

SECTION 07112

BITUMINOUS WATERPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and Division 1 Specifications Sections apply to the work of this Section.

1.02 RELATED WORK

- A. Section 01340 - Shop Drawings, Product Data and Samples
- B. Section 04200- Unit Masonry
- C. Section 07265- Liquid Applied Air Barrier
- D. Section 07910- Through Penetration Protection Systems

1.03 REFERENCED STANDARDS

- A. Brush and Spray Applied Membrane: ASTM D1227, Type 3, Class 1.
- B. Shore A Hardness: ASTM C836
- C. Tensile Strength: ASTM D412
- D. Elongation: ASTM D412
- E. Permeability: ASTM E96, Method B
- F. Water Absorption: ASTM D1970
- G. Flexibility: ASTM D146

1.04 DESCRIPTION OF WORK

- A. Extent of waterproofing work is shown on the Drawings
- B. Type and Application of Work: Below grade cold-applied fluid waterproofing membrane.

1.05 QUALITY ASSURANCE

- A. General: For each type of work, obtain primary waterproofing materials from a single manufacturer. Provide secondary materials only as manufactured or recommended by manufacturer of primary materials.
- B. Installer: A firm which has specialized in application of waterproofing systems, including the type specified in this Section, for a minimum of three years. Installer shall be acceptable to the manufacturer of primary waterproofing materials.
- C. Mock-Ups:
 - 1. Construct mock-up in accordance with Drawings and Section 04200.
 - 2. Include mock-up of product on both footer and CMU substrates.

1.06 PRE-INSTALLATION CONFERENCE

- A. Conduct pre-installation conference in accordance with Section 01200.
- B. Agenda:
 - 1. Review project specification and drawings.
 - 2. Establish installation schedules and sequence.
 - 3. Coordinate work with in-place and subsequent construction.
 - 4. Review weather and working conditions.
 - 5. Review installation procedures, including:
 - a. Substrate requirements for project acceptance (curing of concrete surface, form release agents, temperature).
 - b. Material installation.
 - c. Phasing and sequencing requirements.
 - d. Termination, flashing, expansion joint and penetration requirements.
- C. Conduct tour of areas to receive air barriers and report on surface acceptance, possible problem areas and recommend remedies.

1.07 SUBMITTALS

- A. General: Comply with Section 01340, Shop Drawings, Product Data and Samples.
- B. Product Data: Submit manufacturer's specifications for each type of product or material required. Include data substantiating that materials comply with the requirements of this Section.
- C. Submit MSDS information for each component of waterproofing membrane, as applicable.
- D. Provide manufacturer's written installation instructions.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver waterproofing materials to site in original, unopened packaging, with all identifying labeling intact.
- B. Store materials in a secure area in a cool, clean and dry location. Do not expose material in containers to freezing conditions. Store protection course sheets on pallets above ground.

1.09 WARRANTY

- A. Membrane shall be watertight and shall not deteriorate in excess of limits published by the manufacturer. Entire installation shall have a five (5) year warranty.

PART 2 - PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Provide waterproofing materials that meet or exceed the following performance criteria, or provide comparable products, which are certified in writing by the manufacturer of primary waterproofing materials to meet or exceed referenced standards listed in this Section, for type of membrane and application indicated:
 - 1. 40-50 Shore A hardness (ASTM C836)
 - 2. 15 PSI tensile strength (ASTM D412)
 - 3. 1500% elongation (ASTM D412)
 - 4. .03 perms (ASTM E96)
 - 5. Water absorption: 0.7% @ 72 hours (ASTM D1970)
 - 6. Passes ASTM D146 for flexibility @ -20°

2.02 APPROVED MANUFACTURERS

- A. W. R. Meadows, Inc., (www.wrmeadows.com), shall be the basis of specification.
- B. Other manufacturers, pre-bid approved per section 01630, demonstrating compliance with the requirements of this Section and the Drawings shall be acceptable.

2.03 MATERIALS

- A. Waterproofing Membrane: "MEL-ROL-LM" single component, water-based, polymer modified, cold applied liquid waterproofing membrane.
- B. Primer (for concrete and CMU surfaces): "Sealtight MEL-ROL-LM" diluted with water per manufacturer's recommendations.
- C. Patching Compound: "Meadow Patch 5" or "Meadow Patch 20."
- D. Waterproofing Protection; W. R. Meadows Protection Course, Type PC-2, Standard Duty, 125 mil (1/8") thick, multi-ply, semi-rigid, mineral fortified asphaltic core with outside layers of asphalt impregnated, reinforced mats. Complies with ASTM D6506.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Contractor shall examine substrates and conditions under which waterproofing work shall be performed. Notify Architect and Owner's Representative in writing of any unsatisfactory conditions encountered that would impair proper installation and performance of waterproofing membrane. Do not proceed with installation until the unsatisfactory conditions have been corrected.

3.02 ENVIRONMENTAL CONDITIONS

- A. Do not apply primer or membrane when rainfall is forecast within 4 hours.
- B. Do not apply primer or membrane when temperatures are expected to fall below 40°F within 4 hours of completed installation.

3.03 PREPARATION

- A. All surfaces to receive installation shall be clean and free of projections, reasonably smooth, and free of foreign substances.
- B. Patch all cracks, voids, irregularities and deformities with patching compound. Allow to dry for minimum time recommended by the manufacturer.
- C. Prime substrates in accordance with membrane manufacturer's written instructions. Allow primer to dry for the minimum time recommended by the manufacturer.

3.04 INSTALLATION

- A. Mechanically mix liquid membrane thoroughly prior to application.

- B. Follow manufacturer's written installation instructions. Apply in coverage sufficient to provide a minimum of 45 mil dry film thickness. Frequently inspect surface with wet mil gauge to ensure consistent thickness.
- C. Protection Course: Ensure that completed membrane is clean and relatively smooth prior to installation. Adhere protection course to membrane as soon as possible after membrane application. Protection course sheets shall be butted together as tightly as possible with no large voids.

3.05 CLEAN UP

- A. Remove all excess materials, packaging and other debris from the work area and dispose of legally.

END OF SECTION

SECTION 07115

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Cold-applied, cut-back asphalt dampproofing.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers including printed statement of VOC content.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.05 PROJECT CONDITIONS

- A. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.01 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ChemMasters Corp.
 - 2. Degussa Building Systems; Sonneborn Brand Products.
 - 3. Gardner Gibson, Inc.

4. Henry Company.
 5. Karnak Corporation.
 6. Koppers Inc.
 7. Malarkey Roofing Products.
 8. Meadows, W. R., Inc.
 9. Tamms Industries, Inc.
- B. Trowel Coats: ASTM D 1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- D. VOC Content: 0.25 lb/gal. (30 g/L) or less.

2.02 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
 2. Test for surface moisture according to ASTM D 4263.

3.02 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

- C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections.

3.03 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.
 - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
- B. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior masonry single-wythe masonry walls unless walls are indicated to receive direct application of paint.
 - 1. Continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by delaying construction of intersecting walls until dampproofing is applied.
- C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Interior Face of Single-Wythe Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).
- B. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.05 CLEANING

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

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 04200: Unit Masonry (cavity walls).
- B. Section 07265: Liquid Applied Air Barrier
- C. Section 07510: Built Up Roofing with Gravel Ballast and Insulation.
- D. Section 09110: Non-Load Bearing Wall Framing Systems.
- E. Section 10652: Folding Panel Partition (Sound Barrier above the track).

1.03 QUALITY ASSURANCE

- A. The thicknesses indicated are for thermal conductivity (K value at 75 degrees F) as specified for each material. Provide adjusted thicknesses as directed for the use of material having a different thermal conductivity.
- B. Pre-installation Meeting: Prior to commencement of installation of exterior rigid insulation, review and document methods and procedures related to installation, including the following:
 - 1. Participants: Authorized representatives of the Contractor, [Construction Manager] [Owner], Architect, [Engineer], Applicator, Independent Inspector and Manufacturer.
 - 2. Review metal wall framing assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
 - 3. Review insulated sheathing methods and procedures related to application, including manufacturer's installation guidelines Thermal and Air Barrier Wall System.
 - 4. Review construction schedule and confirm availability of products, applicator personnel, equipment and facilities.
 - 5. Confirm air barrier systems are compatible with cavity wall rigid insulation.

6. Review field quality control procedures.

1.04 REFERENCE STANDARDS

- A. ASTM E84 - Test for Surface Burning Characteristics of Building Materials.
- B. ASTM C-665 - Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).
- C. ASTM C-578 - Rigid Polystyrene Insulation.
- D. ASTM E96/E96M-[05]: Test Method for Water Vapor Transmission of Materials.
- E. ASTM E331-[00]: Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- F. NFPA 285 [2006]: 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

1.05 SUBMITTALS

- A. Manufacturer's Literature: Descriptive data, installation instructions and four physical samples [size: 12" square].
- B. Reports: Submit Test Reports, summarized by Manufacturer of material(s), verifying qualities of thermal and air barrier wall system components meet or exceed specified requirements.
 - 1. Include results of ASTM E2357 air barrier system testing and ASTM E331 water penetration tests.
 - 2. Submit Field Inspection and Test Reports in accordance with Field Quality Control requirements in accordance with Section 01400.
- C. Cradle-to-Cradle Certification for rigid, perimeter, and slab insulation

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original unopened packaging.
- B. Identify contents, manufacturer, brand name, thermal values and applicable standards.
- C. Store materials in area protected from weather and moisture. Materials exposed to inclement weather will be rejected.

- D. Remove damaged material from site and replace same at no additional cost to the Owner.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation when temperature is 40°F or below, during rain or wet weather or when surfaces are wet.

1.08 WARRANTY

- A. Provide written warranty that the actual thermal resistance of the extruded polystyrene foam insulation will not vary by more than 10% from its published thermal resistance.

PART 2 - PRODUCTS

2.01 MINERAL FIBER (BATT-TYPE) BLANKET INSULATION

- A. Fully Concealed Applications (Enclosed metal stud or furring assemblies): Glass or other inorganic fiber and resinous binders formed into flexible blankets or semi-rigid sheets, complying with ASTM C-665; Type I, Class A; density of not less than 1.5 pounds per cubic foot; thermal conductivity of 0.27, of thickness indicated or as necessary to completely fill voids indicated on Drawings.
- B. Exposed or Semi-Exposed Applications (Ceiling/Plenum spaces): All batt insulation shall be "FR" type (fire resistant faced foil), ASTM C-665, type III, class A.
- C. Sound barrier assemblies above the folding partition track head to consist of 5/8" gyp board on both sides to extend from ceiling to underside of structure above. Provide batt insulation pack tight inside the wall to achieve STC wall rating of the same as the Folding Partiton (51 STC)

2.02 SOUND ATTENUATION BATTS

- A. Flexible blankets of glass or other inorganic fiber, unfaced, complying with ASTM C-665, Type I, and ASTM E-136. Sound attenuation batts in rated assemblies shall also comply with ASTM E-119.

2.03 CAVITY WALL RIGID INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, with Class A Rating- maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84. All locations shall use 1.75" thickness unless specifically noted otherwise. R-value at 75 degrees F: R-9.8. Shall meet the following physical properties:

1. Water absorption: Max. 0.1% by volume (ASTM C 272-91 (96)).
 2. Thermal resistance: R-values of 5.6 min. per inch °F-ft²-h/Btu²/inch at 75 °F (ASTM C 518-98).
 3. Surface Burning Characteristics (ASTM E-84)
 - a. Flame spread: 0.
 - b. Smoke Developed: 155.
 4. Comply with ASTM C 578-95, Type IV, density 1.6 lb/cu. ft. min. compressive resistance 25 psi (ASTM D 1621-94).
 5. Cavity wall rigid insulation shall be installed over air barrier, see specification section 07265.
 6. Board size: 15 3/4"x96"
 7. Edge Treatment: Square Edge
 8. Adhesive and Joint Sealant
 - a. Adhesive: type recommended by insulation manufacturer.
 - b. DuPont GREAT STUFF PRO™ Gaps & Cracks single component insulating expanding foam sealant.
 9. "Cavitymate Ultra™" XPS foam insulation; DuPont, "Cavitymate Ultra Cavitycut Exterior extruded polystyrene Insulation" (www.dupont.com).
 10. Other manufacturers complying with this specification and approved in accordance with Section 01630, shall be acceptable.
- B. Use at masonry wall cavities, and other locations indicated on Drawings as "rigid insulation", with the exception of roof, steel stud backup wall, foundation perimeter, and slab insulations.

2.04 STEEL STUD RIGID INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84. All locations shall use 1.75" thickness unless specifically noted otherwise. R-value at 75 degrees F: R-9.8. Shall meet the following physical properties:
1. Water absorption: Max. 0.1% by volume (ASTM C 272-91 (96)).

2. Thermal resistance: R-values of 5.6 min. per inch °F-ft²-h/Btu²/inch at 75 °F (ASTM C 518-98).
 3. Surface Burning Characteristics (ASTM E-84)
 - a. Flame spread: 0.
 - b. Smoke Developed: 155.
 4. Comply with ASTM C 578-95, Type IV, density 1.6 lb/cu. ft. min. compressive resistance 25 psi (ASTM D 1621-94)
 5. Cavity wall rigid insulation shall be installed over air barrier, see specification section 07265.
 6. "Cavitymate Ultra™" brand insulation; DuPont, "Cavitymate **Ultra SL** Exterior extruded polystyrene Insulation." (www.dupont.com).
 7. Board size: 48"x96" (ship lap edges on long dimension).
 8. Other manufacturers complying with this specification and approved in accordance with Section 01630, shall be acceptable.
- B. Use at steel stud backup wall and other locations indicated on Drawings as "rigid insulation", with the exception of roof, masonry wall cavities, foundation perimeter, and slab insulations.
- C. JOINT FLASHING
1. Foam: Provide insulation manufacturer's recommended board joint foam for sealing joints, seams and veneer tie penetrations through the insulation layer.
 - a. DuPont GREAT STUFF PRO™ Gaps & Cracks single component insulating expanding foam sealant.
 - b. The DuPont Liquid Armor™ liquid applied flashing at 50mils wet (See manufacture for install guidelines).

2.05 PERIMETER SLAB INSULATION

- A. Extruded Polystyrene board: Extruded boards complying with ASTM C-578-92, Type IV, density 1.6 lb/cu. ft. min., with minimum compressive strength of 25 pounds per square inch (psi) when tested in accordance with ASTM D1621. All locations shall use 2" thickness unless specifically noted otherwise. R-Value at 75 degrees F: 10.0

1. "Styrofoam" brand insulation; DuPont, "Scoreboard Extruded Polystyrene Foam Insulation" (www.dow.com/Styrofoam).
 2. Other manufacturers complying with this specification and approved in accordance with Section 01630 shall be acceptable.
- B. Use at foundation perimeters and other locations indicated on Drawings as "perimeter slab insulation."
- 2.06 FIRESAFING INSULATION
- A. Mineral Wool Batt: ASTM C-665, Type 1, unfaced; USG "Thermafiber" SAFB or comparable (www.usg.com).
 - B. Foam Seal: Silicone - Dow Corning 3-6548.
- 2.07 EXPANDING FOAM INSULATION
- A. Expanding polyurethane base foam prepackaged in metal aerosol containers.
- 2.08 MECHANICAL FASTNERS
- A. Acceptable Products for Steel Stud Wall Insulation:
 1. Rodenhouse Inc "Thermal-Grip Insulation Fasteners" with 2 inch diameter solid faced high-grade plastic washers
 2. Wind-lock Corporation "ci-Lock Steel Series Selection" with 1-3/4 inch diameter high-grade plastic washers
 - B. As recommended by insulation manufacturer.
 - C. Minimum length 1/2 inch longer than insulation thickness.
- 2.09 ADHESIVES
- A. As recommended by insulation manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas to receive rigid building insulation to ensure that preceding work is completed, and that such work will not adversely affect the installation. Notify the Architect and Owner's Representative of any adverse conditions that have been observed.

- B. Check surfaces to receive rigid building insulation to ensure uniform plane; and those surfaces are free of mortar chips, debris, grease, oil or other items detrimental to installation.
- C. Proceed with application of insulation only when adverse conditions have been corrected to the satisfaction of the Architect and Owner's field representative.

3.02 INSTALLATION

- A. Follow Manufacturer's written recommendations for installation of foundation perimeter and cavity wall insulation. Install insulation with close, tight joints, with the vapor barrier to the warm side, to form a complete and unbroken seal over the entire area to be insulated. Provide clips, wire pins, brackets, adhesive mastics, tape and other mechanical devices recommended by the manufacturer of the insulation to ensure a permanent and secure installation.
- B. Extend insulation full thickness over entire surface to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation and mastic.
- C. Exercise care to prevent damage and soiling of faces on insulation units exposed to view. Align joints accurately, with adjoining surfaces set flush.
- D. Tape joints and ruptures in vapor barriers, using adhesive tape of type recommended by insulation manufacturers. Seal each continuous area of insulation to surrounding construction to ensure vapor-tight installation of the units.
- E. Completely pack voids between top of walls and flutes of roof decking with firesafing insulation.
- F. After installation, in-place insulation shall be inspected by the Architect and Owner's Representative, before installation of subsequent work which will conceal the insulation from view.

3.03 CLEAN-UP

- A. Remove insulation adhesive splatters and smears from exposed surfaces.
- B. Remove debris related to work of this Section from project site and dispose of legally.
- C. Leave work areas in clean condition.

END OF SECTION

INSTRUCTIONS FOR EDITING

SECTION 07216

CONTINUOUS INSULATED WALL SHEATHING

1. Before using this material, discuss with owner and receive advance approval.
2. Edit paragraph 2.02A for project requirements.
3. Edit paragraph 2.03A for project requirements.

SECTION 07216

CONTINUOUS INSULATED WALL SHEATHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Continuous insulation Xci Ply wall panels.

1.02 RELATED SECTIONS

- A. Section 03300- Cast In Place Concrete: Concrete base wall.
- B. Section 04200- Unit Masonry.
- C. Section 5400-Cold Formed Metal Framing
- D. Section 07265- Liquid Applied Air Barrier.
- E. Section 07416- Exterior Wall and Soffit Panels.
- F. Section 09110-Non Load Bearing Wall Systems.
- G. Section 09250- Gypsum Wallboard.

1.03 REFERENCES

- A. ASTM C 209 – Methods of Testing Insulating Board, Structural and Decorative.
- B. ASTM C 1289 – Specifications for Faced Rigid Cellular Polyisocyanurate Thermal Insulating Board.
- C. ASTM D 1621 – Test Methods for Compressive Properties of Rigid Cellular Plastics.
- D. ASTM D 2126 - Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- E. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E 96 - Test Method for Water Vapor Transmission of Materials.
- H. CAN/ULC S770 - Standard Test Method for Determination of Long Term Thermal Resistance of Closed Cell Plastic Thermal Insulating.

- I. NFPA 285 - Standard Fire Test Method for Evaluation Of Fire Propagation Characteristics Of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 DESIGN REQUIREMENTS

- A. Perform work in accordance with all federal, state and local codes.
- B. Physical properties (Foam Core):
 1. Compressive Strength: ASTM D 1621; Grade 2, 20 psi (138 kPa) minimum or Grade 3, 25 psi (172 kPa).
 2. Dimensional Stability: ASTM D 2126, 2 percent linear change (7 days).
 3. Moisture Vapor Permeance: ASTM E 96, less than 1 perm (57.5ng/(Pa•s•m²)).
 4. Water Absorption: ASTM C 209, less than 0.1 percent by volume.
 5. Service Temperature: Minus 100 degrees to 250 degrees F (Minus 73 degrees C to 122 degrees C).
 6. Resistance to Mold: ASTM D 3273 Passed (10).
- C. Fire Retardant Treated Plywood: Flame spread rating of 25 or less when tested in accordance with ASTM E 84.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01340.
- B. Product Data: Manufacturer's data sheets on wall panels and fasteners to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Manufacturer's Certificate: Certify panels will conform to specified performance requirements.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be company that regularly manufactures and assembles specified insulation in house with no outside fabrication operations.
- B. Pre-installation Meeting: Convene minimum one week prior to commencing Work of this section. Review installation procedures and coordination required with Related Work and include the following:
 - 1. Participants: Authorized representatives of the Contractor, Architect, Installer, Manufacturer and Owner Representative.
 - 2. Review wall assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
 - 3. Review continuous insulation wall panels installation methods and procedures related to application, including manufacturer's installation guidelines.
 - 4. Review firestopping requirements and weather resistive membrane requirements and placement locations.
 - 5. Review field quality control procedures.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store products in products off the ground, in dry conditions, under cover and in manufacturer's unopened packaging until ready for installation.

1.08 SEQUENCING

- A. Coordinate with the installation of vapor retarders and air seal materials specified.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.09 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Insulating panels shall be XCI products produced by Hunter Panels, 15 Franklin Street, Portland, Maine 04101. ASD. Phone: (207) 761-5678 or (888) 746-1114. Fax: (207) 775-1769. E-mail: info@hpanels.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01630.

2.02 BOARD INSULATION

- A. Board Insulation Bonded to Plywood: Hunter Panels Xci Ply are a high thermal resistive rigid insulation panel composed of a closed cell polyisocyanurate foam core bonded on one side to a premium performance coated glass facer on one side and fire treated plywood on the other.
 - 1. Type: ASTM C 1289, Type V:
 - a. Grade 3 (25 psi).
 - 2. Fire Retardant Treated Plywood Thickness:
 - a. 5/8 inch.
 - 3. Panel Size:
 - a. 4 feet by 8 feet (1220 mm by 2440 mm).
 - 4. Thickness/ R Value: Long Term Thermal Resistance Values based on ASTM C 1289 and CAN/ULC S770 with a 15-year time weighted average.
 - a. 2.6 inches (66 mm)/ R Value 12.7.
 - b. Provide to the thickness indicated on the Drawings.

2.03 APPLICATION

- A. NFPA 285 Exterior Wall Assembly-Concrete Masonry.
 - 1. Base Wall System: Concrete Masonry Wall or metal studs.
 - 2. Approved Exterior Finish:
 - a. Metal Composite Material: Use any Metal Composite Material system that has been successfully tested by the panel manufacturer via the NFPA 285 test method. Any standard installation technique can be used.
 - 3. Panel Thickness: 2.625 inches maximum.
 - 4. Stud Cavity: Any non-combustible insulation.

5. Exterior Sheathing: Not Applicable.

2.04 PANEL FASTENERS

- A. Fasteners shall be approved TRUFAST Tru-Grip Fluted Concrete Nail fasteners. Fasteners are a corrosion resistant type with oversized heads. Length of fasteners shall be as recommended by the panel manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until exterior walls have been properly prepared.
- B. Verify that all exterior wall assembly construction has been completed to the point where the insulation may correctly be installed.
- C. Verify that mechanical and electrical services in walls have been installed and tested and, if appropriate, verify that adjacent materials and finishes are dry and ready to receive insulation.
- D. If wall assembly preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Install in exterior spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.
- E. Exposed insulation must be protected from open flame and kept dry at all times.
- F. Install air barriers over insulation panels as specified in Section 07265.

- G. Install weather resistant barriers over insulation panels as specified in Section 07416.
- H. Exterior wall insulation is not intended to be left exposed for extended periods of time in excess of 45-60 days without adequate protection. If extended exposure is anticipated all exposed foam surfaces including corners, window and door openings, should be taped with a compatible waterproof tape.
- I. Install exterior cladding as recommended by the cladding manufacturer and as specified in other sections of this specification

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Cover the top and edges of unfinished roof panel work to protect it from the weather and to prevent accumulation of water in the cores of the panels.
- C. Do not leave panels exposed to moisture. Wet panels shall be removed or allowed to completely dry prior to application of vapor barrier and/or roof covering.
- D. Repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07236

AUTOMATIC SMOKE VENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 07510 — 4 ply Built-up Roofing with Gravel Ballast and Insulation.

1.03 SUBMITTALS

- A. Submit shop drawings indicating materials, methods of fabrication and requirements for anchoring to adjacent and supporting construction.
- B. Submit manufacturer's product data, including catalog sheets and technical information.

