

**SECTION 07 11 13
BITUMINOUS DAMPPROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies materials and workmanship for bituminous dampproofing on concrete and masonry surfaces.

1.2 RELATED WORK

LEED Sustainable Construction Specification Section 018111

1.3 QUALITY CONTROL

- A. Provide Mockup as specified in Section 01 33 23 Shop Drawings, Product Data and Samples.

1.4 SUBMITTALS:

- A. Manufacturer's Literature and Data:
 - 1. Product description.
 - 2. Application instructions.

1.5 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - D226-09.....Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
 - D449-03(R2008).....Asphalt Used in Dampproofing and Waterproofing
 - D1227-95(R2007).....Emulsified Asphalt Used as a Protective Coating for Roofing

PART 2 - PRODUCTS

2.1 MATERIALS

See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.

2.2 ASPHALT (HOT APPLIED):

ASTM D449, Type I.

2.3 ASPHALT SATURATED FELT:

ASTM D226, Type I, 7 kg (15 pound).

2.4 ASPHALT EMULSION (COLD APPLIED):

ASTM D1227, Type III (spray grade)

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

- A. Surfaces to receive dampproofing shall be clean and smooth.
- B. Remove foreign matter, loose particles of mortar or other cementitious droppings.
- C. Clean and wash soil or dirt particles from surface.
- D. Remove free water; surfaces may remain damp.

3.2 APPLICATION:

- A. Comply with Manufacturer written instructions for methods and rates of dampproofing application, cleaning and installation of any protection course.
- B. Apply each coat at the rate of not less than 1 L/m² (2-1/2 gallons per 100 square feet) and allow not less than 24 hours drying time after application.

3.3 LOCATION:

- A. Apply to surfaces where shown.
- B. Apply to exterior surface of inner wythe of masonry cavity walls where shown. Coordinate application with masonry work.
- C. Apply to the back side of the first course of limestone as recommended by the Indiana Limestone Institute of America (ILI). Typical at buildings and site walls or as noted on drawings.

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**SECTION 07 21 13
THERMAL INSULATION**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies thermal and acoustical insulation for buildings.
- B. Acoustical insulation is identified by thickness and words "Acoustical Insulation".

1.2 RELATED WORK

- A. Insulation in connection with roofing and waterproofing: Section 07 22 00, ROOF AND DECK INSULATION.
- B. LEED Sustainable Construction Specification Section 018111.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Insulation, each type used.
 - 2. Adhesive, each type used.
 - 3. Tape.
- C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.4 STORAGE AND HANDLING:

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.5 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C270-10.....Mortar for Unit Masonry
 - C516-08.....Vermiculite Loose Fill Thermal Insulation
 - C549-06.....Perlite Loose Fill Insulation
 - C552-07.....Cellular Glass Thermal Insulation.
 - C553-08.....Mineral Fiber Blanket Thermal Insulation for
Commercial and Industrial Applications
 - C578-10.....Rigid, Cellular Polystyrene Thermal Insulation
 - C591-09.....Unfaced Preformed Rigid Cellular
Polyisocynurate Thermal Insulation

C612-10.....	Mineral Fiber Block and Board Thermal Insulation
C665-06.....	Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C728-05 (R2010).....	Perlite Thermal Insulation Board
C954-10.....	Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness
C1002-07.....	Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
D312-00(R2006).....	Asphalt Used in Roofing
E84-10.....	Surface Burning Characteristics of Building Materials
F1667-11.....	Driven Fasteners: Nails, Spikes and Staples.

PART 2 - PRODUCTS

2.1 MATERIALS

See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.

2.2 INSULATION - GENERAL:

- A. Where thermal resistance ("R" value) is specified or shown for insulation, the thickness shown on the drawings is nominal. Use only insulation with actual thickness that is not less than that required to provide the thermal resistance specified.
- B. Where "R" value is not specified for insulation, use the thickness shown on the drawings.
- C. Where more than one type of insulation is specified, the type of insulation for each use is optional, except use only one type of insulation in any particular area.

2.3 MASONRY CAVITY WALL INSULATION:

- A. Polystyrene Board: ASTM C578, Type IV.

2.4 EXTERIOR FRAMING OR FURRING INSULATION:

- A. Batt or Blanket: Optional.
- B. Low Expanding Foam Insulation: 1.75 PCF (nominal' 2-pound), Class I.

C.Mineral Fiber: ASTM C665, Type II, Class C, Category I where framing is faced with gypsum board.

