems: www.chemrex.com.
4. Dow Corning Corporation.
5. GE Silicones.
6. Tremco.

B. Preformed Compressible Foam Sealers:
1. EMSEAL Joint Systems, Ltd: www.emseal.com.
2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.
3. Dayton Superior Corporation: www.daytonsuperior.com.

2.02 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants:
1. As selected by Architect from manufacturer's full range.
2. Allow custom colors for masonry joints.
3. Allow for four custom exterior custom colors including masonry joints.

C. VOC content not to exceed 250 g/L.

2.03 SEALANTS

A. Type LS-1 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
1. Color: Standard colors matching finished surfaces.

B. Type AS-1 - Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
1. Applications: Use for concealed locations only:
a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
b. Sealant between acoustical ceiling perimeter track and wall.

C. Single-Component Neutral- and Basic-Curing Silicone Sealant ES-1:
1. Products:
a. Dow Corning Corporation; 790.
b. Tremco; Spectrem 1 (Basic).
c. GE Silicones; SilPruf SCS2000.
d. Pecora Corporation; 864.
e. Polymeric Systems Inc.; PSI-641.
f. Sonneborn, Division of ChemRex Inc.; Omniseal.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
    a. Use O Joint Substrates: color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and brick.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-2:
1. Products:
    a. Pecora Corporation; 898.
    b. Tremco; Tremsil 600 White.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
    a. Use O Joint Substrates: color anodic aluminum aluminum coated with a high-performance coating galvanized steel and ceramic tile.

E. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant ES-3:
1. Products:
    a. Dow Corning Corporation; 786 Mildew Resistant.
    b. GE Silicones; Sanitary SCS1700.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
    a. Use O Joint Substrates: color anodic aluminum, aluminum coated with a high-performance coating, and ceramic tile.

F. Multicomponent Nonsag Urethane Sealant ES-4:
1. Products:
    a. Pecora Corporation; Dynatrol II.
    b. Tremco; Dymeric 240/240FC.
    c. Tremco; Vulkem 921.
2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
    a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, ceramic tile, and wood.

G. Multicomponent Nonsag Urethane Sealant ES-5:
1. Products:
    a. Sonneborn, Division of ChemRex Inc.; NP 2.
    b. Equal product by other listed manufacturer.
2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

6. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and brick.

2.04 PREFORMED JOINT SEALERS

A. Type PS-1 - Exterior Expansion Joint Sealer: Precompressed foam sealer; factory-applied and cured silicone facing.
   1. Face color: Custom to match veneer material; to be selected by Architect.
   2. Size as required to provide weathertight seal when installed.
   3. Provide product recommended by manufacturer for traffic-bearing use.
   4. Product: Colorseal manufactured by EMSEAL.
   5. Applications: Use for:
      a. Exterior wall expansion joints.

2.05 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Secondary Joint Backing: Precompressed foam sealer; urethane with water-repellent.
   1. Size as required to provide weathertight seal when installed.
   2. Product: Backerseal manufactured by EMSEAL.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

F. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 EXECUTION

3.03 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C 1193.

C. Perform acoustical sealant application work in accordance with ASTM C 919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

3.06 SCHEDULE

A. Joint-Sealant Application JS-1: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
   1. Joint Sealant: ES-1 or ES-4.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

B. Joint-Sealant Application JS-2: Exterior horizontal traffic isolation and contraction joints in cast-in-place concrete slabs.
   1. Joint Sealant: ES-5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

C. Joint-Sealant Application JS-3: Exterior vertical control and expansion joints in unit masonry.
   1. Joint Sealant: ES-1 or ES-4.
   2. Joint-Sealant Color: Maximum of four custom colors.

D. Joint-Sealant Application JS-5: Exterior vertical joints between different materials listed above.
   1. Joint Sealant: ES-1 or ES-4.
   2. Joint-Sealant Color: Maximum of four custom colors.

E. Joint-Sealant Application JS-6: Exterior perimeter joints between masonry and frames of doors, windows, and louvers.
   1. Joint Sealant: ES-1 or ES-4.
   2. Joint-Sealant Color: Maximum of four custom colors.

F. Joint-Sealant Application JS-7: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
   1. Joint Sealant: ES-4.
   2. Joint-Sealant Color: To be field painted.

G. Joint-Sealant Application JS-8: Interior perimeter joints of exterior openings.
   1. Joint Sealant: ES-2 or ES-3.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

H. Joint-Sealant Application JS-9: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
   1. Joint Sealant: ES-2 or ES-3.

2. Joint-Sealant Color: Maximum of two custom colors.

I. Joint-Sealant Application JS-10: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
   1. Joint Sealant: ES-2 or ES-3.
   2. Joint-Sealant Color: White.

J. Joint-Sealant Application JS-11: Vertical joints on exposed surfaces of interior unit masonry and concrete walls.
   1. Joint Sealant: ES-4.
   2. Joint-Sealant Color: To be field painted.

K. Joint-Sealant Application JS-12: Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
   1. Joint Sealant: LS-1.
   2. Joint-Sealant Color: To be field painted.

L. Joint-Sealant Application JS-13: Preformed exterior expansion joints without cover.
   1. Location: Where designated on drawings.
   2. Joint Sealant: PS-1, where indicated to produce a finished color.

END OF SECTION 07900