1.04 WARRANTY

- A. Provide five (5) year written guarantee on installation labor and hatch.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Bilco Company (The), Model ACDSV 60120 (5'-0" x 10'-0") Acoustical, Basis-of- Design Product.
- B. Babcock-Davis; a Cierra Products Inc. Company
- C. Milcor, Inc.
- D. Nystorm Inc.
- E. Other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

2.02 PRODUCT DESCRIPTION

- 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 degrees F (74 degrees C) smoke-detection system, 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 identified on shop drawing approved plans.
- B. Product Features:
1. Loads: Fabricate heat and smoke vent to withstand a minimum 40-lbf/sq.ft.(1.9-kPa)external liveloadand30-lbf/sq.ft.(1.4-kPa)uplift.
 - a. When release is actuated, lid shall open against 10-lbf/sq. ft. (0.5- kPa) snow or wind load and lock in position.
 2. Regulatory Requirements: UL 793 and NFPA 204.
 3. Heat and Smoke Vent Compliance: Provide units that have been tested and UL listed.
 4. Fire Resistance of Lids: UL Class A rating.
 5. Integral Curb, Framing, and Lid Material: G-90 galvanized coated steel sheet, 0.079 inch (2.0 mm) thick.
 - a. Finish: High-performance organic coating.
 6. Insulation: Polyisocyanurate board.
 7. Fabricate integral curbs to minimum height of 12 inches, unless otherwise indicated.
 8. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curbs with height tapered to match slope to level tops of units.
 9. STC Rating: Minimum 45.
 10. Provide fall protection at two open sides of vents.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect the locations where vent(s) shall be installed. Verify that openings are properly constructed, and that adjacent supporting substrates are clean, dry and free of foreign matter. Notify Owner's Representative and Architect if any adverse conditions are encountered that would interfere with proper installation. Do not proceed until such conditions have been corrected.

3.02 INSTALLATION

- A. Install vents(s) in accordance with manufacturer's written installation instructions. Securely attach to supporting substrates.
- B. Smoke Vent Installation: Locate, install, and test heat and smoke vents according to NFPA 204.
 - a. Check heat and smoke vent for proper operation. Adjust operating mechanism as required.

END OF SECTION

INSTRUCTIONS FOR EDITING

SECTION 07240

EXTERIOR INSULATION AND FINISH SYSTEM

(CLASS PB – Polymer Based)

1. Class PB Systems shall be acceptable only in locations not subject to direct abuse (6'-0" minimum above finished grade). Only Class PM Systems (Section 07241) will be acceptable below this level.
2. Indicate expansion joints on the Drawings in conformance with the following criteria:
 - a. Where expansion occurs in the substrate.
 - b. Where the EIFS system abuts dissimilar materials.
 - c. At changes in substrates.
 - d. At intervals not exceeding 75 feet for continuous surfaces.
 - e. At areas of structural movement.

SECTION 07240

EXTERIOR INSULATION AND FINISH SYSTEM (Class PB – Polymer Based)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including Division 1 Specification Sections, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

- A. Provide all labor, materials equipment and labor necessary to install the exterior insulation and finish system (EIF System-Class PB) indicated on the drawings.
- B. Related work specified elsewhere:
 - 1. Unit Masonry: Section 04200.
 - 2. Exterior Insulation and Finish System (Class PM): Section 07241.
 - 3. Sealants: Section 07900.
 - 4. Metal Studs, Furring, and Accessories: Section 09110.
 - 5. Gypsum Sheathing: Section 09250.
- C. General System Description:
 - 1. The exterior insulation and finish system shall be a field applied system consisting of expanded polystyrene insulation board (EPS), glass fabric reinforcing mesh, mechanical anchors, base coat, and finish coat(s).
 - 2. The following is not acceptable:
 - a. Non-mechanical adhesive systems (Exception: adhesive systems shall be acceptable for application over existing glass block).

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide only products supplied by a single EIFS manufacturer, purchased directly from the Manufacturer or its authorized distributor.
- B. Qualifications
 - 1. EIF Manufacturer:

- a. Shall have marketed exterior insulation and finish systems in the United States for at least 10 years.
 - b. Shall have a record of satisfactory completion of at least 1,000 projects utilizing the specified EIF system(s).
 - c. Shall be a member of the Exterior Insulation Manufacturer's Association (EIMA) and shall comply with EIMA Guide Specifications and Standards for PB Systems.
 - d. Shall have been approved for use by the following Model Building Code organizations in published research or compliance reports:
 1. BOCA ES
 2. ICBO ES
 3. SBCCI (Southern Building Code Congress International) PST and ESI
2. Insulation Board Manufacturer:
- a. Shall be listed by the approved Manufacturer and capable of producing the expanded polystyrene (EPS) in accordance with EIFS Manufacturer's specifications.
 - b. Shall participate in the EIFS Manufacturer's third party certification and quality assurance program.
3. Applicator:
- a. Shall have trained and approved in the installation of the approved system(s).
 - b. Shall process a current certificate of membership in approved manufacturers trained network of applicators.
 - c. Shall be experienced and competent in the installation of Class PB EIF Systems.
4. Performance Requirements:
- a. The EIF System shall have been tested for durability and shall have passed based on the following test procedures:
 1. Abrasion Resistance: ASTM D968 after 500 Liters.
 2. Absorption Freeze/Thaw Resistance: EIMA 101.01 (modified ASTM C67); 60 cycles.

3. Accelerated Weathering: ASTM G23; 2000 hours.
 4. Mildew Resistance: MIL STD 810B or ASTM D3273.
 5. Moisture Resistance: ASTM D2247, 14 day exposure.
 6. Salt Spray: ASTM B117, 300 hours.
 7. Water Penetration: EIMA 101.02 (modified ASTM E331).
 8. Water Vapor Transmission: ASTM E96, Procedure B.
- b. The EIF System shall have been tested for structural Performance as follows:
1. Impact resistance: EIMA 101.86, Ultra-High (>150 in-lbs, >17.1J).
 2. Full Scale Structural Tests: ASTM E330.
- c. The EIF System shall have been tested for fire characteristics as follows:
1. Flame Spread/Smoke Development (ASTM E84):
 - a. Adhesives and coatings: Less than 20 and less than 10 respectively.
 - b. Insulation Board: Less than 25 and less than 450 respectively.
 2. ASTM E108 (Modified): No significant contribution to flame spread (horizontally or vertically).
 3. ASTM E119: No effect on rating of wall assemblies (where applicable).

1.04 SUBMITTALS

A. Samples:

1. Submit samples of EIF System for approval prior to beginning work. Minimum size of samples shall be 12" X 12". Samples shall clearly indicate each component of the system and shall be of suitable size to accurately represent each required color and texture. Colors will be selected from the Manufacturer's standard chart.
2. Each sample shall be fabricated using the same tools and techniques as required for the actual application.
3. One (1) approved sample shall be available and maintained at the job site.

- B. Shop Drawings:
 - 1. Submit complete drawings showing wall layout, all details, connections, expansion joints, the system components and installation sequence.
- C. Reports, Calculations, and Certificates:
 - 1. Submit copies of selected test reports by independent laboratories verifying the performance of the finish system and insulation board.
 - 2. When requested, submit engineering calculations verifying the structural performance of the EIF System.
 - 3. Applicator shall submit a copy of his current certificate of membership as an approved applicator of the approved EIF System.
- D. Installation Procedures: Submit copies of Manufacturers approved installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. All materials supplied by the Approved Manufacturer shall be delivered to the site location in the original unopened containers and packages with labels intact.
- B. Upon arrival, materials shall be inspected for damage. Notify the manufacturer should damaged, incorrect or otherwise unsatisfactory material be encountered. Unsatisfactory materials, including coatings and admixtures damaged by freezing, shall not be used.
- C. All materials shall be stored in a cool dry location, out of sunlight, protected from weather and other damage and at temperatures not less than 40 degrees F.

1.06 JOB CONDITIONS

- A. Environmental Conditions:
 - 1. The ambient air temperature shall be a minimum of 40 degrees F or greater and rising at the time of installation of the coatings and shall remain at 40 degrees F for at least 24 hours after application.
 - 2. Application of the finish coat shall not take place during inclement weather unless appropriate protection acceptable to the manufacturer is employed.

- B. Protection:
 - 1. Surrounding materials and areas shall be protected during the installation of the EIF System.
 - 2. The EIF System shall be protected from weather and other damage immediately after installation, including damage from installation of flashing and sealants.
- C. Coordination and Scheduling:
 - 1. Installation of system shall be coordinated with other construction trades.
 - 2. Tops of walls shall be immediately covered to avoid water infiltration.
 - 3. All sealants shall be installed in a timely manner to avoid water infiltration.
 - 4. Sufficient manpower shall be employed to ensure a continuous operation, free of cold joints, scaffolding lines, or other conditions that would adversely affect integrity of system and finished appearance.

1.07 WARRANTY

- A. The Approved Manufacturer shall provide a five (5) year limited warranty stating that all materials have been installed as specified and are free from defects in manufacturing and installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Polymer Based (PB) EIF System:
 - 1. Dryvit "Outsulation" (with "Panzer 15 Mesh"). (Basis of Specification)
 - 2. Finestone "Pebbletex 55" type PB (with "Hi-Impact" mesh)
 - 3. STO "Classic System" Type PB (with "Armor Mat" mesh)
 - 4. Other EIF System manufacturer(s), pre-bid approved in accordance with Section 01630 (Substitutions and Product Options).

2.02 MATERIALS

- A. Expanded Polystyrene Insulation Board:

1. Shall meet ASTM specification ASTM C578, Type I
 2. Nominal Density: Minimum 0.95 pcf; maximum 1.25 pcf
 3. Minimum compressive strength: 10 psi
 4. Maximum water absorption: 2.5% by volume
 5. Shall be labeled with Model Building Code approvals and UL listings
 6. Tested in accordance with ASTM E84 Tunnel Test
 - a. Flame Spread: Not greater than 25
 - b. Smoke Developed: Not greater than 450
 7. Board Thickness: Minimum 3/4"; maximum 4"
- B. Fasteners:
1. Expansion Fastener: Concrete and masonry substrates - expandable sheath with corrosion resistant hammer driven pin, pre-drilled and used with the manufacturer's washer attachment. Anchor spacing not to exceed 12" vertically and 16" horizontally, with minimum penetration of 1".
 2. Screw: Steel stud/gypsum sheathing substrate screws shall be corrosion resistant steel drill screws meeting the requirements of ASTM C 1002. Screw threads shall be adequate to pull screw head below the surface of the insulation board using the manufacturer's washer attachment.
- C. Adhesives (Glass Block Installations): Liquid Polymer, field mixed with Portland cement; "Primus".
- D. Reinforcing Mesh:
1. Shall be balanced, open weave glass fiber fabric.
 - a. Panzer 15: 15 oz/sq. yd. Tensile Strength: 400 lbs/in.
 - b. Corner Mesh: 7.2 oz/sq. yd. Tensile Strength: 274 lbs/in.
- E. Base Coats:
1. PB (Polymer Based) System: "Primus" acrylic-based adhesive/base coat, field mixed with Portland cement in accordance with manufacturer's instructions. Shall be compatible with EPS insulation board and reinforcing meshes.
- F. Finish Coat:

1. Water based acrylic coating, factory blended and integrally colored synthetic finish.
 - a. Standard formulation with dirt pickup resistance (DPR); "Quarzputz" coarse texture.
- G. Accessories: As indicated on the Drawings.
- H. Sealants: Comply with manufacturer's recommendations and EIMA Guidelines for compatible sealants and application procedures.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Prior to beginning work, examine all substrates for soundness, such as tightness of connections, crumbling or looseness of surface, level tolerance of surface, and other conditions when would affect the installation.
 1. Level tolerance: $\frac{1}{4}$ " in a 4 foot radius.
- B. Notify the Owner's Representative and Architect of any adverse or unsatisfactory conditions encountered. Work shall not proceed until such conditions are corrected.

3.02 INSTALLATION

- A. Installation shall conform to Approved Manufacturer's printed application instructions, except as otherwise specified herein or as shown on the drawings.
- B. Insulation Board and Reinforcing Fabric:
 1. Board shall be placed horizontally from a level base line, vertical joints shall be staggered and insulation boards interlocked at corners. Insulation boards shall be butted tightly. Surfaces of adjacent boards shall be flush at joints. Reinforcing glass fabric edges shall be overlapped 3". Insulation and reinforcing fabric shall be mechanically anchored with manufacturer's standard fasteners, spaced not more than 12" vertically nor more than 16" horizontally. Where required, provide expansion through both the reinforcing mesh and board. Vertical joints shall be continuous with butt end located at mid points of panel. Horizontal joints shall butt into vertical joints. Apply a bead of preliminary caulk at butt end conditions and intersections of vertical and horizontal joints.

- a. The fasteners shall be installed so that the insulation board is pulled snug to the wall and is slightly dimpled by the washer.

C. Base Coat:

1. Base coat shall be mixed in accordance with manufacturer's instructions and applied to insulated wall surfaces trowelling the material into the reinforcing fabric in a tight coat and doubling back to 1/8" -3/16" thickness. (Refer to EIF System Application Instructions for proper thickness). Base coats shall be applied to level out surface areas and to fill joints smooth with adjacent area.
2. The mesh shall be fully embedded into the wet adhesive/base coat mixture. (Apply the base coat in two passes to ensure that the mesh pattern shall not be visible).
3. Allow the base coat to dry for a period of at least 24 hours before applying finish coat.
4. Correct surface imperfections prior to applying finish coat.

D. Finish Coat:

1. Finish shall be applied continuously and in one operation to the entire surface. A wet edge shall be maintained. Texture shall be maintained by trowelling, floating or spraying as necessary to achieve the required finish. Texture shall match approved sample. (See 1.04A3).
2. Protect the finish from dust or other airborne contamination and effects of weather until completely dry. Protect surface from construction damage until acceptance by Owner.

E. Installation on Existing Glass Block

1. Prior to installation of the EIFS, the existing glass block surface shall be completely cleaned with a mild detergent, rinsed with clean water, and allowed to dry. The surface shall be free of dirt, debris and soap film, or other foreign surfaces.
2. Install a test sample approximately one foot square: Apply a sample of polystyrene insulation board to the cleaned glass block surface with manufacturer's adhesive/base coat. Adhesive base coat shall be properly mixed and applied in accordance with Manufacturer's recommendations. Allow sample to dry for minimum of 3 days or as otherwise recommended by the manufacturer.

3. Perform a "pull-off" test in the presence of an authorized representative of the system manufacturer and the Owner's Representative. A successful test of adhesion is indicated by failure within the insulation board.
4. Do not proceed unless adhesion of test sample is satisfactory. Perform a second cleaning of glass block surface if adhesion proves inadequate, and perform a second "pull-off" test.

3.03 FIELD QUALITY CONTROL

- A. During installation, the work shall be inspected by the approved manufacturer or its authorized representative in order to ensure compliance with installation instructions.
- B. Make all repairs or modifications resulting from use of improper materials or procedures, at no additional cost to the Owner.

3.04 PROTECTION

- A. Protect EIFS from weather and damage from work of other trades, until flashings and sealants are installed, and until completed system is accepted by Owner.

3.05 CLEAN-UP

- A. Excess materials shall be removed and disposed of legally.
- B. The applicator shall clean adjacent materials and surfaces and the work area to remove foreign materials resulting from the work of this Section.

END OF SECTION

INSTRUCTIONS FOR COORDINATION

SECTION 07241

EXTERIOR INSULATION AND FINISH SYSTEM

(CLASS PM – POLYMER MODIFIED)

1. Class PM Systems shall be used in locations where surface will be subjected to direct abuse (from grade to a minimum of 6'- 0" above grade). Class PB Systems (Section 07240) shall be acceptable only for surfaces above 6'-0".
2. Indicate expansion joints on the Drawings in conformance with the following criteria:
 - a. Where expansion joints occur in the substrate.
 - b. Where the system abuts dissimilar materials.
 - c. At systems terminations.
 - d. At changes in substrate.
 - e. At areas of structural movement.
3. Indicate control joints on the Drawings in conformance with the minimum criteria as follows:
 - a. For monolithic areas, not to exceed 144 sq. ft.
 - b. Center to center spacing of joints shall not exceed 12' (vertically or horizontally).
 - c. The length to width ratio of a monolithic area shall not exceed 2 ½ to 1.
 - d. Locate control joints at penetrations such as doors and windows.

SECTION 07241

EXTERIOR INSULATION AND FINISH SYSTEM (Class PM)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including Division 1 Specification Sections, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

- A. Provide all labor, materials equipment and labor necessary to install the exterior insulation and finish system (EIF System – Class PM) indicated on the drawings.
- B. Related work specified elsewhere:
 - 1. Unit Masonry: Section 04200.
 - 2. Exterior Insulation and Finish System (Class PB): Section 07240
 - 3. Sealants: Section 07900.
 - 4. Metal Studs, Furring, and Accessories: Section 09110.
 - 5. Gypsum Sheathing: Section 09250.
- C. General System Description:
 - 1. The exterior insulation and finish system shall be a field applied system consisting of extruded polystyrene insulation board (XPS), glass fabric reinforcing mesh, mechanical anchors, chopped fiberglass reinforcing fibers, base coat, and finish coat(s).

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide only products supplied by a single EIFS manufacturer, purchased directly from the Manufacturer or its authorized distributor.
- B. Qualifications
 - 1. EIFS Manufacturer:
 - a. Shall have marketed exterior insulation and finish systems in the United States for at least 10 years.

- b. Shall have a record of satisfactory completion of at least 1,000 projects utilizing the specified EIF system(s).
 - c. Shall be a member of the Exterior Insulation Manufacturer's Association (EIMA) and shall comply with EIMA Guide Specifications and Standards for PM Systems.
 - d. Shall be approved for use by the following Model Building Code organizations in published research or compliance reports:
 1. BOCA ES
 2. ICBO ES
 3. SBCCI (Southern Building Code Congress International) PST and ESI.
2. Insulation Board Manufacturer:
- a. Shall be listed by the approved manufacturer and capable of producing the extruded polystyrene (XPS) in accordance with EIFS Manufacturer's specifications.
 - b. Shall participate in the EIFS Manufacturer's third party certification and quality assurance program.
3. Applicator:
- a. Shall be trained and approved in the installation of the approved system.
 - b. Shall process a current certificate of membership in approved manufacturers trained network of applicators.
 - c. Shall be experienced and competent in the installation of Class PM EIF Systems.
4. Performance Requirements:
- a. The EIF System shall have been tested for physical and chemical characteristics and shall have passed based on the following test procedures:
 1. Absorption/Freeze/Thaw resistance: EIMA 101.1 (Modified ASTM C67); 60 cycles.
 2. Salt Spray Resistance: ASTM B117; 300 hours.
 3. Mildew Resistance: MIL STD 810B; Method 508.
 4. Abrasion Resistance: ASTM D968; 500 liters.

5. Accelerated Weathering: ASTM G23; 2000 hours.
- b. The EIF System shall have been tested for structural performance as follows:
1. Compressive Strength and tensile Strength: ASTM C190.
 2. Flexural Strength: ASTM C203.
 3. Impact Resistance: ASTM E695.
 4. Full Scale Structural Test: ASTM E330.
- c. The EIF System shall have been tested for fire characteristics as follows:
1. Flame Spread per ASTM E84: Less than 25 for EIFS coatings.
 2. Systems Tests:
 - a. Diversified Fire Test: ASTM E108 (Modified)
 - b. Multi-Story Fire Test: UBC 17-6.

1.04 SUBMITTALS

A. Samples:

1. Submit samples of EIF System for approval prior to beginning work. Minimum size of samples shall be 12" X 12". Samples shall clearly indicate each component of the system and shall be of suitable size to accurately represent each required color and texture. Colors will be selected from the Manufacturer's standard chart.
2. Each sample shall be fabricated using the same tools and techniques as required for the actual application.
3. One (1) approved sample shall be available and maintained at the job site.

B. Shop Drawings:

1. Submit complete drawings showing wall layout, all details, connections, expansion joints, the system components and installation sequence.

C. Reports, Calculations, and Certificates:

1. Submit copies of selected test reports by independent laboratories verifying the performance of the finish system and insulation board.
2. When requested, submit engineering calculations verifying the structural performance of the EIF System.

3. Applicator shall submit a copy of his current certificate of membership as an approved applicator of the approved EIF System.
- D. Installation Procedures: Submit copies of Manufacturers approved installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. All materials supplied by the Approved Manufacturer shall be delivered to the site location in the original unopened containers and packages with labels intact.
- B. Upon arrival, materials shall be inspected for damage. Notify the manufacturer should damaged, incorrect or otherwise unsatisfactory material be encountered. Unsatisfactory materials, including coatings and admixtures damaged by freezing, shall not be used.
- C. All materials shall be stored in a cool dry location, out of sunlight, protected from weather and other damage and at temperatures not less than 40 degrees F.

1.06 JOB CONDITIONS

- A. Environmental Conditions:
 1. The ambient air temperature shall be a minimum of 40 degrees F or greater and rising at the time of installation of the coatings and shall remain at 40 degrees F for at least 24 hours after application.
 2. Application of the finish coat shall not take place during inclement weather unless appropriate protection acceptable to the manufacturer is employed.
- B. Protection:
 1. Surrounding materials and areas shall be protected during the installation of the EIF System.
 2. The EIF System shall be protected from weather and other damage immediately after installation, including damage from installation of flashing and sealants.
- C. Coordination and Scheduling:
 1. Installation of system shall be coordinated with other construction trades.
 2. Tops of walls shall be immediately covered to avoid water infiltration.
 3. All sealants shall be installed in a timely manner to avoid water infiltration.

4. Sufficient manpower shall be employed to ensure a continuous operation, free of cold joints, scaffolding lines, or other conditions that would adversely affect integrity of system and finished appearance.

1.07 WARRANTY

- A. The Approved Manufacturer shall provide a five (5) year limited warranty stating that all materials have been installed as specified and are free from defects in manufacturing and installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Polymer Modified (PM) EIF System:
 1. Dryvit "Ultralation" System (Type PM). (Basis of Specification)
 2. "Finestone" Class PM "Impact-R" EIFS
 3. STO "Toughwall"
 4. Other PM EIF System Manufacturer(s), pre-bid approved in accordance with Section 01630 (Substitutions and Product Options).

2.02 MATERIALS

- A. Extruded Polystyrene Insulation Board:
 1. Shall meet ASTM specification ASTM C578, Type IV
 2. Nominal Density: 2.0 PCF
 3. Minimum compressive strength: 40 PSI (ASTM C 1621-73)
 4. Maximum water absorption: 3% by volume (ASTM C272-76)
 5. Shall be labeled with Model Building Code approvals and UL listings
 6. Tested in accordance with ASTM E84 Tunnel Test
 - a. Flame Spread: Not greater than 25
 - b. Smoke Developed: Not greater than 450
 7. Board Thickness: 1" minimum to 2" maximum

- B. Fasteners:
1. Expansion Fastener: Concrete and masonry substrates - expandable sheath with corrosion resistant hammer driven pin, pre-drilled and used with the manufacturer's washer attachment. Anchor spacing not to exceed 12" vertically and 16" horizontally, with minimum penetration of 1".
 2. Screw: Steel stud/gypsum sheathing substrate screws shall be corrosion resistant steel drill screws meeting the requirements of ASTM C 1002. Screw threads shall be adequate to pull screw head below the surface of the insulation board using the manufacturer's washer attachment.
- C. Reinforcing Fabric:
1. Shall be balanced, open weave glass fiber mesh for reinforcement of starter base coat; "Utramesh".
- D. Base Coats:
1. PM (Polymer Modified) System:
 - a. Portland Cement: ASTM C150, Type I
 - b. Sand: Dry, bagged; #40-45 sieve silica or bulk sand complying with ASTM C 897
 - c. Chopped fiberglass strands; "Ultrafibers".
 - d. Dryvit Starter: Acrylic based additive, field mixed with cement, sand and fibers in accordance with manufacturer's instructions.
- E. Finish Coat:
1. Water based acrylic coating; factory blended and integrally colored synthetic finish.
- F. Accessories (As indicated on the Drawings): Expansion joints, control joints and corner beads of zinc or exterior grade vinyl as supplied by EIF System manufacturer.
- G. Sealants: Comply with manufacturer's recommendations and EIMA Guidelines for compatible sealants and application procedures.
- H. Water: Clean, cool and potable.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Prior to beginning work, examine all substrates for soundness, such as tightness of connections, crumbling or looseness of surface, level tolerance of surface, and other conditions when would affect the installation.
 - 1. Level Tolerance: $\frac{1}{4}$ " in a 4 foot radius.
- B. Notify the Owner's Representative and Architect of any adverse or unsatisfactory conditions encountered. Work shall not proceed until such conditions are corrected.