D.Mineral Fiber: ASTM C665, Type III, Class A where framing is not faced with gypsum board.

2.5 ACOUSTICAL INSULATION:

A. Mineral Fiber Batt or Blankets: ASTM C665. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.

B. Thickness as shown; of widths and lengths to fit tight against framing.

C. Refer to Section 072119

2.6 FASTENERS:

A. Staples or Nails: ASTM F1667, zinc-coated, size and type best suited for purpose.

B. Screws: ASTM C954 or C1002, size and length best suited for purpose with washer not less than 50 mm (two inches) in diameter.

C. Impaling Pins: Steel pins with head not less than 50 mm (two inches) in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

2.7 ADHESIVE:

A. As recommended by the manufacturer of the insulation.

B. Asphalt: ASTM D312, Type III or IV.

C. Mortar: ASTM C270, Type 0.

2.8 TAPE:

A. Pressure sensitive adhesive on one face.

B. Perm rating of not more than 0.50.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.

B. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.

C. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.

D. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

- E. Provide low expanding foam insulation around doors, windows, and utility penetrations to seal areas otherwise difficult to stuff with batts or mineral wool. Not to be used in rated assemblies unless it is specifically permitted by the UL rating system being used.

3.2 MASONRY CAVITY WALLS:

- A. Mount insulation on exterior faces of inner wythes of masonry cavity walls and brick faced concrete walls, or as shown on drawings. Fill joints with same material used for bonding.
- B. Bond polystyrene board to surfaces with adhesive or Portland cement mortar mixed and applied in accordance with recommendations of insulation manufacturer.
- C. Bond mineral fiberboard, polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive as recommended by insulation manufacturer.
- D. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.

3.3 EXTERIOR FRAMING OR FURRING BLANKET INSULATION:

- A. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Pack behind outlets around pipes, ducts, and services encased in walls. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.
- B. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.
- C. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.
- D. Fasten blanket insulation between wood studs or framing with nails or staples through flanged edges on face of stud. Space fastenings not more than 150 mm (six inches) apart.
- E. Roof Rafter Insulation or Floor Joist Insulation: Place mineral fiber blankets between framing to provide not less than a 50 mm (two inch) air space between insulation and roof sheathing or subfloor.
- F. Ceiling Insulation and Soffit Insulation:
 - 1. Fasten blanket insulation between wood framing or joist with nails or staples through flanged edges of insulation.
 - 2. At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles

- to the main runners or framing. Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.
3. In areas where suspended ceilings adjoin areas without suspended ceilings, install either blanket, batt, or mineral fiberboard extending from the suspended ceiling to underside of deck or slab above. Secure in place to prevent collapse or separation of hung blanket, batt, or board insulation and maintain in vertical position. Secure blanket or batt with continuous cleats to structure above.

3.4 RIGID INSULATION ON SURFACE OF EXTERIOR WALLS, AND UNDERSIDE OF FLOORS:

- A. On the interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to the face of studs for interior wall finish where shown.
- B. Bond to solid vertical surfaces with adhesive as recommended by insulation manufacturer. Fill joints with adhesive cement.
- C. Use impaling pins for attachment to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.
- D. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings not more than 300 mm (12 inches) apart. Stagger fasteners at joints of boards. Install at each corner.

3.5 ACOUSTICAL INSULATION:

- A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
- B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.
- C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- D. Where acoustical insulation is installed above suspended ceilings install blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.

- E. Where semirigid insulation is used which is not full thickness of cavity, adhere to one side of cavity maintaining continuity of insulation and covering penetrations or embedments in insulation.
- F. Where sound deadening board is shown, secure with adhesive to masonry or concrete walls and with screws to metal or wood framing. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

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SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes foamed-in-place insulation in exterior CMU walls.

1.2 RELATED WORK

- A. LEED Sustainable Construction Specification Section 018111

1.3 SUBMITTALS

- A. Manufacturer's technical data indicating all physical and chemical specifications of products.
- B. Certified Test Reports: Show compliance with specified performance values, including R-values, and fire performance characteristics.
- C. Installer's certification from manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Single source product from one manufacturer.
- B. Installer Qualifications: Engage a dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than ten years direct experience in the installation of the product used.
- C. Factory pre-mix resins and powders to ensure consistency.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Products of the following manufacturers are acceptable:
 - 1. Core Foam Masonry Foam Insulation by cfiFOAM, Inc.
 - 2. Core-Fill-500 by Tailored Chemical Products, Inc.
 - 3. Tripolymer 105 Foam by C.P. Chemical Co., Inc.