3.02 INSTALLATION

- A. Installation shall conform to Approved Manufacturer's printed application instructions, except as otherwise specified herein or as shown on the drawings.
- B. Insulation Board:
 - 1. The insulation board shall be mechanically fastened to the substrate using one (1) fastener every eight (8) sq. ft.
 - 2. The fasteners shall be installed so that the insulation board is pulled snug to the wall.
 - 3. At penetrations where control joints are not used, the insulation board shall be installed so that its edges do not coincide with the corners of the opening.
 - 4. A $\frac{1}{2}$ in wide by $\frac{3}{4}$ in deep groove shall be cut into the insulation board to accommodate the "Deep V" control joints. The groove shall be cut so that a minimum of 6 mm ($\frac{1}{4}$ in) of insulation remains at the base of the groove.
 - 5. Protect the finish from dust or other airborne contamination and effects of weather until completely dry. Protect surface from construction damage until acceptance by Owner.
- C. Reinforcing Mesh:
 - 1. Mesh shall be installed over the entire face of the wall and fastened through the insulation board and into the structural substrate. Ends of mesh shall overlap a minimum of 2 $\frac{1}{2}$ in to a maximum of 4 in.

2. The remaining fasteners shall be installed to complete a 12 in by 16 in pattern and shall be installed so that the face of the washer sits not more than 1/16 in above or below the face of the insulation board.
 3. Care shall be taken to ensure that mesh lays flat and has no tears, wrinkles, waves or cuts.
- D. Trim Accessories:
1. Control joints, corner reinforcing, and other trim accessories shall be properly located and fastened into the insulation board using all nylon fasteners.
 2. At all control joint intersections, neutral cure silicone bedding sealant, such as DOW Corning 790, shall be applied in the routed groove, and the control joint is set into the sealant so that the gaps between the joints are completely sealed.
- E. Starter Base:
1. General:
 - a. Prior to application of the Starter base coat, the surface of the insulation board shall be inspected by the applicator as follows:
 1. Fasteners, control joints and other trim accessories are properly installed and spaced.
 2. The Ultramesh shall lay flat with no wrinkles, tears, waves or cuts.
 3. All insulation board gaps greater than 1/8 in shall be silvered with insulation board.
 4. There shall be no surface degradation of the insulation board due to weathering. Affected areas shall be corrected by replacing, sanding or high pressure washing.
 2. Mixing:
 - a. Mix the Starter base coat in the following proportions in accordance with manufacturers written instructions.
 - b. No other additives, except water, of any kind shall be added.
 3. Base Coat Application:

- a. Apply a tight coat of Starter mixture to fully embed the mesh.
 - b. Immediately double back, adding additional material as needed to achieve a smooth surface 6 mm (1/4 in) to 10 mm (3/8 in) thick.
 - c. Strike to a smooth level plane using a rod, darby or similar tool.
 - d. Apply starter mixture to entire panels, without interruption, to avoid cold joints.
 - e. The desired texture shall be applied to the set base coat using the Starter mixture.
- F. Finish Application:
1. The finish shall be applied to distinct wall surfaces in a continuous application.
 2. Sufficient manpower, scaffolding and equipment shall be employed to ensure a continuous operation and a uniform appearance.
 3. Finish shall be protected from airborne contamination such as dust, soot, etc. and from weather and other damage until dry.
 4. No additives shall be added under any circumstances.
 5. Finish shall be applied utilizing the same tools and techniques to match the approved sample.
- G. Sealants and Flashings:
1. All sealants and flashings shall be installed as soon as practical after completion of system installation and shall be designed and installed so that no water enters behind the system.
 2. Temporary protection shall be provided until sealants and flashings are installed to prevent damage from water entry behind the System.
- H. Protect the finish from dust or other airborne contamination and effects of weather until completely dry. Protect surface from construction damage until acceptable by Owner.

3.03 FIELD QUALITY CONTROL

- A. During installation, the work shall be inspected by the approved manufacturer or its authorized representative in order to ensure compliance with installation instructions.

- B. Make all repairs or modifications resulting from use of improper materials or procedures, at no additional cost to the Owner.

3.04 PROTECTION

- A. Protect EIF System from weather and damage from work of other trades, until flashings and sealants are installed, and until completed system is accepted by Owner.

3.05 CLEAN-UP

- A. Excess materials shall be removed and disposed of legally.
- B. The applicator shall clean adjacent materials and surfaces and the work area to remove foreign materials resulting from the work of this Section.

END OF SECTION

SECTION 07265

LIQUID APPLIED AIR BARRIER

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specifications, apply to the Work of this Section.

1.02 RELATED WORK

1. Section 04200-Unit Masonry (Thru-Wall Flashing)
2. Section 06100-Rough Carpentry (Exterior Wall Sheathing)
3. Section 07210-Building Insulation
4. Section 07510- 4-Ply Built Up Roofing with Gravel Ballast and Insulation
5. Section 08520- Aluminum Windows

1.03 SUMMARY

- A. Section includes spray on air barrier for use over exterior wall sheathing substrates and transition material between dissimilar substrates.

1.04 DEFINITIONS

- A. Perm: 1 grain/h•ft²•in-Hg.

1.05 PERFORMANCE REQUIREMENTS

- A. Provide a liquid spray applied, air barrier system constructed to perform as a continuous air barrier, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.
- B. The air barrier shall have the following characteristics:
 1. It must be continuous, with all joints made air-tight.
 2. It (the material used) shall have air permeability not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) when tested in accordance with ASTM E 2178.
 3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not

displace adjacent materials under full load. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:

- a. Foundation and walls.
 - b. Walls and windows or doors.
 - c. Different wall systems.
 - d. Wall and roof.
 - e. Wall and roof over unconditioned space.
 - f. Walls, floor and roof across construction, control and expansion joints.
 - g. Walls, floors and roof to utility, pipe and duct penetrations.
4. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made air-tight.
 5. Comply with Air Barrier Association of America's (ABAA's) definition of a tested system.

1.06 SUBMITTALS

- A. General: Submit following items in accordance with Section 01340.
- B. Product Data:
 1. Submit product data for each product including membrane, primers, sealants, adhesives, and auxiliary materials.
 2. Include manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
- C. Shop Drawings: Show locations and extent of air barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.
- D. Samples: Provide sample of product applied to the following substrates:
 1. CMU.
 2. Glass Fiber Faced Exterior Wall Sheathing.
- E. Submit following Informational Submittals:
 1. Certifications specified in Quality Assurance article.

2. Installer qualifications.
3. Manufacturer's instructions.

F. Closeout Submittals:

1. Submit under provisions of Section 01730.
2. Warranty: Submit specified warranty.

1.07 QUALITY ASSURANCE

A. Single-Source Responsibility:

1. Obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product.
2. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

B. Manufacturer Qualifications: Manufactures materials licensed and certified by Air Barrier Association of America's (ABAA's) Quality Assurance Program. Comply with ABBA master specification Field Quality Control.

C. Installer Qualifications:

1. Certified in writing by system manufacturer as qualified for specified systems.
2. Certified during bidding period as well as for the duration of the installation, as officially recognized Licensed Contractor by the Air Barrier Association of America (ABAA).
3. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA.
4. Air barrier installers must be trained and certified by NECA (National Energy Conservation Association) and PSDI (Professional Skills Development Institute for energy conservation).
5. Fluid-applied membrane air barrier installer(s) shall be certified by BPQI (Building Performance Quality Institute) for the ABAA Quality Assurance Program in accordance with the requirements outlined in the QAP program used by ABAA. Installers shall have their photo identification air-barrier certification cards in their possession and available on the project site, for inspection upon request.

D. Certifications:

1. Submit manufacturer's certification that products furnished for Project meet or exceed specified requirements.
2. Submit manufacturer's certification stating that installed system is in compliance with specified requirements.
3. Certification by air barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds

(VOCs).

4. Certification of compatibility by air barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it.

E. INSPECTIONS

ABBA State Inspections: Arrange and pay for site audits by ABAA to verify conformance with the manufacturer's instructions, the ABAA Quality Assurance Program, and this section of the project specification.

1. Audits shall be carried out per ABAA protocol. Forward written inspection reports to the Architect within 3 working days of the receipt of the audit report.
2. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Owner.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01600.

1.09 MOCK-UPS

- A. Construct mock-up in accordance with Drawings and Section 04200.
- B. Include mock-up of product on both exterior sheathing and CMU substrates.

1.10 PREINSTALLATION CONFERENCE

- A. Conduct pre-installation conference in accordance with Section 01200.
- B. Agenda:
 1. Review Project Specifications and Drawings.
 2. Establish installation schedules and sequence.
 3. Coordinate work with in-place and subsequent construction.
 4. Review weather and working conditions.
 5. Review installation procedures, including:
 - a. Substrate requirements for Project acceptance (curing of concrete surface, form release agents, temperature).
 - b. Material installation.
 - c. Phasing and sequencing requirements.
 - d. Termination, flashing, expansion joint, and penetration requirements.
- C. Conduct tour of areas to receive air barriers and report on surface acceptance, possible problem areas, and recommended remedies.

1.11 SEQUENCING

- A. Begin installation only after substrate work is complete and penetrations are securely anchored.

1.12 PROJECT CONDITIONS

- A. Environmental Conditions: Apply air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
 - 1. Do not apply air barrier in snow, rain, fog or mist.
 - 2. Do not apply air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.13 WARRANTY

- A. Comply with requirements of Section 01740.
- B. Provide manufacturers warranty for a period of 5 years from date of Substantial Completion.

PART 2- PRODUCTS

2.01 MATERIALS

- A. Liquid Applied Non-Permeable (Type I) Air Barriers:
 - 1. One component, rubberized (elastomeric), fluid applied material.
 - 2. Color: Manufacturer's standard.
 - 3. Compatible with extruded polystyrene insulation adhesive in cavity wall construction.
 - 4. Thickness: As determined by manufacturer to achieve performance rating.
 - 5. Compatible with transition membrane, substrate, and insulation.
 - 6. Performance Characteristics:
 - a. Solids by Weight: 69 percent.
 - b. Water Vapor Permeance: 0.03 perms, ASTM E96.
 - c. Elongation: ASTM D412, 270 percent nominal.
 - d. Pull Off Adhesion: ASTM D4541, ≥ 20 psi on masonry and gypsum.
 - e. Low temperature flexibility: Pass 1" @ -20°F ASTM D1970
 - f. Chemical resistance: Mild acids, alkalis and salt.

7. Air Permeance ASTM E2178
 - a. 75 Pa: 0.0013 L/ [sec- m²]- Pass
 8. Basis of Design Product:
 - a. Air-Bloc 16 MR, Henry Co., Huntington Park, CA.
 - b. Other acceptable products shall be Barritech NP, Carlisle Coatings & Waterproofing, Wylie, TX. (www.carlisleccw.com)
- B. Other products and manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable
- C. Liquid Applied Vapor Permeable (Type II) Air Barriers:
1. One component, rubberized (elastometric), fluid applied material.
 2. Color: Manufacturer's standard.
 3. Compatible with extruded polystyrene insulation adhesive in cavity wall construction.
 4. Performance Characteristics:
 - a. Solids by Weight: 63 Percent.
 - b. Water Vapor Permeance: 14 perms, ASTM E96.
 - c. Elongation: ASTM D412, 250% percent nominal.
 - d. Peel Strength: ASTM C836, 1327 lbf/ft.
 5. Air Permeance: ASTM E2178
 - a. 1.57 psf (75 Pa): 0.0001 CFM/ft.²
 6. Basis of Design Product:
 - a. Air-Bloc 17 for cold weather, Henry Company, Huntington Park, CA.
 - b. Other acceptable products shall be Barritech VP, Carlisle Coatings & Waterproofing, Wylie, TX. (www.carlisleccw.com)
- D. Other products and manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.
- E. Transition Membrane:
1. Self-adhering membrane consisting of an SBS rubberized asphalt compound, integrally laminated to polyethylene film.
 2. Thickness: 40 mils.
 3. Performance Characteristics:
 - a. Tensile Strength: ASTM D412 modified, 500 psi.
 - b. Minimum Puncture Resistance: ASTM E154, 40 lbf.
 - c. Elongation: ASTM D412, 200 percent.
 4. Compatible with spray applied air/vapor barrier.
 5. Transition Primer: As recommended by manufacturer for compatibility with transition membrane.
 6. Basis of Design Product: Blueskin SA, Henry Co., Kimberton, PA.
 7. Other acceptable products shall be 705 TWF, Carlisle Coatings & Waterproofing, Wylie, TX. (www.carlisleccw.com)

- F. Through Wall Flashing Membrane (Self-Adhering): See specification section 04200.
- G. Other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

PART 3- EXECUTION

3.01 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 00700.
- B. Verify that substrate work is complete, clean and dry before beginning installation of air barrier materials.
 - 1. Do not proceed with installation until after minimum curing period recommended by air barrier manufacturer.
 - 2. Ensure that:
 - a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
 - b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
 - c. Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
 - 3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

3.02 PREPARATION

A. Liquid Applied Air Barriers:

- 1. Remove rough or sharp projections, loose particles, and foreign matter detrimental to adhesion and application of fluid applied air barriers.
- 2. Clean and prepare surfaces to receive air barriers in accordance with manufacturer's instructions.
- 3. Seal penetrations and cracks, and reinforce changes in substrate and other areas as recommended by manufacturer.
- 4. Apply manufacturer's recommended primer when required for substrate application.
- 5. Fill voids as recommended by manufacturer.

B. Joint and Crack Treatment:

- 1. Fill joints between panels of exterior grade gypsum up to ¼ inch wide with trowel application of air barrier material and reinforce with a strip of 2 inch wide glass fiber tape prior to application of liquid membrane. Joints between panels of exterior grade gypsum wider than ¼ inch should be

- sealed with transition membrane adhered to the substrate.
2. Surfaces should be tied in with beams, columns, window and doorframes, etc.; using strips of transition membrane lapped a minimum of 3 inches on both substrates. Mechanical attachment should be made to all window and doorframes, or a properly designed sealant joint provided.
3. Seal cracks in masonry and concrete with a strip of transition membrane lapped a minimum of 3 inches on both sides of the crack.

3.03 INSTALLATION

A. Transition Membrane

1. Do not apply to wet surfaces.
2. Apply within manufacturer's recommended by manufacturer.
3. Apply primer as recommended by manufacturer.
4. Align, position, and adhere transition membrane as required by manufacturer, and roll firmly into place. Ensure minimum 2 inch overlap at all end and side laps.
5. Tie-in to window frames, hollow metal door frames, spandrel panels, roofing system and at the interface of dissimilar materials as indicated in drawings, providing a minimum 1" adhesion on metal and 2" on membranes.
6. Promptly adhere laps and membrane.
7. Ensure all preparatory work is complete prior to applying air barrier.

B. Liquid Applied Air Barrier:

1. Do not apply to wet surfaces.
2. Apply within manufacturer's recommended temperature limits.
3. Spray apply fluid applied materials in coat thickness as recommended by manufacturer.
4. Fill in crevices and grooves making coating continuous and free from breaks and pin holes.
5. Apply around joints, anchors and into chases, corners and reveals.

3.04 PROTECTION

- A. Protect air barriers from damage during installation and while left exposed during construction. Repair damage before proceeding with subsequent construction.
- B. Air barrier and transition membranes are not designed for permanent exposure. Good practice calls for covering as soon as possible. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions according to air barrier manufacturer's written instructions and approved tested system in accordance with ABAA air barrier testing procedures.

END OF SECTION

SECTION 07410

METAL ROOF SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. See Roof Plans and Details
- B. Section 07600-Flashing and Sheet Metal

1.03 DESCRIPTION OF WORK

- A. This work involves installation of new, sloped metal roof system supported by decking on new sloped roof.
- B. Extent of metal roof system as indicated on drawings and by provisions of this section and is defined to include roof panels, roof insulation, louvers, metal soffit panels, eaves, and gable trim, gutters, roof mounted equipment curbs, plumbing vent flashings, sealants, fasteners, and miscellaneous flashings, closures and accessories directly related to the metal roof and snow retention systems.

1.04 QUALITY ASSURANCE

- A. Single-Installer Responsibility: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm specializing in metal roof system work for at least ten (10) years, capable of showing successful installations similar to work required for project. The roofing contractor must have an office, warehouse with supplies, and permanent roofing crews within a 30 mile radius of Fairfax City, Virginia, in order to be considered a responsible bidder on Fairfax County Public Schools roofing work.
- B. Manufacturers: The Manufacturer of the metal roof system shall have been regularly engaged in the fabrication of metal standing seam roof systems for at least ten (10) years. All materials shall be new, unused, and free from defects.
- C. Pre-Roofing Conference: Prior to installation of roofing system, meet at project site with Installer (Roofer), and Owner's representatives. Tour representative areas of roofing, and discuss substrate condition. Review requirements of contract documents, submittal, status of coordinating work, availability of materials and installation facilities, proposed installation schedule, requirements

for inspections and testing or certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.

D. Design Criteria:

1. Design loads shall include live snow and wind in addition to dead loads.
2. Snow loads: Roof panels and support member shall be designed for a ground snow load of thirty (30) pounds per square foot (psf) uniformly distributed over the vertical projection of the roof surface in accordance with the current Virginia Uniform Statewide Building Code (VUSBC). Roof panels and support members at lower levels of multilevel roofs, valley areas, or major roof projections shall be designed for snow accumulations as specified in the building code, or in the absence of specific criteria, by ANSI A 58.1 standard.
3. Wind Loads: Roof panels, clips, and fasteners shall be designed for a basic wind speed of one hundred fifteen (115) mph applied in accordance with the Virginia Uniform Statewide Building Code for Exposure C.

1.05 SUBMITTALS

- A. Production Data: Submit manufacturers product information, specifications, and installation instructions for building components and accessories insulation.
- B. Shop Drawings: Submit complete erection drawings showing covering and trim details, and accessory installation details to clearly indicated proper assembly of building components.
- C. Installer Certification: Submit certificate one week prior to bid date that the metal roof systems installer has been regularly engaged in the installation of pre-engineered metal roofing of the systems specified.
- D. Samples: Submit samples two (2) each of the following for Architect's review. Samples will be used as basis for evaluating quality of finished roofing system including wall and soffit panels.
 1. Twelve inches long by actual width of roofing, liner panel, and siding panels, with required finishes.
 2. Fasteners for application of roofing, siding, and soffit panels.
 3. Sealants and closures.
 4. Twelve inches long minimum by 12 inches wide minimum of actual standing seam side lap seams for both sides of a typical panel.

5. Length and width as required for actual standing seam roof panel and lap seam including stiffeners and fasteners and side lap seams both sides of typical panel. Typical Panel shall be 16" on center, 1 1/2" standing seam double locked or otherwise approved by FCPS.
- E. Submit calculations with registered engineers seal, verifying roof panel and attachment methods resist wind pressures imposed on it pursuant to applicable building codes and project design parameters.
- F. CHPS Minimum Recycled Content Level: Submit data that the aluminum material qualifies as a contributor for MW.C2 credit for minimum recycled content level.

1.06 JOB CONDITIONS

- A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.07 PRODUCT HANDLING

- A. General: Deliver and store prefabricated components, sheets, panels, and other manufactured items so they will not be damaged or deformed. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials that might cause staining.
- B. Roof Loading: Do not store materials on roof decks, nor position roofing installation equipment on roof decks, in concentrations exceeding design live loading. All materials will have to be stored in trailers or other weatherproof housings until required to be installed on the roof.
- C. Do not use cranes to hoist materials onto the roof when the building is occupied.

1.08 WARRANTIES

- A. Provide manufacturer's written weathertightness warranty for a minimum of ten (10) years against leaks in the entire roof system including all roof panels, flashing, interior gutters, etc., arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
- B. Provide manufacturer's standard paint film written warranty for twenty (20) years against cracking, peeling, chalking, and fading of metal roof, soffit and wall panels
- C. Inspection and Report Services: Metal roof system manufacturer or his authorized agent shall perform an inspection of the entire roof system and shall

submit a written report to the Owner detailing all conditions requiring maintenance and repair by parties under the above warranties. Inspections and reports shall be performed once every other year over the ten (10) year weathertightness warranty period. Cost of Inspection and Report Service shall be included in the contract amount.

1.09 INSPECTIONS AND JOB CONTROL

- A. A qualified technical representative of the manufacturer shall be available to make recommendations necessary to insure compliance with the specifications and to make recommendations where unforeseen conditions become apparent to the Architect.
- B. As soon as all construction under this Section, as well as any construction which could in any way affect construction under this Section, has been completed, a final inspection of the roofing system shall be made by a qualified representative of the roofing manufacturer.

1.10 MAINTENANCE INSTRUCTIONS

- A. At the time of issuance of the warranty, a full set of instructions shall be included detailing preventative maintenance and noting a list of harmful substances that may damage the roofing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Hot-Rolled Structural Shapes: ASTM A36 or A529.
- B. Tubing or Pipe: ASTM A500, Grade B; ASTM A501; or ASTM A53.
- C. Members Fabricated from Plate or Bar Stock: 50,000 psi minimum yield strength; ASTM A529, A570, or A572 or A607.
- D. Members Fabricated by Cold Forming: ASTM A607 or A570, Grade 50.
- E. Aluminum Sheet: Coil-coated .032 aluminum sheet (ASTM B209M), Alloy 3105-H14 for painted finishes, with temper as required to suit forming operations and structural performance required.

2.02 ROOFING AND SIDING

- A. General: Provide roofing and siding sheets roll formed to profile indicated and specified. Provide flashings, closures, fillers, metal expansion joints, ridge

covers, roof panel mounting clips, gable and eaves trim, gutters, and other sheet metal accessories as required. Material and finish shall be as specified.

- B. Metal roofing shall be site locally manufactured 1 1/2" (\pm) double locked standing seams, with seams 16" on center in continuous lengths and incorporating pencil rib or striated profiles as directed by Owner, from Petersen Aluminum Corporation, Englert Inc,DMI, Atas Inc. or Approved Equal per section 01630
 - 1. Roof Panel Finish: Provide a full strength, 70% Kynar 500 Hylar 5000 fluoropolymer finish to roof panels.
 - 2. Color: As selected by the Architect. Color must have reflective index of 29 or more.
 - 3. The metal roofing materials must contain a minimum recycled content required by CHPS to qualify for MW.C2 credit.
- C. All metal roof related details shall be in accordance with manufacturers details and practices, the architectural drawings, and SMACNA (Sheet Metal and Air Conditioning Contractors National Association)..

2.03 SHEET METAL ACCESSORIES

- A. Accessories (i.e., ventilators, skylights, gutter, fascia) shall be as standard with manufacturer, unless otherwise noted and furnished as specified.
- B. The metal coating on all accessories, gutters, downspouts, gable trim, and eaves trim to be a full strength, 70% Kynar 500 fluoropolymer coating. Color shall match roof panels.
- C. Location of standard accessories shall be as shown on erection drawings as furnished by manufacturer.
- D. Gutters: Formed from same material and finish as roof panels in sections not less than 8 feet in length, complete with end pieces, outlet tubes, and special pieces that may be required. Apply waterblock or butyl caulk before joining pieces together. Join sections with riveted and EPDM flashing membrane joints. Furnish gutter supports spaced 24" on center, constructed of 1/8" x 1" Aluminum bar. Unless otherwise indicated, provide expansion joint with cover plate every 40' or where indicated. Furnish gutter supports spaced at 24" o. c., constructed of the same metal as gutters. Provide standard bronze, copper, or aluminum, wire ball strainers at each outlet. Gutters shall be 6" ogee style. Finish matching roof fascia and rake. Gutter size and configuration shall be as indicated on drawings or approved by Owner.
- E. Downspouts: Formed in sections not less than 8 feet in length complete with any special pieces that may be required. Join sections with riveted and soldered or

sealed joints. Downspouts shall be same material and finish system as the roof panels. Finish color shall match fascia. Gutter straps shall be spaced 8' o. c. maximum and be same material as gutter. All strap edges shall be rolled or smooth. Size to match as shown on drawings.

- F. Roof Curbs: Manufacturer's standard roof curb units for roof-mounted equipment to be supplied and installed by others and painted to match roof finish. Roof curbs shall be aluminum, metal or stainless steel as design loads will allow and shall provide for a weathertight seal with standing seam roof system. Stainless steel crickets shall be provided on high side or curbs for proper drainage as an integral part of roof curb design. All curbs shall be seamed in place. Roofer will furnish/install roof curb and related curb top to match panel system where shown on drawings.
- G. Snow Guards: Provide snow guards ColorGard by S-5 at all eaves of metal roof.
 - 1. Provide one (1) S-5-U-HD clamp at every rib and two (2) snow retention guards per panel at all roof panel runs (measured from ridge to gutter) of 50 feet or greater.
 - 2. Provide one (1) S-5-U-HD clamp at every other rib and one (1) snow retention guard per panel at all roof panel runs (measured from ridge to gutter) of less than 50 feet.
- H. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas including covering all fascia and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".

2.04 THERMAL INSULATION

- A. Rigid Insulation: 2 layers of 2.5" polyiso insulation equaling 5" and an R value of 25. Stagger both layers of insulation. Secure plywood to top layer using low rise adhesive staggered from layer below. provide 1/2" pressure treated plywood sheathing for installation over rigid insulation. Cover all plywood and wood with ice and watershield. Utilize mechanical fasteners when fasteners are not exposed to view on the underside of the decking.
- B. Insulation Adhesive: Two component, low rise polyurethane adhesive designed for anchoring insulation to metal deck. Adhesive shall contain no solvents, near zero VOC's and no harmful CHFC's or CFC's. Utilize adhesive fastening only when fasteners will be exposed to view on the underside of the decking.

PART 3 - EXECUTION

3.01 GENERAL

- A. Metal roofing system shall be installed in strict conformance with manufacturer's instructions. Roof panels shall be installed to allow for relative movement between roof panels and ridge, gables, fascias, and other components of the roof system.

3.02 ROOFING AND SIDING

- A. General: Arrange and nest wall panel sidelap joints so that prevailing winds blow over, not into lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Samples submitted shall be used as basis for evaluating quality of work performed.
- B. Provide weatherseal under ridge cap/flash and seal roof panels at eaves and rake with rubber, neoprene, or other closures to exclude weather.
- C. Roof Sheets: Secure roof panels to structural by means of a sliding clip fastened to the structural and securely locked into panel seam. Sliding clip shall be centered in mounting clip.
 - 1. Panel seams shall be mechanically field seamed using manufacturer's standard machine seaming device. Cracking or splitting of metal or cracking, peeling, blistering or other damage to panel coating shall not be acceptable. Panels shall be securely fastened to eaves structural and sealed watertight.
 - 2. Panel and splices shall consist of prepunched and prenotched roof panels bolted together with a back-up plate or stiffener and sealed weathertight. End lap seams shall be tight and flat. "Fishmouthing" between fasteners is not acceptable.
- D. Wall sheets: Apply elastomeric sealant continuous between metal wall panels and concrete and elsewhere as necessary for water-proofing. Handle and apply sealant and back-up in accordance with sealant manufacturer's recommendations. Provide weatherseal at top and bottom of wall panels with rubber, neoprene or other closures to exclude weather.
 - 1. Align bottoms of wall panels and fasten panels with blind rivets, bolts, or self-tapping panel screws. Fasten flashings, trim around openings, etc., with self-tapping screws.

2. Install screw fasteners with power tool having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes. Self-drilling screws shall not be used.
 - E. Sheet Metal Accessories: Install gutters and other sheetmetal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting.
 - F. Snow Guards: Provide snow guards. Install in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting.
 - G. Thermal Insulation: Install concurrently with installation of roof panels, and in accordance with manufacturer's published directions.
 - H. Dissimilar Materials: Where aluminum surfaces come in contact with ferrous metal or other incompatible materials, keep aluminum surfaces from direct contact by applications to the other material as follows:
 1. One coat of zinc chromate primer, FS TT-P-645, followed by two coats of aluminum paint, SSPC-Paint 101.
 2. In lieu of two coats of aluminum paint, apply one coat of high build bituminous paint, SSPC-Paint 12, applied to a thickness of 1/16" over zinc chromate primer.
 - I. Backpaint aluminum surface, where impractical to paint other surface.
- 3.03 CLEAN UP
- the
- A. Remove all excess materials, packaging, trash & other debris associated with work of this section, and dispose of legally offsite.

END OF SECTION

SECTION 07413

METAL FASCIA AND WALL PANELS (CORRUGATED PANELS)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 05400: Load Bearing Metal Studs and Joist
- B. Section 06100: Rough Carpentry
- C. Section 07410: Metal Roofing System.
- D. Section 07600: Flashing and Sheet Metal
- E. Section 07900: Sealants.

1.03 SCOPE OF WORK

Furnish and install metal panel at fascia, canopy and roof equipment screens. Location of metal panels is indicated on the Drawings. Provide all accessories, including trims, flashings and closures, required for a complete system and installation. All accessories shall be same gauge and finish as the panel or as specified.

1.04 REFERENCE STANDARDS

- A. ASTM D 1005, ASTM D 1400, ASTM D 4138: Dry Film Thickness.
- B. ASTM E72: Structural Properties.
- C. ASTM D 4145: T-Bend Flexibility
- D. ASTM D 2794: Impact Resistance.
- E. ASTM D 870: Water Immersion Resistance.
- F. ASTM D 2247: Humidity Resistance
- G. NAAMM: Metal finishes Handbook

1.05 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit Shop Drawings indicating material profile, jointing pattern, jointing details, fastening methods, details of roof openings/penetrations and installation details. Provide 12" X 12" material sample for each type of wall panel.

- B. Submit manufacturer's certification indicating that the products comply with performance requirements.
- C. Provide calculations signed and sealed by a Professional Engineer indicating compliance with VUSBC requirements for wind and snow loading.
- D. Manufacturers Standard color chart

1.06 MOCK-UP

- A. Provide 4 ft. X 2 ft. sized sample of metal mounted on backing illustrating typical seaming, external corner, internal corner, soffit, joints, and approved finish. Approved mock-up sample may become a part the completed work.

1.07 STORAGE AND HANDLING

- A. Stack performed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Any damaged material shall be rejected.
- B. Prevent contact with materials during storage which may cause discoloration or staining.

1.08 WARRANTIES

- A. Provide a thirty (30) year limited warranty against cracking, peeling, chalking and fading.

1.09 QUALITY ASSURANCE

Panel system installer shall be experienced with the installation of metal fascia panels on projects with similar scope and complexity, and in accordance to manufacturer's standards and requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Subject to compliance with requirements, provide products by the manufacturer specified or prebid approved manufactures and products in accordance with section 01630.
- B. Basis of Design: "Corra-Lok" by Atas International, Inc. Allentown, PA. 1-800-464-1441. (www.atas.com)
- C. Product Description: 16 5/8" wide by 7/8" deep structural panel with 2 3/4" wide concealed fastener corrugations; panel to panel interlock positive system.

Fasteners are to be hidden by the consecutive panel. NO EXPOSED FASTENERS WILL BE ACCEPTED.

- D. Materials and Finish: A standard offering of .032 Aluminum. Two coatings of Fluoropolymer, KYNAR 500 PVDF or Manufacturer's recommendations. Base finishes shall be tested by paint supplier to comply with required ASTM recommendations from a choice of standard 30 colors available in KYNAR 500.

2.02 FABRICATION

- A. Fabricate and finish metal panel and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing.
- B. Panel Construction: Panels shall be uniformly dimensioned, roll formed to exact lengths to avoid trimming. The panel system shall be anchored as recommended by the Manufacturer. All fasteners shall be concealed. Panels shall be continuous with no end laps. There shall be no face penetration of panels, except as approved by the architect for securing panels to facilitate directional expansion/contraction.

Flashing and Trim: All exposed standard or special flashing/trim and such other accessories shall be in the same gauge, color, and finish to match other applications as listed on scope of work.

Accessories such as clips, closures, fasteners, etc., shall be as recommended by the Manufacturer.

2.03 ACCESSORIES

- A. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas including covering all fascia and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify substrate is uniform, even and symmetrical by running a string test. Inspect to assure that all purlins or sub-structure/framing members are flat and insulation is embedded symmetrically so when the metal panels are applied, they will not appear wavy or distorted.

- B. Provide a written report of discrepancies or variations in the substrate to the Architect.
- C. Do not begin installation until unsatisfactory conditions are corrected.
- D. Commencement of installation shall signify acceptance of the substrate and adjacent conditions as being proper and acceptable for installation to proceed.

3.02 INSTALLATION

- A. No exposed fasteners shall be made. Panels must be installed to have a positive panel to panel interlock. Installation shall be made in accordance with Manufacturer's recommended procedures and layout drawings.
- B. No face penetrations or perforation shall be made in metal panels by fasteners without architect's specific approval.
- C. Exercise proper care during installation to avoid damage or scratching of the panels. Avoid walking over the metal roof after installation is completed.

3.03 CLEANING AND PROTECTION

- A. Remove all excess materials, packaging, trash, or other debris associated with the work of this Section, and dispose of legally offsite.

END OF SECTION

SECTION 07415

EXTERIOR WALL PANELS & SYSTEMS

PART 1: GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General Conditions and Division-1 Specification sections, apply to work of this section.

1.02 WORK INCLUDED

- A. Section Includes: Laminated panels and attachment systems for use as exterior cladding.

1.03 RELATED WORK

- A. Section 05400: Load Bearing Metal Studs and Joist
- B. Section 06100: Rough Carpentry
- C. Section 07210: Building Insulation
- D. Section 07600: Flashing and Sheet Metal
- E. Section 07900: Sealants

1.04 SYSTEM DESCRIPTION

- A. Panel's exposed finishes shall perform according to AAMA 2605-98; exposed anodized aluminum according to AAMA 611-98.
- B. Panel composite assembly shall confirm to ASTM E84, flame spread resistance, Class A.
- C. Panel bond integrity shall have a minimum peel strength of 34.5 in-lbs/in when tested according to ASTM D1781.
- D. Design wall system to withstand a positive and negative windload pressure acting inward and outward normal to the plane of the wall to meet the requirements of the latest adopted Local Building Code.
- E. Make adequate provisions in the wall system for thermal expansion and contraction of the component parts and fastening of the system to prevent harmful damage caused by buckling, opening of joints, contraction and expansion due to accumulation of dead loads and variations of live loads.

- F. Design wall system to be sealed at all joints, intersections and cutouts to prevent moisture intrusion of any type.

1.05 QUALITY ASSURANCE

- A. Panel Manufacturer: Manufacturer shall have a minimum of ten (10) years experience in the manufacture of ACM/MCM and have ISO 9001:2000 Certification.
- B. Panel Installer: Installer shall be experienced in performing work of this section and be specialized in the installation of similar work required on this project.
- C. Field Measurements: When possible, measurements should be taken prior to the completion of shop manufacturing and assembly.
- D. Pre-Installation Meetings: Conduct pre-installation meetings to verify project requirements, substrate condition, installation instructions and warranty requirements. Comply with Division 1 Project Management and Coordination, Project Meetings Section.

1.06 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - ASTM E84: Surface Burning Characteristics
 - ASTM D1781: Climbing Drum Peel for Adhesives
- B. Architectural Aluminum Manufacturers' Association (AAMA):
 - AAMA 2605-98: Voluntary Specification, Performance Requirement and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
 - AAMA 611-98: Voluntary Specification for Anodized Architectural Aluminum

1.07 SUBMITTALS

- A. Samples:
 - Panel: Two samples of each type of assembly.
 - Color Standards: Two 12" x 12" samples of each color of finish selected.
- B. Shop Drawings: Indicate thickness and dimension of parts, fastening and anchoring methods, detail and location of joints, including joints necessary to accommodate thermal movement.

- C. Material Certification: Two (2) copies certifying that material meets the requirements specified. Provide calculations signed and sealed by a professional engineer indicating compliance with VUSBC requirements for wind and snow loading.
- D. Manufacturer's Literature: Two (2) copies of manufacturer's literature for panel material.
- E. Test Reports: Two (2) copies of third party test reports on testing required in Section 1.03.
- F. Provide manufacturer color chart.

1.08 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Division 1 Product Requirements Section
- B. Deliver, store and handle panels and other components so they will not be damaged or deformed. Package all panels for protection against transportation damage.
- C. Storage and Protection: Stack materials on platforms or pallets, covered with suitable ventilated covering. Do not store panels to accumulate water or be in contact with other materials that might cause staining, denting or other surface damage.

1.09 WARRANTY

- A. Manufacturer's Warranty: Furnish panel manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of other rights Owner may have under the Contract Documents.
- B. Panel Lamination Warranty: Five (5) years commencing on Date of Substantial Completion
- C. Finish Warranty: {Select finish type below}
 - {Kynar 500®: Twenty (20) years}
 - {Kynar 500® Metallic: Twenty (20) years}
 - {Anodized: Twenty (20) years}

PART 2: PRODUCTS

2.01 EXTERIOR WALL PANELS & SYSTEMS

A. Manufacturer (or pre-bid approved equal):

Citadel Architectural Products, Inc.
3131-A North Franklin Road
Indianapolis, Indiana 46226
Phone: (317) 894-9400
(800) 446-8828
Fax: (317) 894-6333
(800) 247-2635
www.citadelap.com
info@citadelap.com

B. Envelope 2000®
Engineered Architectural Wall System

1. Panel Composition:

- a. Face Skin:
.024" (minimum) prefinished smooth aluminum, painted to match Architect's color selection.
- b. Core: .105" thermoset phenolic resin
- c. Back Skin:
.010" primed smooth aluminum backer.

2. Panel Tolerances:

- a. Thickness: $\pm 1/32$ "
- b. Length and Width: +0, -1/16"
- c. Squareness: 1/64" per lineal foot.

3. Attachment System:

- a. Reveal (RV) System-1B System

2.02 SUBSTITUTIONS

- A. Acceptable Alternatives: Panels of similar composition providing manufacturer has a minimum of ten (10) years experience.
- B. The materials and products specified in this section establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
- C. No substitution will be considered unless written request for approval has been submitted by the bidder and has been received by the architect ten (10) days prior to the date for receipt of bids.
- D. Each request shall include the name of the materials and a complete description of the proposed material, including test performance and any other information necessary for evaluation.

2.03 FINISH {Select finish type below}

- A. Exposed Finish:
 - {Kynar 500®}
 - {Kynar 500® Metallic}
 - {Clear Anodized}
- B. Color: As selected by Architect from panel manufacturer's Color Selection Guide.

2.04 ACCESSORIES

- A. Fasteners and moldings as required for panel system's design by panel system manufacturer. Fasteners shall be coated or stainless steel.
- B. Weather Seals: Shall be Tremco® Spectrum® 2, applied per the sealant manufacturer's instructions.
- C. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas including covering all fascia and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".

PART 3: EXECUTION

3.01 EXAMINATION

- A. Examine and verify substrate surfaces to receive composite metal panel system and associated work and condition which work will be installed.
- B. Maximum deviation from vertical and horizontal alignment of substrate shall be no more than 1/4" in 20'-0".
- C. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed an installer's acceptance of surface conditions.

3.02 PREPARATION

- A. Comply with manufacturer's product data including product technical bulletins, product catalog installation instructions, and product carton instructions.
- B. Surfaces to receive panels shall be even, smooth, sound, clean, and free from defects detrimental to panel installation.
- C. Field measure and verify dimensions as required.
- D. Protect adjacent areas or surfaces from damage as a result of the Work of this Section

3.03 INSTALLATION

- A. Sheathing and water resistant membrane (if specified) by others.
- B. Erect panels level and true to intended plane.
- C. Maximum deviation from vertical and horizontal alignment of erected panels shall be no more than 1/4" in 20'-0".
- D. Maximum deviation in panel flatness shall be 0.6% of the assembled units.
- E. Conform to panel manufacturer's instructions for attachment systems.
- F. Weather seal all joints as required using methods and materials as recommended by the panel manufacturer.

3.04 CLEANING

- A. Remove temporary coverings and protection to adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- B. Remove and legally dispose of construction debris from project site.

END OF SECTION

INSTRUCTIONS FOR EDITING

SECTION 07416

EXTERIOR WALL AND SOFFIT PANELS

1. Part 2 Products: Edit Materials and Finishes 2.06 A1 – select either .032” thick or .040” thick depending on anticipated color selection appropriate to project scope. Manufacturers of .040” thickness have a limited number of color selections.
2. Edit paragraphs 2.04 and 2.05, panel designs, for project scope of work.

SECTION 07416

EXTERIOR WALL AND SOFFIT PANELS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specifications Sections, apply to the work of this section.

1.02 RELATED WORK:

- A. Section 05120 – Structural Steel
- B. Section 05500 – Metal Fabrications
- C. Section 06100 - Rough Carpentry
- D. Section 07210 – Building Insulation
- E. Section 07600 - Flashing and Sheet Metal
- F. Section 07510 - 4-Ply Built-up Roofing with Gravel Ballast and Insulation
- G. Section 07265 – Liquid Applied Air Barrier
- H. Section 07900 - Sealants

1.03 DESCRIPTION OF WORK:

- A. This section covers the pre-finished, pre-fabricated Architectural metal wall/soffit panel system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
- B. Section Includes
 - 1. Factory formed metal/soffit and wall panels.

1.04 DEFINITIONS

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

1.05 QUALITY ASSURANCE

- A. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.
- B. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.
- C. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate - .032 or .040 and Aluminum

1.06 SUBSTITUTIONS

- A. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.
- B. Other pre-bid approved manufacturers complying with the requirements and the intent of this Section shall be acceptable; see Section 01630.

1.07 SYSTEM PERFORMANCE TESTING

- A. General Performance: Metal wall/soffit panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.
- B. Panels to meet:
 - 1. Wall System shall be designed to meet applicable Local Building Code and the Soffit System shall have been tested by the Manufacturer per ASTM E-330 and have the applicable Load Tables published from this Air Bag testing for negative loads.

1.08 SUBMITTALS

- A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
- B. Provide manufacturer's range of colors for selection by Architect.
- C. Verification Samples: For each finish product specified, provide two samples, minimum size 3 inches by 5 inches representing actual product, color, and patterns.
- D. Shop drawings: Show fabrication, installation layouts and details of metal wall panels or metal soffit panels, details of edge conditions, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
- E. Coordination Drawings: Plans, drawn to scale, on which all adjacent items are shown and coordinated with each other, based on input from installer of the items involved.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
- B. Deliver components, sheets, metal wall/soffit panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- C. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal wall/soffit panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall/soffit panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
- E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim and construction of decks, parapet walls and other adjoining work to provide a leakproof, secure and noncorrosive installation.

1.12 WARRANTIES

- A. Provide a five (5) year written guarantee on installation for all exterior wall and soffit panel systems.
- B. Provide manufacturer's standard paint film written warranty for twenty (20) years against cracking, peeling, chalking, and fading of metal roof, soffit and wall panels.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Dimensional Metals Inc. Reynoldsburg, Oh. FP-1012 Flush Wall & Soffit Panel (www.dmimetals.com)
- B. Reynobond, Renolux as manufactured by Alcoa Cladding Systems, (www.alcoa.com)
- C. Flush Wall and Soffit panel as manufactured by Petersen Aluminum Corporation; www.pac-clad.com; 1-800-PAC-CLAD.
- D. Pre-Bid approved manufacturer, see Section 01630.

2.02 PANEL DESIGN: WALL- TYPE 1 (1" HIGH FLUSH PANEL for Wall conditions, Soffit and Roof Equipment Screen.)

- A. Provide (2) evenly spaced "High BEAD" stiffening beads at soffit panel conditions.
- B. Provide 1" reveal at wall conditions.
- C. General: Provide factory-formed metal wall panels designed for exterior wall, soffit and fascia and equipment roof screen applications where a flush or flat appearance is desired. A round interlock leg and concealed fastening system act to improve the flush appearance while providing additional strength.
- D. Wall panels shall be 1" Flush Panel in 12" coverage widths, unless noted otherwise. Provide "smooth" face on flush panels with widths less than 12".
- E. Forming: Use continuous end rolling method. No end laps on panels. Portable rollforming machines will be permitted on this project. Installer-owned or installer rented machines will be permitted. Factory-Manufactured panel systems are also acceptable for this project.

2.03 PANEL DESIGN: WALL - TYPE 2 (Flat Profile "S" Lock)

- A. General: Provide contractor formed metal wall panels designed for exterior walls only where a flush or flat appearance is desired.
- B. Provide Wall panels shall be 12" in coverage widths, unless noted otherwise.
- C. Wall panels fabrication shall follow SMACNA (Architectural Sheet Metal Manual Seventh Edition) Figure 7-3 "Flat Profile".
- D. Wall panels shall be fabricated of .032 thick 3105-H14 Aluminum.
- E. Color to be selected by architect from manufacture's full range of standard colors.

2.04 PANEL DESIGN: WALL - TYPE 3

- A. General: Provide factory formed metal wall panels designed for exterior wall applications where a rib appearance is desired. An interlocking concealed engagement leg and fastening system is required.
- B. Wall panels shall be smooth, with an angular ribbed appearance. Ribs will be spaced 4" OC with a depth of 7/8". Panel width is 16".
- C. Forming: Use continuous end rolling method. No portable rollforming machines will be permitted on this project, no installer-owned, or installer- rented machines will be permitted. It is the intent of the Architect to provide Factory manufactured panel systems only for this project.
- D. Acceptable Manufacturers:
Dimensional Metals Inc. Reynoldsburg Ohio: **HWP-16** (dmimetals.com)
- E. Pre-Bid approved manufacturer, see Section 01630.

2.05 PANEL DESIGN: WALL - TYPE 4

- A. General: Provide formed metal wall panels designed for exterior wall applications where a horizontal, lapped appearance is desired. An interlocking concealed engagement leg with clip attachment is required.
- B. Wall panels shall be smooth with staggered end laps, standard panel size will be 12"x 48" with staggered joints and a depth of 1" at the bottom panel edge.
- C. Acceptable Manufacturers:
Dimensional Metals Inc. Reynoldsburg, Oh. **Bermuda Shingle** (dmimetals.com)
- D. Pre-Bid approved manufacturer, see Section 01630.

2.06 MATERIALS AND FINISHES

- A. Prefomed metal wall panels shall be fabricated of 3105-H14 aluminum.
 - 1. Prefomed metal wall panels shall be fabricated of [**.032" thick or .040" thick**] aluminum.
- B. Prefomed soffit panels shall be fabricated of .032" thick 3105-H14 aluminum.
- C. Color shall be selected by Architect from manufacturer's full range of standard colors.

- D. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 2605 or 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
- E. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.
- F. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
- G. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity.
- H. Sealants:
 - 1. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints or
 - 2. One part polysulfide not containing pitch or phenolic extenders or
 - 3. Exterior grade silicone sealant recommended by roofing manufacturer or
 - 4. One part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.
- I. All surfaces to be covered with metal wall panels shall be covered with liquid applied air barrier per section 07265 or HT Ice and water shield following plans and specifications.
- J. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas including covering all fascia plywood and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".

2.07 FABRICATION

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation.
- B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FASTENERS

- A. Secure units to supports.
- B. Place fasteners as indicated in manufacturer's standards.

3.03 INSTALLATION

- A. Compliance: Comply with manufacturer's product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.
- B. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
- C. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.
- D. Provide uniform, neat seams.
- E. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal

fasteners and anchors for watertight and leak proof installation.

- F. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

3.04 DAMAGED MATERIAL

- A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

3.05 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damage installed products. Clean installed products in accordance with manufacturer's instruction prior to owners acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

**INSTRUCTIONS FOR EDITING
AND COORDINATION
SECTION 07510**

4-PLY BUILT-UP ROOFING WITH GRAVEL BALLAST AND INSULATION

1. Page 07510-1, paragraph 1.03: Edit description of work to correlate with project scope; depending upon whether the work includes new construction, re-roofing of existing deck (tear-off complete or partial) project, or both. Note: Where a roof tear-off is required, verify the extent of tear-off and if the scope of tear-off requires both the removal of an existing recover membrane as well as the original 20-year roof membrane. Coordinate with Design and Construction to ascertain the roofing history of the school. Where applicable, visual inspection of the roof edge may indicate if both an original roof and a roof recover are present (if both exist, the original gravel stop/fascia will be overlaid with a recover gravel stop/fascia). In some cases, coring of the existing roof may be required to identify the membrane composition.
 - A. Ensure that roof demolition plans clearly indicate that all or partial existing roofing membranes, roof insulation, and related flashings and accessories shall be removed in the area of re-roofing.
2. Page 07510-10, paragraph 3.03: Delete reference to vapor barrier installation unless project scope involves roofing over acoustical deck (gymnasium).
3. Page 07510-6, paragraph 2.06: Edit as required:
 - A. Delete entire section if the scope is a new construction, re-roofing of existing deck (tear-off) project or both.
 - B. Leave section and edit accordingly if the scope is for re-roofing jobs only.

SECTION 07510

4-PLY BUILT-UP ROOFING WITH GRAVEL BALLAST AND INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 RELATED WORK

- A. See Roof Plans and Details
- B. Section 07600-Flashing and Sheet Metal

1.03 DESCRIPTION OF WORK

- A. Extent of built-up roofing system work is indicated on drawings and by provisions of this section and is defined to include roofing membrane, insulation flashing and stripping and roofing accessories integrally related to roof installation.
- B. The work consists of new built-up roofing over new decks or over existing decks where tear-off of all or partial existing layers of membrane, insulation and flashings shall be performed. Refer to drawings for scope of work and field verify all existing conditions. Any repairs or replacement to existing decking, wood blocking or other parts of the building structure will be done as directed by a Fairfax County Public Schools (FCPS) inspector on a time and material basis.

1.04 QUALITY ASSURANCE

- A. Single Source Manufacturer: Provide primary products, including each type of roofing sheet (felt), bitumen, insulations, composition flashings, produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.
- B. Installer Qualifications: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm with not less than ten (10) years of successful experience in installation of built-up roofing systems similar to those required for this project. The roofer shall be a certified installer for the approved roofing system. The Roofer must have an office, warehouse with supplies, and permanent roofing crews within a 50-mile radius of the City of Fairfax, Virginia. Roofer shall have had Soprema, Firestone "Red Shield", GAF Master Select or Johns Manville approval in this area for at least eight (8) years from manufacturer, and shall perform a minimum of five (5) of these built-up roofing manufacturer guarantees per year.
- C. Pre-Roofing Conference: As soon as possible after award of built-up roofing work, contractor shall schedule and attend a meeting with Roofer, Manufacturer's

Representative, installers of substrate construction (decks) and other work adjoining roof system, including penetrating work and roof-top units; Architect, Owner, and representatives of other entities directly concerned with performance of roofing system. Review requirements of Contract Documents, submittals, status of coordinating work, availability of materials and installation facilities and proposed installation schedule, requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.

- D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.
- E. UL Listing:
 - 1. Provide built-up roofing system and component materials which have been tested for application and slopes indicated on Drawings and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
 - 2. Provide roof covering materials bearing Classification Marking (UL) on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-up Service.
- F. Product and Application Guides: Soprema or Firestone manufacturer's "Roofing Manual for Commercial/Industrial Roofing Solutions."

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.
 - 1. For asphalt bitumen: provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP) and equiviscous temperature (EVT).
 - 2. Expansion Joints: Follow FCPS specified details.
- B. Shop Drawings: Submit shop drawings showing plan layouts of all roofing assembly types, materials, roof top equipment, tapered insulation, crickets and drains. For additional information and requirements see section 01340.
- C. Samples, Built-Up Roofing System: Submit 2-pound samples of aggregate surfacing material.

1.06 JOB CONDITIONS

- A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.07 DELIVERY, STORAGE AND PRODUCT HANDLING

- A. Deliver specified materials and accessories in unopened rolls, containers and packaging with manufacturer's original labels intact bearing name, source of product and delivery, storage date of manufacture. Cover all materials with waterproof tarps or two layers of plastic. Original material covering is not accepted as a single covering.
- B. Store and handle roofing felts in a manner that will ensure that there is no possibility of significant moisture pick-up.
- C. Store in a dry, well ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end, on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck. Materials that are found to have been exposed to moisture-related weather will be marked or designated as deficient and must be removed and not used on any FCPS project.
- D. Stockpiles of aggregate on roof surface shall only be set on areas which have been coated with asphalt, in order to protect the underlying membrane.
- E. Roof Loading: Do not store materials on roof decks or position installation equipment on roof decks in concentrations or locations exceeding design live loading for structural roof system.
- F. All roofing materials shall be covered with weatherproof tarps or two layers of plastic.

1.08 WARRANTIES

- A. Manufacturer's Guarantee (Project): Submit three (3) executed copies of full 20 year "NDL" (no dollar limit) "Manufacturer's Roofing Guarantee" on form approved by Owner, covering work of this section to include roofing membrane, composition flashing, roof insulation, and roofing accessories.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Insurance and Code Requirements: Provide materials complying with governing regulations and which can be installed to comply with the following:
1. Underwriters Laboratories "Fire Classified" and "Class 90" wind uplift resistance.

2.02 ROOF INSULATION

A. TYPE 1 New Construction and Complete Tear Off Of All Existing Roofing:

1. Polyisocyanurate Insulation (Bottom Layer): 2 layers of 2.5" both layers staggered in all directions," Rigid, closed cell polyisocyanurate foam, faced with a fiberglass, reinforced mat. Meets requirements of ASTM C1289-02, Type II, Class 1, Grade 2. R value: 6.0/inch over the expected life of the insulation. Thickness: Total thickness: 5" R-value of 28.8 (LTTR).
2. ½ " Fiberboard or Perlite (Top Layer), with R-value of 1.32, and shall comply with ASTM C728.

B. TYPE 2 Partial Tear Off Of Existing Roof Where Existing Insulation is to remain:

1. Polyisocyanurate Insulation – 1 layer of 2.8" (R-Value 16.2) (staggering all joints over the existing insulation) to be mechanically attached to the existing layers of insulation, Rigid, closed cell polyisocyanurate foam, faced with a fiberglass, reinforced mat. Meets requirements of ASTM C 1289-02, Type II, Class 1, Grade 2. R-Value: 6.0/inch over the expected life of the insulation. Thickness: Total to meet minimum R value of 28.72 (LTTR).
2. ½ " Fiberboard or Perlite (Top Layer), with R value of 1.32, and shall comply with ASTM C728.

C. TYPE 3 Partial Tear Off Of Existing Roof Where Existing Insulation is to remain:

1. 1 layer of ½" Fiberboard or ½" Perlite (staggering at joints over the existing insulation) to be mechanically attached through the existing insulation to the deck.
2. 1 layer of ½" Fiberboard or ½" Perlite (staggering at joints over the previous layer of ½" fireboard) set in a full mapping of Type III asphalt.

D. TYPE 4 Partial Tear Off Of Existing Roof Where Existing Insulation and Cap Sheet is to remain:

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1. Polyisocyanurate Insulation- 1 layer of 2.8" (R-Value 16.2) (staggered at joints over the prime coated existing insulation) set in a full mopping of hot asphalt, rigid, closed cell polyisocyanurate foam, faced with a fiberglass, reinforced mat. Meets requirements of ASTM C 1289-02, Type II, Class1, Grade 2. R Value: 6.0 /inch over the expected life of the insulation. Thickness: Total to meet minimum R value of 28.72 (LTTR).
 2. ½" Fiberboard or Perlite (Top Layer) with R value of 1.32, and shall comply with ASTM C 728.
- E. Tapered polyisocyanurate or tapered perlite panels roof insulation for slopes, tapered edge strips, and crickets.

2.03 BUILT-UP ROOF MEMBRANE SYSTEM

- A. Insulated-Deck Asphalt/Glass-Fiber/Aggregate Roofing: Provide built-up aggregate-surfaced roof system with asphalt bitumen and 4 plies of glass fiber felts for lay-up as indicated.
1. Primer: Asphalt cutback primer complying with ASTM D41.
 2. Ply Felts: 4 plies of asphalt-impregnated glass-fiber felts, Type 4 of Firestone, Soprema, GAF or Johns Manville ASTM D2178.
 3. Bitumen: Roofing asphalt, complying with ASTM D312, Type III."Low Odor"/"Low Fume Only"
 4. Paint all base flashing seams: Firestone – 1 coat base and 1 coat top
 - a. Firestone – 1 coat base and 1 coat top
 - b. Soprema – Alsan Finish
 - c. GAF-1 coat Unibase Primer and 1 coat Roof Mate top coat.
 - d. JohnsManville – 1 coast base and 1 coat top.
 5. Broom all felts
- B. Comply with NRCA Roofing and Waterproofing Manual, 5th edition, Specification Plate #BU-4-I-A-A or latest edition, Diagram B; except 4 plies.
- C. Products: Subject to compliance with requirements, provide the following BUR System: NO SUBSTITUTIONS ALLOWED!
1. Soprema
 2. Firestone
 3. GAF
 4. Johns Manville
- D. Base Flashings

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1. Firestone- 1 ply SBS Premium base mopped only and 1 ply Ultra White Granual SBS FR torched or mopped.
 2. Soprema- 1 ply Sopralene Sandes PS mopped only and 1 ply Sopra Star Flame torched or mopped.
 3. GAF- 1 ply rubberoid mop smooth 1.5 and 1 ply Siplast Pavator 30 BW.
 4. Johns Manville- 1 ply Dyna Base PR and 1 ply Dyna Glas FR CR G.
- E. Strippling Piles: For gravel stops, vent pipe flashings, pitch pockets, and "B" vent type flashing install 2 plies type 4 felt set in hot asphalt. At gravel stop/drip edge flashing install 1 ply SBS Ultra White gravels. For Firestone, 1 ply Sopra Star white for Soprema and Johns Manville Dyna Glas FR CR G.

2.04 BUR EDGE/PENETRATION MATERIALS (As recommended by manufacturer)

- A. Roofing Cement: Asphaltic cement; comply with ASTM D4586, (non-asbestos containing).
- B. Glass Fiber Fabric: 1.5-pound minimum sheet of woven glass fiber, impregnated with asphalt (ASTM D 1668).
- C. Lead Flashing: 4-pound sheet of common desilverized pig lead. All sides primed that come in contact with built-up roofing.
- D. Preformed Edge Strips: Rigid insulation units matching roof insulation, or asphalt-impregnated organic fiber insulation units, molded to form 3-1/2" x 3-1/2" x 45 deg cant strips and 1-5/8" x 18" tapered edge strips, as shown to receive roofing ply-sheet courses and lift edges above main roofing surfaces. (Set in asphalt.)
- E. Cant strips: Fiber or perlite (Set in asphalt.)

2.05 SHEET METAL ACCESSORY MATERIALS

- A. Stainless Steel: ASTM A 167, AISI 302/304, No. 2D finish, temper as required for forming and performance; 0.015" thick (28 gage), except as otherwise indicated.
- B. Copper: ASTM B 370, cold-rolled unless soft temper required for forming and performance; 16-ounce (0.0216" thick), except as otherwise indicated.
- C. Aluminum: ASTM B 209, alloy 3003, temper H 14 unless harder temper required for forming and performance, with "Kynar" fluorocarbon enamel finish; 0.032" thick (20 gauge), except as otherwise indicated. Color as selected by Architect.
- D. Solder for Sheet Metal: Except as otherwise indicated or recommended by metal manufacturer, provide 50/50 tin/lead type (ASTM B32) for tinning and soldering joints; use rosin flux. All joints shall be soldered.

4-PLY BUILT-UP ROOFING WITH GRAVEL BALLAST AND INSULATION SECTION 07510

1. Solder stainless steel joints with 60/40 tin/lead type solder; use acid-chloride flux, except use rosin flux on tinned surfaces.

2.06 ROOF DRAINS (THIS SECTION TO BE REMOVED BY EDIT FOR OTHER THAN ROOFING ONLY JOBS)

- A. Josam, J.R. Smith, Wade, Watts or Zurn Equipment matching existing pipe size to be approved by FCPS (as indicated on drawings).
 1. All roof drains assemblies shall be removed and replaced with new Josam, J.R. Smith, Wade, Watts or Zurn. Replacement drains shall be large bowls with new drain deck pans.
 2. Provide new 1" hard wrap insulation at drain bowls sealed to decking. Replace any pipe insulation that has been removed for drain replacement.

2.07 MISCELLANEOUS MATERIALS

- A. Surfacing Aggregate: Crushed stone, free of sharp edges and complying with ASTM D 1863. Color: White. Texas #7- NO SUBSTITUTIONS
- B. Wood Members: Provide wood pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2 as indicated on drawings.
- C. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas including covering all fascia and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".
- D. Mastic Sealant: Polysio-butylene (plain or bituminous modified), non-hardening, nonmigrating, nonskinning and nondrying.
- E. Asphaltic Primer: Comply with ASTM D 41.
- F. Mechanical Fasteners: To comply with FM approval Guide 1-28 for I-90 classification; provide industry-standard types of mechanical fasteners for BUR system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1" diameter nail heads or 1-3/8" diameter x 30-gage sheet metal caps for nails used to secure felts or insulation boards of roofing system.
 1. Metal Decks: Soprema Fastening System, Firestone, or GAF approved equal. Note: Where acoustical deck is used, fasteners shall not protrude below the bottom of the rib profile. Should this occur, the protruding portion of the fastener shall be cut.
 2. Gypsum Concrete Decks: Soprema, Firestone, GAF, or Johns Manville Specialty Systems.

- G. Vapor Retarders: (Acoustical Deck): Provide self adhering "Blueskin PE 200 HT" vapor retarding, high temperature roof underlayment by Henry Company, 800-486-1278. Vapor retarding underlayment shall be 40 mils thick, SBS rubberized asphalt compound laminated to a non-slip coated, polyethylene film top layer and a silconizes kraft paper bottom layer.
- H. Expansion Joints: Install new expansion joints and replace existing expansion joints at locations shown on the drawings in details as indicated.

2.08 FABRICATION OF SHEET METAL ACCESSORIES

- A. SMACNA and NRCA Details: Work shall conform with details shown, and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.
- B. Provide 4" wide flanges for all accessories for setting on BUR membrane with concealment by composition stripping.
- C. Fabricate work with flat-lock soldered joints and seams; except where joint movement is necessary provide 1" deep interlocking hooked flanges, filled with mastic sealant.
- D. Fabricate penetration sleeves with minimum 8" high stack of diameter 1" larger than penetrating element. Counter flashing is specified as work of Section 07600, Flashing and Sheet Metal.
- E. All metal copings shall have standing seam joints (per manufacturer's recommendation).
- F. All masonry associated counterflashing will use existing through wall assembly or provide new through wall assembly per the plans and specifications.

PART 3 - EXECUTION

3.01 INSPECTION OF SUBSTRATE

- A. Examine substrate surfaces to receive roofing system and associated work and conditions under which roofing will be installed. For re-roofing projects, examine existing conditions (such as deck substrate, edge construction, curb openings and other roof penetrations) and verify that such conditions will allow proper installation of the roof membrane assembly. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer and complying with manufacturer's standards. Existing decking will be cleaned completely of all debris including deck flutes.

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- B. Final determination of existing conditions will be that of FCPS Design and Construction. Any repair or replacement of existing structure will be directed by FCPS inspector on a time and material basis.
 - 1. Verify that flatness and fastening of metal roof decks comply with the following:
 - a. Top Flanges: No concavity or convexity in excess of 1/16" across any 3 adjacent flanges.
 - b. Side Laps: Minimum 2" laps located over and fastened to supports.
 - c. Deck secured to each supporting member in every other rib (maximum spacing of 12" o. c.) with puddle welds or approved mechanical fasteners.
 - 2. Deck infiller replacement shall follow FCPS specification details.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with manufacturer's published specifications for ply lapping, asphalt application, fastener recommendations, roof edge details and base flashing details. NOTE: FCPS specifications may supersede the minimum manufacturer requirement.
- B. Cooperate with inspection and test agencies engaged or required to perform services in connection with BUR system installation.
- C. Protect other work from spillage of BUR materials and prevent liquid materials from entering or clogging drains and conductors. Replace and restore other work damaged by installation of BUR system work.
- D. Insurance/Code Compliance: Install BUR system for (and test where required to show) compliance with governing regulations and with the insurance requirements of this Section.
- E. Coordinate the installation of insulation, roofing felts flashings, stripping, coatings and surfacings, so that insulation and felts are not exposed to precipitation nor exposed overnight. Provide cut-offs at end of each day's work, to cover exposed felts and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work. No phasing of roofing will be accepted unless approved by FCPS.
- F. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with Equiviscous Temperature Method ("EVT Method") as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT ("25 degrees F or 14 degrees C, at point of application) more than one hour prior to time of application. Discard bitumen that has been held at temperature exceeding Finished Blowing Temperature (FBT) for a period

exceeding 3 hours. Determine flash point, FBT and EVT of bitumen, either by information from bitumen producer or by suitable tests, and determine maximum fire-safe handling temperature and do not exceed temperature in heating bitumen. In no case shall bitumen be heated to a temperature higher than 25 degrees F (14 degrees C) below flash point. For aggregate-surfaced pour coats of bitumen, limit application temperature to minimum required for proper embedment of aggregate, and maximum which will permit retention of a coating of weight required, depending upon slope of surface. Tankers only will be used on all FCPS roof projects.

- G. Bitumen Mopping Weights: For interply mopping and for other moppings except as otherwise indicated, apply bitumen at the following rate:

Asphalt: 25-lbs. of asphalt (25% on a total-job average basis) per roof square (100 square feet) between plies, but not less than 23 pounds per square per ply, applied within the EVT range.

- H. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, vapor barrier (retarders) or other construction. Where steep asphalt is applied directly to a substrate, hold mopping back 2" from both sides of each joint.

- I. Cut-Offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of 2 plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work. Do not glaze coat ply sheets in the interim before surfacing.

- J. Cold Weather Application: Fully comply with manufacturer's written guidelines for cold weather roof installation when work shall be performed in temperatures below 45°F.

- K. Newly installed roofing that is left unsurfaced for a period of time that will exceed that of what is recommended by the manufacturer will be coated with asphalt at a rate that is recommended by that manufacturer.

- L. At all times provide an odor eliminator additive – use “desent” by Arrmaz Custom Chemicals or approved equal.

- M. For roof replacement remove loose gravel by power vacuuming only.

3.03 VAPOR BARRIER APPLICATION/ACOUSTICAL DECK INSTALLATIONS (GYMNASIUM)

- A. Install preformed sound absorbing glass fiber insulation strips supplied under Section 05230, in acoustical wide rib deck flutes. Install in accordance with deck manufacturer's instructions.

4-PLY BUILT-UP ROOFING WITH GRAVEL BALLAST AND INSULATION SECTION 07510

- B. Prior to commencing installation, ambient and deck surface temperature shall be not less than 40 degrees and rising.
- C. Install self adhering single layer vapor retarding underlayment in shingle fashion parallel to metal deck flutes in accordance with manufacturers written instructions. All edges (sides and end laps) shall be lapped not less than 2 ½" and sealed with manufacturers recommended sealing compound.
- D. Extend vapor retarder under cant strips and blocking. Lap flexible flashing over vapor retarder or wall construction to provide continuity of vapor barrier envelope.
- E. Vapor retarding underlayment shall be fully covered by roofing system within six weeks of installation. Exposed underlayment shall be protected from foot and equipment traffic as recommended by manufacturer.

3.04 INSTALLATION OF INSULATION

- A. General: Comply with insulation manufacturer's instructions and recommendations for the handling, installation and bonding or anchorage of insulation to substrate.
- B. Secure insulation: to deck using mechanical fasteners specifically designed and sized for attachment of specified board type insulation to deck type shown. Fasten all layers of insulation over entire area of roofing at spacing as required by manufacturer.
- C. Three-Layer Installation: Install required thickness in three layers with joints of second layer staggered from joints of first layer a minimum of 12" each direction.
- D. Mecanically attach the first two layers together. Install third layer staggered from the second layer in full mopping of hot Type III asphalt, applied within temperature range of EVT " 25°F (14°C) and at average rate of 25 pounds. ("25% on total-job basis) per 100 square foot.
- E. Tapered insulation will be installed at all roof drains, crickets, tapered areas and on the high sides of all units as per the drawings and specifications.
- F. Tapered Insulation: Installation shall be as recommended by manufacturer.
- G. Install one-ply of #15 lb. felt laid in dry at all walls, roof edges and penetrations prior to installing roofing plies. #15 felt should be set under 1st layer of new insulation.
- H. Insulation required inside roof curbs shall match the R-value and thickness of the surrounding roof area.

3.05 ROOF MEMBRANE INSTALLATION

- A. Shingling of Plies: Except as otherwise indicated, install membrane with ply sheets shingled uniformly to achieve required number of thickness of membranes

throughout. Shingle in proper direction to shed water on each large area of roofing. Drainage flow shall be over or parallel to, but not against the lap. Lightly broom felts as directed on all roofing plies. **GLAZE COAT PLIES IF SURFACE IS NOT INSTALLED WITHIN 60 DAYS.**

- B. Cant Strips/Tapered Edge Strips: Except as otherwise shown, install preformed 45° insulation cant strips at junctures of BUR membrane with vertical surface. Provide preformed tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces. Set all edge strips and cant strips in hot asphalt.
- C. Inter-Ply Felts: Provide the number and type(s) of felts indicated, lapped (shingled) as required to form a continuous, uniform membrane with bitumen moppings between sheets so that ply sheet does not touch ply sheet. Except as otherwise indicated, glaze-coat top of ply-sheet membrane with 10-pound mopping of same bitumen, integrally with operation of laying up membrane.
1. Mop base directly to substrate.
 2. Extend BUR membrane to 2" (nominal) above top edge of cant strip, solidly adhered, without bridging or buckling.
 3. Provide a folded-back envelope at edges and penetrations of BUR membrane where it is not turned up on a tapered strip, so as to provide positive protection against flow of bitumen into building or off the edge. Extend base sheet to form envelope or, where no base sheet is provided, install one ply or coated felt set in steep asphalt with joints sealed. Seal corners and other interruptions of envelope with large beads of roofing cement to provide positive protection against flow of bitumen.
 4. Nail edges of roofing membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space recommended fasteners at minimum 6" o. c. with staggered rows through one-inch (1") diameter metal discs, unless otherwise noted.
- D. Set-on Accessories: Where small roof accessories are set on BUR membrane, set metal flanges in a bed of roofing cement, and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.
- E. Roof Drains: All roof drains shall have a tapered insulation sump area consisting of a minimum 12' x 12' total area. The sump shall be a minimum of 6' in each direction from the center of the roof drain. Sump area may need to be larger depending on the thickness of new insulation. Insulation should have a gradual slope to drain not to exceed ¾" per foot or approved by FCPS. Fill clamping ring base with a heavy coat of roofing cement. Set lead flashing sheet in a bed of roofing cement over completed ply sheet course. Lead sheet shall be primed with asphalt primer, clamped in roof drain ring, and extended a minimum of 24" onto the roof. Cover lead sheet with two plies of Type 4 felt. Finish by covering the entire sump area with SBS White Modified Bitumen sheet specified under the base flashing section, extending a minimum of 6" out onto the roofing field.

1. Lead flashing sheet: Minimum 30" x 30" in size.
- F. Allow for Expansion: of running metal flashing and edge trim that adjoins roofing. Do not seal or bond BUR membrane or composition flashing and stripping to metal flanges over 3'-0" in length.
- G. Flashings: Two-ply flashings shall not be applied until the roof membrane (excluding surfacing) has been installed. Provide a temporary seal at ply terminations until flashing can be installed.
1. Prime masonry surfaces and wood cant and expansion joint with recommended asphalt primer at the rate of one (1) gallon per 100 square feet.
 2. Apply asphaltic primer to all sheet metal that shall come into contact with bituminous materials (top and bottom).
 3. Embed flashings into a solid mopping of steep asphalt extending at least eight inches (8") up the curb or wall, and extending at least four inches (4") beyond the cant strip onto the roof.
 4. Seal all nail heads, inside and outside corners with roof cement. Provide a three- (3) course seal using glass fabric embedded into and covered with roofing cement under all surface-mounted counter flashing.
 5. Cover all wood blocking/plywood not covered by the B/U/R with ice/wwater shield.
- H. Counter Flashings: Counter flashings, cap flashings, expansion joints, through wall receiver metal are "all" stainless steel and "all" similar metal work to be coordinated and will become part of the BUR work.
- I. Roof Accessories: Miscellaneous sheet metal accessory items, including, and major items of accessories to be coordinated with BUR work, are specified in other sections of these specifications.
1. Sheet metal flashing flanges and through wall shall have all seams (base and up seams) soldered. Prime coat all parts that come into contact with roofing membrane. Set in bed of roofing cement prior to concealment by composition stripping.
- J. Aggregate Surfacing: Promptly after completion of BUR membrane, edge treatment and set-on accessories in each substantial area of roofing, flood-coat surface as indicated and while each small area is hot and fluid, cast the following approximate weight of aggregate in a uniform course. NOTE: ALL AREAS THAT SHALL RECEIVE AGGREGATE SHALL BE INSPECTED BY OWNER'S REPRESENTATIVE AND ROOFING MANUFACTURER'S REPRESENTATIVE PRIOR TO INSTALLING AGGREGATE.

1. Flood Coat: 60 pounds per square into hot steep asphalt.
2. Aggregate: Texas #7 White Stone ONLY! No Substitutions

Roof surface shall be clean, free of dirt, dust, and moisture prior to applying aggregate. Install aggregate so that at least 50% of the aggregate is solidly adhered in the asphalt.

- K. Do not install flood coating of bitumen and aggregate surface source at edges of roofing until composition flashing and stripping work has been completed. Glaze-coat ply sheet courses where surfacing cannot be installed on the same day. Delay aggregate surfacing only as long as necessary to substantially complete edge work and tests where required.
- L. Allow 5% of extra asphalt and stone for ponded water areas.

3.06 CORRECTION OF DEFECTIVE OR DAMAGED WORK

- A. Owner reserves the right to direct that roof cuts (samples) be taken in any area of the work whenever defective work is suspected. Owner's Representative will notify Contractor and Roofing Manufacturer's Representative, when such action is deemed necessary in the opinion of the Owner.
- B. "Fishmouths" (non-adhered arched ply edges). Cut out plies which are not properly embedded in bitumen; replace the cut area with the minimum number of plies specified for the roofing system, plus one (1) additional ply using the "feather out" method recommended by the Manufacturer for cut-out repair. Embed each ply in a solid, uniform 23 to 35 pounds per square mopping of hot bitumen. No dry laps shall be permitted. Feather felts 2" over preceding layers.
- C. Physical damage resulting from construction activity: Cut out damaged plies and insulation. Install new insulation and repair the cutout in accordance with the procedures outlined in paragraph A above.
- D. Non-adhered laps: Secure laps by embedding each ply in a solid, uniform 23 to 35 pounds per square mopping of hot bitumen.
- E. Other defective or non complying work discovered as a result of Manufacturer's audit for guaranty requirements shall be corrected in accordance with manufacturer's recommended procedures for each type of defect encountered.

3.07 CLEANING

- A. Remove excess materials, equipment, trash and debris associated with the roofing activities from the project area and dispose of legally.
- B. Repair damage to adjacent work of other trades which has resulted from roofing activities; remove stains and drippage resulting from bitumen application.

3.08 PROTECTION OF ROOFING

- A. Upon completion of roofing work, including associated work, Roofer shall advise Contractor of recommended procedures for surveillance and protection of roofing during remainder of construction period. At end of Construction period, or at Contractor's option, at a time when remaining construction work will in no way affect or endanger roofing, Roofer shall make a final inspection of roofing and prepare a written report, directed to Contractor with copy to Owner describing nature and extent of deterioration of damage found in the work.
- B. Roofer shall repair or replace deteriorated or defective work found at time of final inspection. Roofer shall be engaged by Contractor to repair damages to roofing that occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.
- C. Repair all damaged side walks, grounds and all other damaged surfaces to match existing.

END OF SECTION

**INSTRUCTIONS FOR EDITING
AND COORDINATION
SECTION 07512**

4-PLY BUILT-UP MODIFIED “COOL ROOF” AND INSULATION

1. Page 07510-1, paragraph 1.02: Edit description of work to correlate with project scope; depending upon whether the work includes new construction, re-roofing of existing deck (tear-off), or both. Note: Where a roof tear-off required, verify the extent of tear-off and if the scope of tear-off requires both the removal of an existing recover membrane as well as the original 20-year roof System. Coordinate with Design and Construction to ascertain the roofing history of the school. Where applicable, visual inspection of the roof edge may indicate if both an original roof and a roof recover are present (if both exist, the original gravel stop/fascia will be overlain with a recover gravel stop/fascia). In some cases, coring of the existing roof may be required to identify the membrane mposition.
 - A. Ensure that roof demolition plans clearly indicate that all existing roofing membranes, roof insulation, and related flashings and accessories shall be removed in the area of re-roofing.
2. Page 07510-9, paragraph 3.03: Delete reference to vapor barrier installation unless project scope involves roofing over all acoustical deck areas as shown on drawings.
3. Page 07512-5, paragraph 2.07: Edit as required:
 - A. Delete entire section if the scope is a new construction, re-roofing of existing deck (tear-off) project or both.
 - B. Leave section and edit accordingly if the scope is for re-roofing jobs only.

SECTION 07512

4-PLY BUILT-UP MODIFIED "COOL ROOF" AND INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. See Roof Plans and Details
- B. Section 07600-Flashing and Sheet Metal

1.03 DESCRIPTION OF WORK

- A. Extent of built-up roofing system work is indicated on drawings and by provisions of this section and is defined to include roofing membrane, insulation flashing and stripping and roofing accessories integrally related to roof installation.
- B. The work consists of new built-up roofing over existing decks where tear-off of all existing layers of membrane, insulation and flashings shall be performed. Refer to drawings for scope of work and field verify all existing conditions. Any repairs or replacement to existing decking, wood blocking or other parts of the building structure will be done as directed by a Fairfax County Public Schools (FCPS) inspector on a time and material basis.
- C. The work consists of new built-up roofing over existing insulation where tear off of only the roof cap (built-up plies, flashings and gravel) shall be performed. Refer to drawings for scope of work and specified roof areas.

1.04 QUALITY ASSURANCE

- A. Single Source Manufacturer: Provide primary products, including each type of roofing sheet (felt), bitumen, insulations, composition flashings, produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.
- B. Installer Qualifications: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm with not less than ten (10) years of successful experience in installation of built-up roofing systems similar to those required for this project. The roofer shall be a certified installer for the approved roofing system. The Roofer must have an office, warehouse with supplies, and permanent roofing crews within a 50-mile radius of the City of Fairfax, Virginia. Roofer shall have had, "Firestone "Red Shield" or Soprema approval in this area

for at least eight (8) years from manufacturer, and shall perform a minimum of twenty (20) of these built-up roofing manufacturer guarantees per year.

- C. Pre-Roofing Conference: As soon as possible after award of built-up roofing work, contractor shall schedule and attend a meeting with Roofer, Manufacturer's Representative, installers of substrate construction (decks) and other work adjoining roof system, including penetrating work and roof-top units; Architect, Owner, and representatives of other entities directly concerned with performance of roofing system. Review requirements of Contract Documents, submittals, status of coordinating work, availability of materials and installation facilities and proposed installation schedule, requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.
- D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.
- E. UL Listing:
1. Provide built-up roofing system and component materials which have been tested for application and slopes indicated on Drawings and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
 2. Provide roof covering materials bearing Classification Marking (UL) on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-up Service.
- F. Product and Application Guides: FIRESTONE or SOPREMA manufacturer's "Roofing Manual for Commercial/Industrial Roofing Solutions."

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.
1. For asphalt bitumen: provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP) and equiviscous temperature (EVT).
 2. Expansion Joints: Follow FCPS specified details.
- B. Shop Drawings: Submit shop drawings showing plan layouts of all roofing assembly types, materials, roof top equipment, tapered insulation, crickets and drains. For additional information and requirements see section 01340.

1.06 JOB CONDITIONS

- A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.07 DELIVERY, STORAGE AND PRODUCT HANDLING

- A. Deliver specified materials and accessories in unopened rolls, containers and packaging with manufacturer's original labels intact bearing name, source of product and delivery, storage date of manufacture.
- B. Store and handle roofing felts in a manner that will ensure that there is no possibility of significant moisture pick-up.
- C. Store in a dry, well ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end, on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck. Materials that are found to have been exposed to moisture-related weather will be marked or designated as deficient and must be removed and not used on any FCPS project.
- D. Roof Loading: Do not store materials on roof decks or position installation equipment on roof decks in concentrations or locations exceeding design live loading for structural roof system.
- E. All roofing materials shall be covered with weatherproof tarps or double wrapped poly.
Note: Shipping materials are not acceptable

1.08 WARRANTIES

- A. Manufacturer's Guarantee (Project): Submit three (3) executed copies of full 20 year "NDL" (no dollar limit) "Manufacturer's Roofing Guarantee" on form approved by Owner, covering work of this section to include roofing membrane, composition flashing, roof insulation, and roofing accessories.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Insurance and Code Requirements: Provide materials complying with governing regulations and which can be installed to comply with the following:

1. Underwriters Laboratories "Fire Classified" and "Class 90" wind uplift resistance.

2.02 ROOF INSULATION

- A. Polyisocyanurate Insulation (Bottom Layer): 3," Rigid, closed cell polyisocyanurate foam, faced with a black, fiberglass, reinforced mat. Meets requirements of ASTM C1289-02, Type II, Class 1, Grade 2. R value: 6.0/inch over the expected life of the insulation. Thickness: 3" with R-value of 17.4 (LTTR).
- B. 1/2" Retrofit Board (Top Layer) for Firestone or 1/2" Fiberboard (Top Layer) for Soprema, with R-value of 1.32, and shall comply with ASTM C728.

2.03 TAPERED ROOF INSULATION PANEL

- A. Tapered polyisocyanurate or tapered perlite panels roof insulation for slopes, tapered edge strips, crickets and drain sumps

2.04 BUILT-UP ROOF MEMBRANE SYSTEM

- A. Insulated-Deck Asphalt/Glass-Fiber/Aggregate Roofing:

Provide built-up roof system with asphalt bitumen and 3 plies of glass fiber felts for lay-up as indicated.

1. Primer: Asphalt cutback primer complying with ASTM D41.
 2. Ply Felts: 3 plies of asphalt-impregnated glass-fiber felts, FIRESTONE or SOPREMA complying with ASTM D2178, Type 4.
 3. Bitumen: Roofing asphalt, complying with ASTM D312, Type III.
 4. FR (SBS) Cap Sheet: Firestone Ultra White, Soprema, Sopra Star Flam
 5. Paint all base Flashing and field seams: Firestone – 1 coat base and 1 coat top, Soprema – Alsan Finish
 6. Broom all felts and capsheet installation.
- B. Comply with NRCA Roofing and Waterproofing Manual, 5th edition, Specification Plate #BU-4-I-A-M, Diagram A or latest edition; except 3 plies plus 1 SBS cap.
 - C. Products: Subject to compliance with requirements, provide the following BUR System: **(NO SUBSTITUTION ALLOWED)**
 1. FIRESTONE – I-3F-31UW or

2. SOPREMA – 3-0492B.

- D. Base Flashings: Firestone – 1 ply SBS Premum base mopped only 1 ply Ultra White Granual SBS FR torched or hot mopped. Soprema – 1 Ply Elastophene Sandes mopped only and 1 ply Sopra Star Flam torched only
- E. Removal of Roof cap (built-up plies, flashings and gravel) only.
 - 1. Over existing insulation, install ½" insulation mechanically attached per manufacturers' specifications to the existing steel deck. Stagger all joints.
 - 2. Install over the mechanically attached ½" insulation a second layer of ½" insulation in a solid mopping of hot asphalt. Stagger all joints from previous layer installed.
 - 3. Install Built-up Roof Membrane System following section 2.04 B, C, D and E.

2.05 BUR EDGE/PENETRATION MATERIALS (As recommended by manufacturer)

- A. Roofing Cement: Asphaltic cement; comply with ASTM D4586, (non-asbestos containing).
- B. Glass Fiber Fabric: 1.5-pound minimum sheet of woven glass fiber, impregnated with asphalt (ASTM D 1668).
- C. Lead Flashing: 4-pound sheet of common desilverized pig lead. All sides primed that come in contact with built-up roofing.
- D. Preformed Edge Strips: Rigid insulation units matching roof insulation, or asphalt-impregnated organic fiber insulation units, molded to form 3-1/2" x 3-1/2" x 45 deg cant strips and 1-5/8" x 18" tapered edge strips, as shown to receive roofing ply-sheet courses and lift edges above main roofing surfaces. (Set in asphalt.)
- E. Cant strips: " perlite or Fiberboard (Set in asphalt.)

2.06 SHEET METAL ACCESSORY MATERIALS

- A. Stainless Steel: ASTM A 167, AISI 302/304, No. 2D finish, temper as required for forming and performance; 0.015" thick (28 gage), except as otherwise indicated.
- B. Copper: ASTM B 370, cold-rolled unless soft temper required for forming and performance; 16-ounce (0.0216" thick), except as otherwise indicated.
- C. Aluminum: ASTM B 209, alloy 3003, temper H 14 unless harder temper required for forming and performance, AS-C22A41 clear anodized finish; 0.032" thick (20 gage), except as otherwise indicated.

- D. Solder for Sheet Metal: Except as otherwise indicated or recommended by metal manufacturer, provide 50/50 tin/lead type (ASTM B32) for tinning and soldering joints; use rosin flux. All joints shall be soldered.
 - 1. Solder stainless steel joints with 60/40 tin/lead type solder; use acid-chloride flux, except use rosin flux on tinned surfaces.

2.07 MISCELLANEOUS MATERIALS

- A. Wood Members: Provide wood pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2 as indicated on drawings.
- B. Walkway Protection Boards: Provide two (2) layers of SBS cap sheets.
- C. Mastic Sealant: Polysobutylene (plain or bituminous modified), non-hardening, nonmigrating, nonskinning and nondrying.
- D. Asphaltic Primer: Comply with ASTM D 41.
- E. Mechanical Fasteners: To comply with FM approval Guide 1-28 for I-90 classification; provide industry-standard types of mechanical fasteners for BUR system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1" diameter nail heads or 1-3/8" diameter x 30-gage sheet metal caps for nails used to secure felts or insulation boards of roofing system.
 - 1. Metal Decks: FIRESTONE Fastening System or SOPREMA approved equal. Note: Where acoustical deck is used, fasteners shall not protrude below the bottom of the rib profile. Should this occur, the protruding portion of the fastener shall be cut.
 - 2. Gypsum Concrete Decks: FIRESTONE Specialty Fastening System or SOPREMA approved equal.
- F. Vapor Retarders: (Acoustical Metal Roof Deck): Provide self-adhering "Blueskin PE 200 HT" vapor retarding, high temperature roof underlayment by Henry Company, El Segundo, CA (800-486-1278), www.henry.com. Vapor retarding underlayment shall be 40 mils thick, SBS rubberized asphalt compound laminated to a non-slip coated, polyethylene film top layer and a silconized kraft paper bottom layer. Provide sealing compound product as recommended by vapor retarding underlayment manufacturer.
- G. Expansion Joints: Install new expansion joints and replace existing expansion joints at locations shown on the drawings in details as indicated.

2.08 FABRICATION OF SHEET METAL ACCESSORIES

- A. SMACNA and NRCA Details: Work shall conform with details shown, and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.
- B. Provide 4" wide flanges for all accessories for setting on BUR membrane with concealment by composition stripping.
- C. Fabricate work with flat-lock soldered joints and seams; except where joint movement is necessary provide 1" deep interlocking hooked flanges, filled with mastic sealant.
- D. Fabricate penetration sleeves with minimum 8" high stack of diameter 1" larger than penetrating element. Counter flashing is specified as work of Section 07600, Flashing and Sheet Metal.
- E. All metal copings shall have standing seam joints per manufacturer's recommendations.
- F. All counterflashing will use cut reglet unless otherwise directed.

PART 3 - EXECUTION

3.01 INSPECTION OF SUBSTRATE

- A. Examine substrate surfaces to receive roofing system and associated work and conditions under which roofing will be installed. For re-roofing projects, examine existing conditions (such as deck substrate, edge construction, curb openings and other roof penetrations) and verify that such conditions will allow proper installation of the roof membrane assembly. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer and complying with manufacturer's standards. Existing decking will be cleaned completely of all debris including deck flutes.
- B. Final determination of existing conditions will be that of FCPS Design and Construction. Any repair or replacement of existing structure will be directed by FCPS inspector on a time and material basis.
 - 1. Verify that flatness and fastening of metal roof decks comply with the following:
 - a. Top Flanges: No concavity or convexity in excess of 1/16" across any 3 adjacent flanges.
 - b. Side Laps: Minimum 2" laps located over and fastened to supports.

- c. Deck secured to each supporting member in every other rib (maximum spacing of 12" o. c.) with puddle welds or approved mechanical fasteners.

2. Deck infiller replacement shall follow FCPS specification details.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with manufacturer's published specifications for ply lapping, asphalt application, fastener recommendations, roof edge details and base flashing details. NOTE: FCPS specifications may supersede the minimum manufacturer requirement.
- B. Cooperate with inspection and test agencies engaged or required to perform services in connection with BUR system installation.
- C. Protect other work from spillage of BUR materials and prevent liquid materials from entering or clogging drains and conductors. Replace and restore other work damaged by installation of BUR system work.
- D. Insurance/Code Compliance: Install BUR system for (and test where required to show) compliance with governing regulations and with the insurance requirements of this Section.
- E. Coordinate the installation of insulation, roofing felts flashings, stripping, coatings and surfacings, so that insulation and felts are not exposed to precipitation nor exposed overnight. Provide cut-offs at end of each day's work, to cover exposed felts and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work. No phasing of roofing will be accepted unless approved by FCPS.
- F. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with Equiviscous Temperature Method ("EVT Method") as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT ("25 degrees F or 14 degrees C, at point of application) more than one hour prior to time of application. Discard bitumen that has been held at temperature exceeding Finished Blowing Temperature (FBT) for a period exceeding 3 hours. Determine flash point, FBT and EVT of bitumen, either by information from bitumen producer or by suitable tests, and determine maximum fire-safe handling temperature and do not exceed temperature in heating bitumen. In no case shall bitumen be heated to a temperature higher than 25 degrees F (14 degrees C) below flash point. For aggregate-surfaced pour coats of bitumen, limit application temperature to minimum required for proper embedment of aggregate, and maximum which will permit retention of a coating of weight required, depending upon slope of surface. Tankers only will be used if required by FCPS.

- G. Bitumen Mopping Weights: For interply mopping and for other moppings except as otherwise indicated, apply bitumen at the following rate:
- Asphalt: 25-lbs. of asphalt (25% on a total-job average basis) per roof square (100 square feet) between plies, but not less than 23 pounds per square per ply, applied within the EVT range.
- H. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, vapor barrier (retarders) or other construction. Where steep asphalt is applied directly to a substrate, hold mopping back 2" from both sides of each joint.
- I. Cut-Offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of 2 plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work. Do not glaze coat ply sheets in the interim before surfacing.
- J. Cold Weather Application: Fully comply with manufacturer's written guidelines for cold weather roof installation when work shall be performed in temperatures below 45°F.
- K. Newly installed roofing that is left unsurfaced for a period of time that will exceed that of what is recommended by the manufacturer will be coated with asphalt at a rate that is recommended by that manufacturer.
- L. At all times provide an odor eliminator additive – use "desent" by Arrmaz Custom Chemical or approved equal.

3.03 VAPOR BARRIER APPLICATION/ACOUSTICAL DECK INSTALLATIONS (GYMNASIUM)

- A. Install preformed sound absorbing glass fiber insulation strips supplied under Section 05230, in acoustical wide rib deck flutes. Install in accordance with deck manufacturer's instructions.
- B. Prior to commencing installation, ambient and deck surface temperatures shall be not less than 40 degrees F and rising.
- C. Install self-adhering single layer vapor retarding underlayment in shingle fashion parallel to metal deck flutes in accordance with manufacturer's written instructions. All edges (sides and end laps) shall be lapped not less than 2 1/2" and sealed with manufacturer's recommended sealing compound.
- D. Extend vapor retarder under cant strips and blocking. Lap flexible flashing over vapor retarder or wall construction to provide continuity of vapor barrier envelope.

- E. Vapor retarding underlayment shall be fully covered by roofing system within six-weeks of installation. Exposed underlayment shall be protected from foot and equipment traffic as recommended by manufacturer.

3.04 INSTALLATION OF INSULATION

- A. General: Comply with insulation manufacturer's instructions and recommendations for the handling, installation and bonding or anchorage of insulation to substrate.
- B. Secure insulation: to deck using mechanical fasteners specifically designed and sized for attachment of specified board type insulation to deck type shown. Fasten all layers of insulation over entire area of roofing at spacing as required by manufacturer.
- C. Two-Layer Installation: Install required thickness in two layers with joints of second layer staggered from joints of first layer a minimum of 12" each direction. Install second layer in full mopping of hot Type III asphalt, applied within temperature range of EVT " 25°F (14°C) and at average rate of 25 pounds. ("25% on total-job basis) per 100 square foot.
- D. Tapered insulation will be installed at all roof drains, crickets, tapered areas and on the high sides of all units as per the drawings and specifications. Install in full mopping of Type III asphalt.
- E. Tapered Insulation: Installation shall be as recommended by manufacturer.
- F. Install one-ply of #15 lb. felt in the asphalt at all walls, roof edges and penetrations prior to installing roofing plies.

3.05 ROOF MEMBRANE INSTALLATION

- A. Shingling of Plies: Except as otherwise indicated, install membrane with ply sheets shingled uniformly to achieve required number of thickness of membranes throughout. Shingle in proper direction to shed water on each large area of roofing. Drainage flow shall be over or parallel to, but not against the lap. Lightly broom felts as directed on all roofing plies. **GLAZE COAT PLIES IF SURFACE IS NOT INSTALLED WITHIN 60 DAYS.**
- B. Cant Strips/Tapered Edge Strips: Except as otherwise shown, install preformed 45° insulation cant strips at junctures of BUR membrane with vertical surface. Provide preformed tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces. Set all edge strips and cant strips in hot asphalt.
- C. Inter-Ply Felts: Provide the number and type(s) of felts indicated, lapped (shingled) as required to form a continuous, uniform membrane with bitumen moppings between sheets so that ply sheet does not touch ply sheet. Except as

otherwise indicated, glaze-coat top of ply-sheet membrane with 10-pound mopping of same bitumen, integrally with operation of laying up membrane.

1. Mop base directly to substrate.
 2. Extend BUR membrane to 2" (nominal) above top edge of cant strip, solidly adhered, without bridging or buckling.
 3. Provide a folded-back envelope at edges and penetrations of BUR membrane where it is not turned up on a tapered strip, so as to provide positive protection against flow of bitumen into building or off the edge. Extend base sheet to form envelope or, where no base sheet is provided, install one ply or coated felt set in steep asphalt with joints sealed. Seal corners and other interruptions of envelope with large beads of roofing cement to provide positive protection against flow of bitumen.
 4. Nail edges of roofing membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space recommended fasteners at minimum 6" o. c. with staggered rows through one-inch (1") diameter metal discs, unless otherwise noted.
- D. Set-on Accessories: Where small roof accessories are set on BUR membrane, set metal flanges in a bed of roofing cement, and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.
- E. Roof Drains: All roof drains shall have a tapered insulation sump area consisting of a minimum 8' x 8' total area. The sump shall be a minimum of 4' in each direction from the center of the roof drain. Fill clamping ring base with a heavy coat of roofing cement. Set lead flashing sheet in a bed of roofing cement over completed ply sheet course. Lead sheet shall be primed with asphalt primer, (both sides) clamped in roof drain ring, and extended a minimum of 24" onto the roof. Cover lead sheet with two plies of Type 4 felt.
1. Lead flashing sheet: Minimum 30" x 30" in size.
- F. Allow for Expansion: of running metal flashing and edge trim that adjoins roofing. Do not seal or bond BUR membrane or composition flashing and stripping to metal flanges over 3'-0" in length.
- G. Flashings: Three-ply flashings shall not be applied until the roof membrane (excluding surfacing) has been installed. Provide a temporary seal at ply terminations until flashing can be installed.
1. Prime masonry surfaces and wood cant and expansion joint with recommended asphalt primer at the rate of one (1) gallon per 100 square feet.

2. Apply asphaltic primer to all sheet metal that shall come into contact with bituminous materials (top and bottom).
 3. Embed flashings into a solid mopping of steep asphalt extending at least eight inches (8") up the curb or wall, and extending at least four inches (4") beyond the cant strip onto the roof.
 4. Seal all nail heads, inside and outside corners with roof cement. Provide a three- (3) course seal using glass fabric embedded into and covered with roofing cement under all surface-mounted counter flashing.
- H. Counter Flashings: Counter flashings, cap flashings, expansion joints and similar work to be coordinated with BUR work, are specified in Section 07600, Flashing and Sheet Metal.
- I. Roof Accessories: Miscellaneous sheet metal accessory items, including, and major items of accessories to be coordinated with BUR work, are specified in other sections of these specifications.
1. Sheet metal flashing flanges shall have all seams (base and up seams) soldered. Prime coat all parts that come into contact with roofing membrane. Set in bed of roofing cement prior to concealment by composition stripping.

3.06 CORRECTION OF DEFECTIVE OR DAMAGED WORK

- A. Owner reserves the right to direct that roof cuts (samples) be taken in any area of the work whenever defective work is suspected. Owner's Representative will notify Contractor and Roofing Manufacturer's Representative, when such action is deemed necessary in the opinion of the Owner.
- B. "Fishmouths" (non-adhered arched ply edges). Cut out plies which are not properly embedded in bitumen; replace the cut area with the minimum number of plies specified for the roofing system, plus one (1) additional ply using the "feather out" method recommended by the Manufacturer for cut-out repair. Embed each ply in a solid, uniform 23 to 35 pounds per square mopping of hot bitumen. No dry laps shall be permitted. Feather felts 2" over preceding layers.
- C. Physical damage resulting from construction activity: Cut out damaged plies and insulation. Install new insulation and repair the cutout in accordance with the procedures outlined in paragraph A above.
- D. Non-adhered laps: Secure laps by embedding each ply in a solid, uniform 23 to 35 pounds per square mopping of hot bitumen.
- E. Other defective or non complying work discovered as a result of Manufacturer's audit for guaranty requirements shall be corrected in accordance with manufacturer's recommended procedures for each type of defect encountered.

3.07 CLEANING

- A. Remove excess materials, equipment, trash and debris associated with the roofing activities from the project area and dispose of legally.
- B. Repair damage to adjacent work of other trades which has resulted from roofing activities; remove stains and drippage resulting from bitumen application.
- C. Clean all membrane (Soprema) of asphalt over spills, wheel marks and foot prints or paint with Alsan Finish. Firestone – Paint all asphalt over spills, wheel marks and foot prints with 1 coat base and 1 coat top

3.08 PROTECTION OF ROOFING

- A. Upon completion of roofing work, including associated work, Roofer shall advise Contractor of recommended procedures for surveillance and protection of roofing during remainder of construction period. At end of Construction period, or at Contractor's option, at a time when remaining construction work will in no way affect or endanger roofing, Roofer shall make a final inspection of roofing and prepare a written report, directed to Contractor with copy to Owner describing nature and extent of deterioration of damage found in the work.
- B. Roofer shall repair or replace deteriorated or defective work found at time of final inspection. Roofer shall be engaged by Contractor to repair damages to roofing that occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.
- C. Repair all damaged site walks, grounds and all other damaged surfaces to match existing.

END OF SECTION

SECTION 07513

ROOF DRAIN MAINTENANCE MARKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 REFERENCE STANDARDS

- A. ASTM B 209 (ASTM B 209M) – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B 221 (ASTM B 221M) – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM D 256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- D. ASTM D 790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM F 593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

1.03 RELATED WORK

- A. Section 07510: 4-Ply Built-Up Roofing with Gravel Ballast and Insulation
- B. Section 07530: TPO Single-Ply Membrane Roofing (Canopies)

1.04 SUBMITTALS

- A. Product Data: For roof drain markers, including:
 - 1. Standard drawings illustrating product dimensions.
 - 2. Installation instructions and recommendations.
- B. Samples for Verification: For each product specified.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Roof Drain Marker Co., LLC., West Bridgewater, MA; (877) 571-6644; email: Imay@roofdrainmarker.com, www.roofdrainmarker.com. (Basis of Specification).
- B. Other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

2.02 ROOF DRAIN MARKER

- A. Roof Drain Marker: Roof drain mounted vertical fiberglass flag marker secured in aluminum socket with a pre-punched aluminum bracket configured for through-bolting to roof-drain dome.
 - 1. Flag Marker Protruded fiber-reinforced polymer rod, 1/2 inch (12 mm) diameter by 48 inch (1219 mm) long, with reflective dual-colored reversible ends enabling marking of selected drains.
 - a. Flexural Strength, minimum ASTM D 790, 700,000 psi (689 MPa).
 - b. Impact Strength, minimum, ASTM D 256; 40 ft-lb/in.
 - c. Color: Pearl white rod with a 5" wide blue band 3" from the top of rod, with a 5" wide red band 2.75" from the bottom of the rod. A 5" wide "Drain marker Emblem" shall be located 2" above the red band
 - 2. Marker Base: 1 by 1 by 4 inch (25 by 25 by 102 mm) extruded aluminum bar, ASTM B 209 (ASTM B 209M), with milled flag receiver, threaded flag set screw retainer, and threaded base.
 - 3. Flag Bracket: 1 by 11 by 0.063 inch (25 by 25 by 160 mm) aluminum plate bracket, ASTM B 221 (ASTM B 221M).
 - 4. Fasteners: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roof drain dome conditions to verify secure attachment to drain base and compatible alignment with roof drain marker mounting bracket.

3.02 ROOF DRAIN MARKER INSTALLATION

- A. Install roof drain markers on each roof drain dome in roof area indicated. Install in accordance with manufacturer's instructions.
1. Attach bracket to drain dome using manufacturer-furnished corrosion-resistant fastener, securely tightened.
 2. Thread marker bases to threaded stud on marker bracket and tighten securely.
 3. Insert flag marker into marker base and secure using set screw.

END OF SECTION

**INSTRUCTIONS FOR EDITING
TPO SINGLE-PLY MEMBRANE ROOFING
(CANOPIES)
SECTION 07530**

1. Page 07530-2, paragraph 1.04 (D), (E), (F), (G): Retain if Installer certification is required in "Quality Assurance" Article or a special warranty is required.
2. Page 07530-2, paragraph 1.04 (H): Insert specific model code organization or revise if report must be from another source.
3. Page 07530-4, paragraph 2.03B: Retain subparagraphs if tapered insulation is required to achieve a sloped deck. Distinguish insulation types used in different layers, if applicable. Add maximum size or minimum thickness of tapered insulation boards if required. Delete types of insulation not required. Coordinate selections with thicknesses indicated on Drawings and with HVAC design and energy program.
4. Page 07530-5, paragraph 2.05 (C), (D): Edit depending on method of seaming required. Retain both if choice of seaming method is Contractor's option.
5. Page 07530-8, paragraph 3.06: Coordinate with FCPS and project requirement select E or F.
6. Page 07530-9, paragraph 3.07 delete paragraph if equipment noted are not part of the project requirements.

SECTION 07530

TPO SINGLE-PLY MEMBRANE ROOFING (CANOPIES)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following (Edit per project requirements):

1. Adhered single-ply sheet roofing.
2. Polyiso roof insulation.

- B. RELATED WORK

1. Section 06100: Rough Carpentry
2. Section 07600: Flashing and Sheet Metal
3. Section 07900: Sealants

1.03 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.04 SUBMITTALS

- A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

- B. Shop Drawings:

1. Include plans, sections and details.
2. Base flashings and membrane terminations.
3. Tapered insulation, including slopes.

- C. Samples for Verification of the following products (Edit samples below per project requirements):

1. Manufacturer's standard sample of sheet roofing.
 2. Manufacturer's standard sample of roof insulation and cover board.
 3. Manufacturer's standard sample of metal termination bars.
 4. 6 roof cover fasteners of each type, length, and finish.
- D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.
- F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.
- H. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- I. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.
- J. Warranty: Sample copy of standard roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
- K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm with not less than ten (10) years of successful experience in installation of TPO single-ply membrane roofing systems similar to those required for this project. The roofer shall be a certified installer for the approved roofing system. The Roofer must have an office, warehouse with supplies, and permanent roofing crews within a 50-mile radius of the City of Fairfax, Virginia. Roofer shall have had Firestone Building Products, Carlisle

Syntec Systems, Genflex Building Products, GAF Roofing or Johns Manville Products approval in this area for at least eight (8) years from manufacturer, and shall perform a minimum of twenty (20) of these TPO roofing manufacturer guarantees per year.

- B. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.

(Edit subparagraphs below per Project Requirements.)

1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

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

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.07 PROJECT CONDITIONS

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

1.08 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. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship and to repair cuts and punctures caused by rooftop service and maintenance activities for the following warranty period:
 - 1. Base Bid Warranty Period: 20 years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Product: Subject to compliance with requirements, provide fully adhered UltraPly TPO as manufactured by **Firestone Building Products** or a comparable product by one of the following:
 - 1. Carlisle Syntec Systems
 - 2. Genflex Building Products

3. GAF Roofing
4. Firestone Building Products
5. Johns Manville Products

2.02 TPO SHEET

- A. Base Bid TPO Sheet: Uniform, flexible sheet formed from thermal polyolefin, complying with ASTM D 4637, Type I, of the following grade, class, thickness:
 1. Grade: Reinforced
 2. Thickness: 60 mils, nominal.
 3. Color shall be white- Color must have reflective index of 78 or more

2.03 INSULATION MATERIALS

- A. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated. Insulation system shall include preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- B. Polyiso insulation (1.5) shall be manufactured utilizing "Zero ODP" pentane blowing agents complying with ASTM C 1289-02, and classified by facer type as follows:
 1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.
 2. Tapered Polyiso Board Insulation: $\frac{1}{4}$ " slope, rigid, polyiso thermal insulation with an overall minimum thickness required to meet the tapered insulation design.
 3. Tapered Polyiso Board insulation crickets as indicated on drawings or where needed for positive drainage shall be sloped $\frac{1}{2}$ " per foot with a minimum thickness of $\frac{1}{2}$ ".

2.04 INSULATION ACCESSORIES

- A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.
 1. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470, designed for fastening roofing insulation to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

2.05 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with TPO membrane roofing.
- B. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.
 - 1. Sheet Flashing: 60 mil thick TPO, unsupported (non-reinforced) or cured, according to application.
 - 2. Flashing Accessories: Manufacturer's unsupported membrane, pre-manufactured detail accessories, and Quick seam product.
 - 3. Bonding Adhesive: Manufacturer's LVOC bonding adhesive
 - 4. Cleaner: Manufacturer's LVOC splice cleaner.
 - 5. Primer: Manufacturer's LVOC Quick prime
 - 6. Cut Edge Sealant: Manufacturer's standard single-component sealant.
 - 7. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
 - 8. Metal Termination Bar: Manufacturer's standard aluminum bar, approximately 1" wide, roll formed and pre-punched.
 - 9. RPF Strip: Manufacturer's standard 6" wide reinforced perimeter fastening strip.
 - 10. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening sheet to substrate, and acceptable to roofing system manufacturer.
 - 11. Walk-Way Pads: Heat welded or self adhered per manufacturer's recommendations.
 - 12. Miscellaneous Accessories: Provide pourable sealers, in-seam sealants, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.
- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
- C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.03 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 roofing insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.
- D. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- E. Install one layer of insulation under area of roofing to achieve required thickness.

- F. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.
- G. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Insure top layer of insulation joints are staggered with bottom layer of insulation. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- H. Attached Insulation: Install the insulation by securing to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roofing insulation to deck type indicated.

3.04 ADHERED SHEET INSTALLATION

- A. Install TPO sheet over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to relax for a minimum of 30 minutes.
- B. Start installation of sheet in presence of roofing system manufacturer's technical personnel.
- C. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Apply bonding adhesive to substrate and underside of sheet at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of sheet.
- E. Mechanically or adhesively fasten sheet securely at terminations and perimeter of roofing.
- F. Apply roofing sheet with side laps shingled with slope of roof deck where possible.
- G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing sheet in place with clamping ring.
- H. Install adhered TPO sheet and auxiliary materials to tie in to existing roofing.

3.05 SEAM INSTALLATION

- A. Clean both faces of lap areas, heat weld laps to overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation.

- B. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.06 FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of flashing sheet 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 as recommended by manufacturer.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply cut edge sealant and seal exposed edges of sheet flashing terminations per manufacturer's recommendations.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.07 WALKWAY INSTALLATION

- A. Install walkway's around mechanical units, roof hatches, top and bottom of ladders and across roof to connect to walkway on adjacent roof.
- B. Clean membrane where walkway's are to be installed using manufacturer's splice cleaner.
- C. Attach walkway's using heat weld or self adhered methods as per manufacturer's recommendations.

3.08 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.

3.09 PROTECTING AND CLEANING

- A. Protect sheet membrane roofing 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 that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.
 - 1. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General Conditions and Division-1 Specification sections, apply to work of this section.

1.02 RELATED WORK

- A. Section 04200- Unit Masonry
- B. Section 07510 – 4-ply Built-up Roofing with Gravel Ballast and Insulation

1.03 DESCRIPTION OF WORK:

- A. Extent of each type of flashing and sheet metal work is indicated on the drawings and by provisions of this section.
- B. Type of work specified in this section includes, but is not limited to, the following:
 - 1. Metal counter flashing; and base flashing.
 - 2. Metal wall flashing and expansion joints.
 - 3. Built-in metal valleys, gutters and scuppers.
 - 4. Exposed metal trim/fascia units/coping units.
 - 5. Gravel stops.
 - 6. Gutters.
 - 7. Miscellaneous sheet metal accessories.
- C. Integral masonry flashings are specified as masonry work in Section 04200.
- D. Roofing accessories, which are installed integral with roofing membrane, and provided by the roofing manufacturer, are specified in Section 07510 as part of roofing work.
- E. Set-on type, pre-manufactured unit roof accessories are specified in Section 07510 as part of roofing work.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- B. Samples: Submit minimum 8" square samples of each type of specified sheet materials to be exposed as finished surfaces.
- C. Shop Drawings: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter-flashings, gutters, downspouts, scuppers and expansion joint systems. Provide layouts at 1/4"=1'-0" scale and details at 3"=1'-0" scale.

1.05 JOB CONDITIONS:

- A. Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.06 WARRANTIES

- A. Provide a five (5) year written guarantee on labor and a ten (10) year written guarantee on materials for all flashing and sheet metal work.

PART 2 - PRODUCTS

2.01 FLASHING AND SHEET METAL MATERIAL:

- A. Sheet Metal Flashings and Trim:
 - 1. Counter Flashings, Scuppers, Built-in Receivers, Expansion Joint flashings and umbrella cones for roof mounted pipe supports:
 - a. Stainless Steel: ASTM A167 AISI 302/304, No 2D finish, temper as required for forming and performance; 0.018" thick (28 gauge) except as otherwise indicated.
 - b. Copper: ASTM B370, cold rolled unless soft temper required for forming and performance; 16 ounce (0.0216" thick), except as noted
 - 2. Copings, Gravel Stops, Gutters, Drain Spouts:
 - a. Sheet Aluminum: ASTM B 209, aluminum alloy, with "Kynar" fluorocarbon enamel finish; 0.032" thick except as otherwise indicated. Color as selected by Architect.

- B. Miscellaneous Materials and Accessories:
1. Fasteners: Same metal as flashing and sheet metal or other non-corrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
 2. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
 3. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
 4. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
 5. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
 6. Solder for Sheet Metal: Except as otherwise indicated or recommended by metal manufacturer, provide 50/50 tin/lead type complying with ASTM B32; use rosin flux.
 7. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, non-corrosive.
 8. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.
 9. Roofing Cement: ASTM D 4586, asphaltic and non-asbestos containing.

C. Weather-Resistant Barrier

1. Acceptable products and Manufacturers: Grace Ice & Water Shield HT, as manufactured by W.R. Grace & Co., Grace Construction Products, Cambridge, MA.
2. Grace Ice & Water Shield is a cold-applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of rubberized asphalt adhesive. An embossed, slip resistant surface is provided on the polyethylene. Grace Ice & Water Shield is interwound with a disposable silicone coated release sheet.
 - a. Membrane shall conform to the physical properties as listed in table below:

<u>Property</u>	<u>Value</u>	<u>Test Method</u>
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Color:	Gray black	
Thickness/ Membrane:	40 mil (1.02 mm)	ASTM D3767 procedure A (Section 9.1)
Tensile Strength/ Membrane:	250 psi (1720 kN/m ²)	ASTM D412 (Die C Modified)
Elongation, Membrane:	250%	ASTM D412 (Die C Modified)
Low Temperature, Unaffected @ Flexibility:	-20°F (-29°C)	ASTM D1970
Adhesion to Plywood:	3.0 lbs/in. width (525 N/m)	ASTM D903
Permeance (Max):	0.05 Perms (2.9 ng/m ² s Pa)	ASTM E96
Material Weight Installed (Max)	0.3 lb/ft ² (1.3 kg/m ²)	ASTM D461

3. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas including covering all fascia and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".

2.02 FABRICATED UNITS:

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Horizontal seams, such as copings, shall be standing seams. Gutters-seams, apply waterblock or butyl caulk before joining pieces together. Seal joined seams with EPDM flashing membrane.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form

- expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
 - E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS:

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- B. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- C. Install reglets to receive counter-flashing in manner and by methods indicated. Where shown in concrete, furnish reglets for installation in work of Division 3 Sections. Where shown in masonry, furnish reglets for installation in work of Division 4 Sections.
- D. Install counter flashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- E. All stainless steel or copper metal through wall flashing, gravel stops, pitch pockets, rain collars and expansion joints with lapped joints shall be soldered water tight.

3.02 WEATHER-RESISTANT BARRIER

- A. Install the membrane directly on a clean, dry, continuous structural plywood sheathing, blocking, and other locations as indicated. Remove dust, dirt, loose nails, and old roofing materials. Protrusions from the substrate area must be removed. Decks shall have no voids, damaged, or unsupported areas. Repair areas before installing the membrane. Install membrane in accordance with manufacturer's printed directions.

3.03 CLEANING AND PROTECTION:

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction. Ensure that work shall be without damage or deterioration, due to factors other than natural weathering, at time of acceptance by Owner.

END OF SECTION

SECTION 07652

SELF-ADHERING SHEET MEMBRANE AIR BARRIER

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to the work of this Section.
- B. Section 04200 – Unit Masonry.

1.02 SUMMARY

- A. Section includes the following:
 - 1. Flexible rubberized asphalt, self-sealing wall flashing and wall flashing accessories for installing on CMU wall surfaces where noted on Drawings.
 - 2. Materials and installation methods for self-adhered vapor permeable air barrier membrane system located in the non-accessible part of the wall.
 - 3. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

1.03 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM C920 Specifications for Elastomeric Joint Sealants
 - 2. ASTM D412 Standard Test Methods for Rubber Properties in Tension
 - 3. ASTM D570 Test Method for Water Absorption of Plastics
 - 4. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - 5. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 - 6. ASTM D1876 Test Method for Peel Resistance of Adhesives
 - 7. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting

8. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
9. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
10. ASTM D4541 Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers
11. ASTM D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics
12. ASTM E96 Test Methods for Water Vapor Transmission of Materials
13. ASTM E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
14. ASTM E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
15. ASTM E2178 Standard Test Method for Air Permeance of Building Materials
16. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
17. AATCC-127 Water Resistance: Hydrostatic Pressure Test (American Association of Textile Chemists and Colorists)

1.04 SUBMITTALS

- A. Product Data: Submit Spec-Data®/Data Sheets, details and installation procedures
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 1. Include details of interfaces with other materials that form part of air barrier.
 2. Include details of mockups.
- C. Test Reports: Indicating compliance with the performance requirements of this section.

D. Samples: Submit representative samples of the following for approval:

1. Self-Adhered Air Barrier Membrane
2. Self-Adhered Transition Membrane
3. Self-Adhered Through Wall Flashing

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations for storage and handling of each product.

1.06 WARRANTY

A. Standard Product Warranty:

1. Submit manufacturer's warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
2. Warranty Period: Five years from date of completion of the air barrier membrane and accessories installation.
3. Installer to warrant that air barrier, flashing and accessories have been installed in accordance with manufacturer's recommendations.

PART 2 — PRODUCTS

2.01 FLEXIBLE MEMBRANE THROUGH-WALL FLASHING

A. Flashing Description: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mils) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

B. Performance Requirements:

1. Water Vapor Transmission: ASTM E96, Method B – 2.9 ng/m²sPa (0.05 perms) maximum
2. Water Absorption: ASTM D570 – Max. 0.1% by weight
3. Puncture Resistance: ASTM E154 – 356 N (80 lbs)

4. Tear Resistance:
 - a. Initiation – ASTM D1004 – min. 58 N (13.0 lbs) M.D.
 - b. Propagation – ASTM D1938 – min. 40 N (9.0 lbs) M.D.
 5. Lap Adhesion at -4°C (25°F): ASTM D1876 – 880 N/M (5.0 lbs/in.) of width
 6. Low Temperature Flexibility – ASTM D1970 – Unaffected to -43°C (-45°F)
 7. Tensile Strength: ASTM D412, Die C Modified – Min. 5.5 MPa (800 psi)
 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C – Min. 200%
- C. Product: Basis of Design - Perm-A-Barrier® Wall Flashing manufactured by Grace Construction Products. Similar products by Soprema (Soprasedal Stick 1100T) is also approved, or Manufacturer's pre-bid approved in accordance with Section 01630.
- D. Wall Flashing Accessories:
1. Termination Mastic:
 - a. Description: Rubberized asphalt-based mastic with 200 g/L max. VOC Content.
 - b. Basis of Design: Product: Bituthene® Mastic manufactured by Grace Construction Products.

2.02 SELF-ADHERED AIR BARRIER MEMBRANE

- A. Membrane Description: a self-adhered membrane consisting of a breathable carrier film with a specially designed adhesive, which permits the transfusion of water vapor and provides superior protection against the damaging effects of air and water ingress on building structures
- B. Performance Requirements:
1. Air Permeance, ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to 0.02L/sq. m @ 75 Pa)
 2. Assembly Air Permeance, ASTM E2357: Not to exceed 0.04 cfm/sq.ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/sq.m @ 75 Pa)

3. Water Vapor Permeance, ASTM E96: Not less than 15 perms
 4. Water Resistance, AATCC-127: No less than 5 hrs at 55 cm/21 inch
 5. Breaking Force, ASTM D5034: 55 lbf MD, and 44 lbf CD
 6. Pull Adhesion, ASTM D4541: min. 15 psi to primed glass faced gypsum sheathing, min. 12 psi to primed CMU
 7. Peel Adhesion, ASTM D903: min. 5 pli to primed glass faced gypsum sheathing, min. 4 pli to Perm-A-Barrier® VPS, min. 2.5 pli to primed CMU
 8. UV Exposure Limit: Not more than 150 calendar days
 9. Water Penetration Resistance Around Nails, ASTM D1970 Modified: Pass
 10. Fire Resistant: Evaluated to NFPA 285 as part of the designed wall assemblies containing foam plastic insulation
- C. Product: Basis of Design - Perm-A-Barrier VPS manufactured by Grace Construction Products or alternate manufacturer's product pre-bid approved in accordance with Section 01630.

2.03 TRANSITION MEMBRANE

- A. Transition Membrane Description: a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- B. Performance Requirements:
1. Water Vapor Transmission, ASTM E96, Method B: 2.9 ng/m²sPa (0.05 perms) max.
 2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m²) (0.00012 cfm/ft²) max.
 3. Puncture Resistance, ASTM E154: 178 N (40 lbs.) min.
 4. Lap Adhesion at -4°C (25°F), ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 5. Low Temperature Flexibility, ASTM D1970: Unaffected to -43°C (-45°F)
 6. Tensile Strength, ASTM D412, Die C Modified: min. 2.7 MPa (400 psi)

7. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%
- C. Product: Basis of Design - Perm-A-Barrier Detail Membrane manufactured by Grace Construction Product or alternate manufacturer's product pre-bid approved in accordance with Section 01630.

2.04 ACCESSORIES

A. PRIMERS

1. Primary Self-adhered air barrier membrane:
 - a. Description: a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
 - 1) Color: Milky White (wet), Clear (dry)
 - 2) Weight: 8.25 lbs./gal.
 - 3) Solids Content (by wt.): 53-57%
 - 4) Solvent Type: Water
 - 5) VOC Content: Not to excess 1 g/L
 - 6) Application Temperature: 4°C (40°F) and above
 - b. Basis of Design: Perm-A-Barrier Primer Plus manufactured by Grace Construction Products
2. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing:
 - a. Description: a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product Shall have the following minimum physical properties:
 - 1) Flash Point: No flash to boiling point
 - 2) Solvent Type: Water
 - 3) VOC Content: Not to exceed 10 g/L
 - 4) Application Temperature: -4°C (25°F) and above
 - 5) Freezing point (as packaged): -7°C (21°F)

- b. Basis of Design: Perm-A- Barrier WB Primer manufactured by Grace Construction Products
- B. TERMINATION MASTIC
- 1. Description: Rubberized asphalt-based mastic with 200 g/L max. VOC Content.
 - 2. Basis of Design: Product: Bituthene® Mastic manufactured by Grace Construction Products.

PART 3 — EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of air barrier and flashing.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush.
- C. Remove all deleterious materials from surfaces to be flashed.

3.02 INSTALLATION

- A. General: Install flashing to dry surfaces at air and surface temperatures of -4°C (25°F) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.
- B. Flexible Wall Flashing:
 - 1. Precut pieces of flashing to easily handled lengths for each location.
 - 2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 - 3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 - 4. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a steel hand roller.

5. Trim bottom edge 13 mm (1/2 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
6. At heads, sills and all flashing terminations turn up ends a minimum of 50 mm (2 in.) and make careful folds to form an end dam, with the seams sealed.
7. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
8. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.

C. Air Barrier Membrane:

1. Refer to manufacturer's literature for recommendations on installation
2. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
3. Application of Self-Adhered Air Barrier Membrane
 - a. Install air barrier to dry surfaces at air and surface temperatures of 4°C (40°F) and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
 - b. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
 - c. Precut pieces of air barrier into easily handled lengths.
 - d. Remove release linear and position membrane carefully before placing against the surface.
 - e. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
 - f. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 - g. Overlap adjacent pieces 50 mm (2 in.) and roll seams.
 - h. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties.

Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50 mm (2 in.). Roll firmly into place.

- i. Seal around masonry reinforcing or ties and all penetrations with penetration & termination sealant.
- j. At end of each working day seal top edge of air barrier to substrate with termination sealant.
- k. Do not expose air barrier membrane to sunlight for more than 150 days prior to enclosure.
- l. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.

D. Transition Membrane:

1. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.
2. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.
 - a. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.
3. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
4. At end of each working day, seal top edge transition membrane to substrate with termination sealant.
5. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

6. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
 - a. Transition Membrane: Roll firmly to enhance adhesion.
 7. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
 8. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.
- E. Accessories:
1. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply Perm-A-Barrier Primer Plus by air spray, brush or roller or apply Perm-A-Barrier WB Primer by brush or roller at the rate recommended by manufacturer, prior to flashing installation. Allow the primer to dry completely before flashing application.
 2. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations.

END OF SECTION

SECTION 07800

SKYLIGHTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Conditions and other Division 1 Specification sections, apply to work of this section.

1.02 RELATED WORK

- A. Section 07510-4 Ply Built-Up Roof with Gravel Ballast and Insulation
- B. Section 07600-Flashing and Sheet Metal

1.03 DESCRIPTION OF WORK

- A. Extent of unit skylights is shown on the drawings.
- B. Skylights shall include framing, fasteners, flashings, trim, glazing and sealants, and other accessories necessary for a complete, watertight installation.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with not less than Three (3) years experience in the installation of metal framed skylights similar to requirements for this project and which is acceptable to manufacturer.
- B. Coordination of Work: Coordinate layout and installation of unit skylights with other work.
- C. Design Criteria:
 - 1. Dead Load: Skylight weight
 - 2. Live Load: 30 psf snow load and 20 psf wind load.
 - 3. Negative Live Load: 20 psf minimum.
 - 4. Thermal Expansion: Resistant to stress from 100NF temperature shift.
 - 5. Maximum Rafter Deflection: L/175
 - 6. Provide condensation frame to direct water to exterior.
- D. Reference Standards:

1. Aluminum Associates (AA) "Designation for Aluminum Finishes".
2. American Society for Testing and Materials (ASTM):
 - a. ASTM B209, Aluminum-Alloy Sheet and Plate.
 - b. ASTM B221, Aluminum-Alloy Extruded Bars, Rods, Wire Shapes and Tubes.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for skylights required, including certified laboratory test reports and other data as required to show compliance with these specifications.
- B. Samples: Submit two (2) each of the following.
 1. 6 x 6 inch pieces of each type of glazing.
 2. 6 inch lengths of each type of exposed metal framing with available finishes.
- C. Shop Drawings: Details and sections showing construction of framing, joints, gaskets, drainage, insulation, accessories, anchorage gutters and flashings.
- D. Manufacturer's Literature: Recommended written instructions for installation and cleaning.
- E. Certificates: Manufacturer's certification that all materials meet specification requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials to the job site in manufacturer's packaging to protect the materials from damage. Store the units away from contact with soil and from other damage, and under cover in an area designated by the contractor.

1.07 WARRANTY

- A. Provide written warranty against defects in skylight materials and glazing for a period of ten (10) years.
- B. Provide written warranty against defects in installation for a period of five (5) years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Wasco Products, Inc., Sanford, ME (www.wascoproducts.com): Classic System Model C- PY, aluminum framed pyramid unit skylight (*add skylight dimensions to fit individual project requirements*).
- B. Comparable products by the following manufacturers, complying with the requirements of this Section, shall be acceptable:
 - 1. Major Industries, Inc., Wausau, WI (www.majorskylights.com)
 - 2. Fiore Skylights, Inc., Somerdale, NJ (www.fioreskylights.com)
- C. Other models and manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

2.02 MATERIALS

- A. Aluminum Extrusions: ASTM B-221, alloy 6063-T5 or 6061-T6.
- B. Aluminum Sheet and Plate: Alloy compatible with finish.
 - 1. Loading and deflection: Cross-sectional configuration.
- C. Aluminum finish, exposed fasteners, exposed miscellaneous metals.
 - 1. Class 1, color anodized. Color shall be selected by architect from manufacturer's standard palette of finishes.
- D. Fasteners: Stainless steel, AISI 300, Type 301 or 302.
- E. Protective Coatings:
 - 1. Zinc Chromate Primer, FS TT-P-666.
 - 2. Bituminous Coating Compound, FS TT-C-494, Type II.
- F. Gaskets, ASTM C509-70.
- G. Sealants, two-part elastomeric, FS TT-S-00227, Type II, Class A.
- H. Glazing:

1. Double glazed, 1/4" tempered bronze tinted low E glass over 3/8" clear laminated safety glass with a 1/2" sealed air space.

2.03 FABRICATION

- A. The unit skylight shall be factory fitted and assembled (where practical), piece marked and shipped knocked down for final assembly at the job site.
- B. All welding shall be performed using the heliarc process.
- C. Retainer bars shall be attached with gasketed stainless steel fasteners spaced at a maximum of 12" O.C.
- D. Extruded elastomeric setting blocks and spacers shall be located and sized in accordance with the glazing manufacturer's recommendations. At no point shall the glazing come in contact with the skylight frame or fasteners.
- E. The skylight shall have properly located weep holes provided for drainage of condensation to the exterior.

2.04 CONSTRUCTION

- A. Provide skylight geometry in profile and sizes as indicated.
- B. Both rafter and purlin components shall be extruded aluminum. Fitting and assembly of the unit shall be done in the manufacturer's shop, disassembled and shipped to the job. Rafter bars shall be designed for snap-in type glazing gaskets.
- C. Attach aluminum clamping bars to the glazing bar members through the use of stainless steel tapping screws spaced a maximum of 12 inches o.c.
- D. No exposed cap fasteners are permitted.
- E. Provide weephole located at the lower portion of the curb bar at each rafter connection for drainage of condensation at the exterior.
- F. All welding shall be performed by the heliarc process. Grind all welds smooth to a minimum 100-grit finish.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Determine that construction of opening for the skylight has been completed, and that all flashings are in place. Verify that rough opening dimensions are within manufacturer's recommended tolerances for proper, weathertight installation.

- B. Ensure that surfaces to receive the skylight are free of dirt, debris, or other substances which would interfere with proper installation.
- C. Notify Owner's Representative and Architect of any unsatisfactory conditions encountered during inspection. Do not proceed with installation until such conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's instructions and approved shop drawings.
- B. Set plumb, level, and true to line without warp or rack.
- C. Provide a continuous bed of sealant between the flashing and the extruded aluminum curb bar.
- D. Apply protective coating to separate aluminum from incompatible materials.
- E. Install glazing in strict accordance with glazing material manufacturer's written instructions, using permeable tapes and proper clearances.
- F. Anchor securely to surroundings construction.
- G. Install glazing in conformance with manufacturer's instruction using permeable tapes and proper clearances.

3.03 TESTING

- A. Conduct field test for water penetration of skylight in the presence of the architect.
- B. Test shall consist of directing spray from 3/4-inch diameter water hose over all surfaces of skylights for a minimum of 20 minutes.
- C. Examine skylight for evidence of water leakage. Repair skylight based on results of leakage test.

3.04 CLEANING

- A. Clean aluminum and glass surfaces in accordance with manufacturer's written instructions.
- B. Remove debris from work site and dispose of legally.

END OF SECTION

SECTION 07830

ROOF HATCHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 07510 – 4 ply Built-up Roofing with Gravel Ballast and Insulation.
- B. Section 16620 - Security Intrusion System.

1.03 SUBMITTALS

- A. Submit shop drawings indicating materials, methods of fabrication and requirements for anchoring to adjacent and supporting construction.
- B. Submit manufacturer's product data, including catalog sheets and technical information.

1.04 WARRANTY

- A. Provide five (5) year written guarantee on installation labor.
- B. Provide five (5) year written guarantee on roof hatch.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Babcock –Davis (www.babcockdavis.com): Model BA3630 – 3'-0"X2'-6"
- B. Bilco (www.bilco.com): Type S-50 - 3'-0" x 2' x 6".
- C. Milcor, Inc. (www.milcorinc.com): Type RD-1 - 3'-0" x 2'-6".
- D. Dur-Red Products (www.dur-red.com): LH-A - 3'-0" X 2'-6".
- E. Other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

2.02 PRODUCT DESCRIPTION

A. Product Features:

1. Cover and Liner: .090 Aluminum (11 GA) cover and .040 Aluminum liner.
2. Frame: .090 Aluminum, 12 high, with 3 1/2" wide mounting flange
3. Insulation Core: 1" rigid fiberglass for cover and curb perimeter.
4. Cover Operation: Torsion bar spring, concealed in telescoping tube, and contained within the confines of the hatch.
5. Hold-open Arm: Automatically locking, with grip handle
6. Latching Device: Spring latch with exterior and interior turn handles
7. Hinges: Zinc plated steel tamper proof hinge assembled on the inside of the hatch as part of spring assembly
8. Padlock hasp mounted on inside of hatch
9. Weatherseal: Closed-cell rubber.
10. Hardware Finish: Zinc plated.

2.03 SAFETY RAILING SYSTEM

- A. Provide roof hatch manufacturer's standard roof hatch safety railing system, compatible with hatch size specified. Safety railing shall comply with OSHA Fall Protection Regulation 29 FR 1910.23.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect the locations where hatch(es) shall be installed. Verify that openings are properly constructed, and that adjacent supporting substrates are clean, dry and free of foreign matter. Notify Owner's Representative and Architect if any adverse conditions are encountered that would interfere with proper installation. Do not proceed until such conditions have been corrected.

3.02 INSTALLATION

- A. Install hatch(es) in accordance with manufacturer's written installation instructions. Securely attach to supporting substrates.
- B. Hatch(es) shall be provided with security intrusion switch connected to building Security Intrusion system as part of the work of Division 16.

END OF SECTION

SECTION 07900

SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 07910 – Through Penetration Protection Systems: Sealants used in conjunction with fire stopping systems in rated construction.
- B. Section 08800 - Glazing: Sealants used in conjunction with glazing.

1.03 REFERENCE STANDARDS

- A. FS TT-S-230C - Sealing Compounds, Synthetic-Rubber, Single Component, Chemically Curing.
- B. FS TT-S-00227E – Sealing Compound, Elastomeric Type, Multi-Component
- C. FS TT-S-.001657 Sealing Compound, Single Component, Butyl Rubber Based Solvent Release Type.
- D. ASTM C834 - Latex Sealing Compounds.
- E. ASTM C920 – Elastomeric Joint Sealant Compounds
- F. ASTM E90 – Airborne Sound Transmission Loss

1.04 SUBMITTALS

- A. Comply with applicable provisions of Section 01340, Shop Drawings, Product Data and Samples.
- B. Submit sealant manufacturer's catalog and technical data, including surface preparation and installation instructions. Include data for compressions seals, backer rods, bond breakers, and other accessories for joint conditions as detailed or required by Drawings, and per manufacturer's recommendations.
- C. Submit samples of sealant colors.

1.05 WARRANTY

- A. Provide a two (2) year written warranty covering materials and installation.

PART 2 - PRODUCTS

2.01 SEALANT MANUFACTURERS

- A. The materials specified in 2.02 are products manufactured by Pecora Corporation (www.pecora.com); (Basis of Specification)
- B. Other manufacturers, pre-bid approved in accordance with Section 01630, and complying with the requirements and the intent of this Section shall be acceptable.

2.02 SEALANT MATERIALS

- A. Type 1: "AC-20+Silicone"; one part, non-sag, acrylic latex caulk, complying with ASTM C834.
- B. Type 2: "890NST"; single-component, Non-sag, Nonstaining, Ultra-Low Modulus, Neutral Moisture-curing, Silicone Sealant, 100% extension/50% compression; complying with TT-S-001543, TT-C-00230C, CDPH-CA01350 and ASTM C920, Type S, Grade NS Class 100/50, Use NT, M, G, A, O.
- C. Type 3: "Urexpan NR-201"; one part urethane, self-leveling (Type I), 25% maximum movement capability for extension/compression; complying with FS TT-S-230C, ASTM C920.
- D. Type 4: "AC-20FTR"; one part, modified acrylic latex acoustical sealant, complying with ASTM E90-16 and ASTM C834.
- E. Type 5: "BC-158" Butyl Sealant, Federal Specification FS TT-S-001657 (Type I), Shore A hardness of 25 or greater.

2.03 PRECOMPRESSED SEALANT TAPE

- A. "Will-Seal" as manufactured by Illburck, U.S.A.
 - 1. Tape Type 150; tape number W-820.
- B. Install in compliance with manufacturer's recommendations.
 - 1. Verify conditions of installation (and actual field dimensions) with manufacturer's supplier as for correctness of installation.

C. See Drawings for locations and details
2.04 NEOPRENE COMPRESSION SEAL

- A. Preformed vulcanized elastomeric compound as manufactured by Watson Bowman Acme Corp.
 - 1. Heavy Duty Seal, WA Series, Number WA 162.
 - 2. Install utilizing manufacturer's recommended lubricant type adhesive.
- B. Prepare and shape material adjoining seal in compliance with manufacturer's recommendations.
- C. Install in compliance with manufacturer's recommendations.

2.05 ACCESSORIES

- A. Primer: Non-staining type, as recommended by sealant manufacturer for type of sealant, joint substrate, and size of joint.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Backer Rod: Round, closed cell polyethylene or "Denver Foam" polyurethane foam rod as required by manufacturer for type of sealant; oversize 30 to 50 percent.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- E. Masking Tape: To prevent application of sealant on surfaces not scheduled to receive it. Tape shall be removable without damage to substrate.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that joint dimensions, physical and environmental conditions are acceptable to receive work of this Section.
- B. Beginning of installation shall indicate acceptance of condition of substrates and of adjacent installed work.

3.02 PREPARATION

- A. Clean, prepare, and size joints in accordance with manufacturer's written instructions. Remove any dirt, grease, loose materials and other foreign matter that might impair adhesion and proper performance of sealant.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve width/depth ratios as required by manufacturer.
- D. Use backer rod to achieve required joint depths, and to allow sealants to perform in accordance with manufacturers technical specifications.
- E. Use bond breaker tape where recommended by the sealant manufacturer and where indicated on the Drawings.

3.03 INSTALLATION

- A. Seal exterior joints subject to moisture penetration and interior joints exposed to view with sealant specified in schedule below.
- B. Perform work in accordance with latest ASTM requirements for type of sealant and type of application.
- C. Install sealant in accordance with manufacturer's written instructions.
- D. Apply sealant within manufacturer's recommended temperature ranges. Consult manufacturer prior to installation when sealant cannot be applied within recommended temperature ranges.
- E. Tool joints to a concave profile.
- F. Joints shall be free of air pockets, foreign embedded matter or other foreign substances. Joints shall be uniform, free of ridges, and sags.

3.04 SCHEDULE

- A. Type 1: Interior non-moving joint applications.
- B. Type 2: Exterior vertical surface applications, and interior moving joint applications.
- C. Type 3: Exterior horizontal surface applications.
- D. Type 4: Interior acoustical applications.
- E. Type 5: Radon mitigation joints where slabs abut foundation walls.

3.05 CLEAN-UP

- A. Clean adjacent surfaces of excess sealant and sealant droppings as the work progresses, using solvents or cleaning agents recommended by manufacturer for surfaces to be cleaned.
- B. Upon completion of sealant installation, remove all associated debris, empty containers, and surplus sealant from the job site. Do not leave excess sealants and accessories on the premises as "attic stock".

END OF SECTION

SECTION 07910

THROUGH PENETRATION PROTECTION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 04200 - Unit Masonry
- B. Section 07210 - Building Insulation
- C. Section 07900 - Sealants
- D. Division 15 - Mechanical Duct and Piping Penetrations
- E. Division 16 - Electrical Cable and Conduit Penetrations

1.03 REFERENCE STANDARDS

- A. ASTM International E 814, "Standard Test Method for Fire Tests of Through-Penetration Fire Stops".
- B. UL 1479, "Standard for Fire Tests of Through-Penetration Firestops"

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. F-Rated (flame penetration to the unexposed side of the construction assembly) Through-Penetration Firestop systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than the fire-resistance rating of the construction assemblies penetrated.
- B. T-Rated (temperature rise on the non-fire side of the construction assembly) Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 square inches in overall cross-sectional area.
- C. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than the fire-resistance rating of the construction in which the joint occurs.

- D. For firestopping exposed to: moisture, and potential physical damage, only provide products that do not deteriorate when exposed to these conditions.
- E. For piping penetrations for plumbing and wet-pipe sprinkler systems, only provide moisture-resistant through-penetration firestop systems.
- F. For penetrations involving insulated piping, only provide through-penetration firestop systems not requiring removal of insulation.

1.05 SUBMITTALS

- A. Provide shop drawings and manufacturer's literature illustrating details, materials, surface preparation, installation methods, and relationships to adjoining construction for each through-penetration firestop system, each kind of construction condition penetrated and each kind of penetrating item. Include firestop design designation from qualified testing and inspecting agency demonstrating compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from U.L. or other qualified testing and inspecting agency, applicable to each through-penetration firestop configuration required, for each construction type and all items penetrating such construction.
- B. Submit certification from firestopping manufacturer indicating that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs), and that those products are nontoxic to building occupants.
- C. Submit product certificates, signed by manufacturers of firestopping products, certifying that their products comply with specified requirements.
- D. It shall be the Contractor's sole responsibility to submit and obtain approval from Fairfax County DPWES for through-penetration firestop system materials and systems approved by U.L. or other qualified testing and inspection agency, for the required through-penetration configurations.

1.06 WARRANTY

- A. Submit copies of written warranty agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data. The warranty period shall be one year. See Section 01740 for effective date of warranty commencement.

1.07 QUALITY ASSURANCE

- A. Installer's qualifications: A specialty firestop contractor experienced in installation or application of systems similar to those required for this project, plus the following:
 - 1. Acceptable to or licensed by manufacturer, State or local authority where applicable.

2. At least 2 years experience with required systems.
 3. Successfully completed at least 5 comparable scale projects using these systems.
 4. Member in good standing of Firestop Contractors International Association (FCIA).
- B. Local and State regulatory requirements: Submit forms of acceptance for proposed assemblies, if not conforming to specific UL Firestop System numbers, or UL classified devices.
- C. Materials shall have been tested to provide fire rating at least equal to that of the type of construction being penetrated.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL

- A. Through-Penetration Firestopping of Fire-Rated Construction:
1. Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ shall be used, and they shall conform to the construction type, penetrant type, annular space requirements and fire rating required for each condition. Systems shall be symmetrical for wall applications. Systems or devices shall be asbestos-free. Mortar systems shall be approved by Warnock Hersey International.
 2. Additional requirements: Systems shall withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.
 3. Acceptable manufacturers and products.
 - a. Those listed in the U.L. Fire Resistance Directory for the U.L. System involved. Mortar systems: approved by Warnock Hersey International.
 4. All firestopping products shall be supplied by a single manufacturer.
- B. Compatibility: Provide firestopping systems using components that are compatible with each other, the substrates forming the openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer, and based on testing and field experience.
- C. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for

the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming, damming and backing materials including the following:
 - a. Semi-refractory fiber (mineral wool) insulation.
 - b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Joint fillers for joint sealants.
2. Temporary forming material.
 - a. Substrate primer.
 - b. Collars
 - c. Steel sleeves.

D. Application: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.02 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS (AS REQUIRED BY SYSTEM)

- A. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- B. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- C. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- D. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- E. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 1. Grade: Non-sag formulation for openings in vertical and other surfaces requiring a non-slumping, gunnable sealant.
- F. Products for Through Penetration Firestop Systems: Design standards and U.L. design assemblies listed on the Drawings are based on 3M Fire Protection products. These and other products listed below shall be acceptable, subject to compliance with the requirements of this Section and the Drawings:

1. Intumescent Latex Sealant:
 - a. Metacaulk 950, The RectorSeal Corporation.
 - b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
2. Intumescent Putty:
 - a. Pensil 500 Intumescent Putty, General Electrical Co.
 - b. Flame-Safe FSP1000 Putty, International Protective Coating Corp.
 - c. Fire Barrier Moldable Putty, 3M fire Protection Products.
3. Intumescent Wrap Strips:
 - a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
 - b. CS2420 Intumescent Wrap, Hilti Construction chemicals, Inc.
 - c. Fire Barrier Moldable Putty, 3M Fire Protection Products.
4. Silicone Sealants:
 - a. Dow Corning Firestop Sealant 2000, Dow Corning Corp.
 - b. Down Corning Firestop Sealant SL 2003, Dow corning Corp.
 - c. Pensil 100 Firestop Sealant, General Electric Co.
 - d. CS240 Firestop Sealant, Hilti Construction Chemicals, Inc.
 - e. Metacaulk 835, The RectorSeal Corporation.
 - f. Metacaulk 880, the RectorSeal Corporation.
 - g. Fyre-Sil, Tremco Inc.
 - h. Fyre-Sil S/L, Tremco Inc.
5. Cable Management through-Penetration Systems
 - a. "Flame Stopper" Thru-Wall Fitting, The Wiremold Company, or comparable. System shall be compatible with cable trays.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Prior to beginning work, Contractor shall verify that joint dimensions, physical and environmental conditions are acceptable to receive work of this Section. Contact Architect or Owner's Representative immediately if conditions are not acceptable. Do not begin work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping, in accordance with written recommendations of firestopping manufacturer and the following requirements:
1. Remove all foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.
 2. Clean openings, joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form release agents from concrete.
 4. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to area of bond; do not allow spillage and migration onto exposed surfaces.
 5. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work, or would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape in accordance with manufacturer's instructions in order to avoid disturbing firestopping seal and adhesion to substrates.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in PART 1, the through-penetration firestop manufacturer's installation instructions and Drawing requirements.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for Through Penetration firestop systems in accordance with manufacturer's written instructions.

- D. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
- E. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- F. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in PART 1, with ASTM C 1193, with the sealant manufacturer's installation instructions and Drawing requirements.
- B. Install joint fillers to provide support of sealants during application and at position required to provide the cross-sectional shapes and depths of installed sealants relative to joint widths. Install fillers to allow optimum sealant movement capability and development of fire-resistance rating required.
- C. Install sealants in accordance with manufacturer's written instructions to result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and to provide uniform, cross-sectional shapes and depths relative to joint width that allow optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool non-sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads in configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets. Ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Use only tooling agents approved by sealant manufacturer.

3.05 QUALITY CONTROL

- A. Do not enclose firestopping with other construction until reports of examinations are issued.
- B. Where deficiencies are found, repair or replace firestopping.

3.06 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses, using methods and cleaning materials approved by manufacturers of firestopping products and which are suitable for substrates in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances, and from damage resulting from construction operations or other causes until time of Substantial Completion and Owner acceptance.

1. If damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.
- C. Remove all excess materials, packaging, tools and other items associated with the work of this Section, and dispose of legally offsite.

END OF SECTION