2.2 MATERIAL

- A. See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.
- B. Insulation shall consist of two components, resin and catalyst with the following physical properties:
 - 1. Density: .8 - 1.3 lbs. per cu.ft.
 - 2. Thermal Value: R-4.9 per inch at 32 degrees F or R-4.4 per inch at 75 degrees F, when tested per ASTM C177 or ASTM C518
 - 3. Fire Characteristics per ASTM E 84, Class A
 - 4. Water Vapor Transmission ASTM E96 or ASTM C 355: ≤17 perms per inch
 - 5. VOC emissions of Cured Foam: ≤100 ppb

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install foamed-in-place insulation from interior, prior to installation of interior finish work and after all masonry and structural concrete work is in place.

- B. Install in accordance with manufacturers written installation instructions.
- C. Fill all open cells and voids in hollow concrete masonry walls.
 - 1. Pressure inject insulation through a series of holes drilled into every vertical column of block cells and at a minimum, 10 feet vertical height (i.e.: A 12 foot height will require two holes).
- D. Patch holes with mortar and score to resemble existing surface.
- E. Encapsulate foam to meet the requirements of NFPA 275 where required by code. Provide one of the following when not detailed:
 - 1. Spray applied cementitious coatings.
 - 2. Spray applied cellulosic materials.
 - 3. Spray applied rockwool.

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**SECTION 07 22 00
ROOF AND DECK INSULATION**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Roof and deck insulation, on new construction ready to receive roofing or waterproofing membrane.
- B. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

- A. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.
- B. Rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- C. LEED Sustainable Construction Specification Section 018111

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 - 90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings
- C. ASTM International (ASTM):
 - C208-08.....Cellulosic Fiber Insulating Board
 - C552-07.....Cellular Glass Thermal Insulation
 - C726-05.....Mineral Fiber Roof Insulation Board
 - C728-05.....Perlite Thermal Insulation Board
 - C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - C1278/C1278M-07.....Standard Specification for Fiber-Reinforced Gypsum Panel
 - C1289-10.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - C1396/C1396M-09.....Standard Specification for Gypsum Board
 - D41-05.....Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
 - D312-06.....Asphalt Used in Roofing

- D1970-09.....Standard Specification for Self-Adhering
Polymer Modified Bituminous Sheet Materials
Used as Steep Roofing Underlayment for Ice Dam
Protection
- D2178-04.....Asphalt Glass Felt Used in Roofing and
Waterproofing
- D2822-05.....Asphalt Roof Cement
- D4586-07.....Standard Specification for Asphalt Roof Cement,
Asbestos-Free
- E84-09.....Standard Test Method for Surface Burning
Characteristics of Building Material
- F1667-05.....Driven Fasteners: Nails, Spikes, and Staples
- D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
- 4450-89.....Approved Standard for Class 1 Insulated Steel
Deck Roofs
- 4470-10.....Approved Standard for Class 1 Roof Coverings
- 1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.
- 1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof
Components
- 1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing
- E. National Roofing Contractors Association: Roofing and Waterproofing
Manual
- F. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog,
www.biopreferred.gov
- G. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)
- H. U.S. Department of Commerce National Institute of Standards and
Technology (NIST):
- DOC PS 1-09.....U.S. Product Standard for Construction and
Industrial Plywood
- DOC PS 2-04.....Performance Standard for Wood-Based Structural-
Use Panels.

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Performance: Provide roof insulation meeting minimum overall
average R-value of 33, with minimum R-value at any location of 10.
- B. FM Approvals: Provide roof insulation complying with requirements in
FM Approvals 4450 and 4470 as part of specified roofing system, listed

in FM Approvals "RoofNav" as part of roofing system meeting
Fire/Windstorm Classification in Division 07 roofing section.

1.5 QUALITY CONTROL

- A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.
- B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.
- C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.
- D. Requirements of roofing system uplift pressure design for specified roofing system.
- E. Requirements of applicable FM Approval for specified roofing system insulation attachment.
- F. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
 - 1. Asphalt and adhesive materials, each type.
 - 2. Roofing cement, each type.
 - 3. Roof insulation, each type.
 - 4. Substrate board, each type.
 - 5. Cover board, each type.
 - 6. Fastening requirements.
 - 7. Insulation span data for flutes of metal decks.
- C. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and

- preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.
- D. Shop Drawings: Include plans, sections, details, and attachments.
1. Insulation layout and attachment patterns for roof and saddle areas.
- E. Certificates:
1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.
- F. Laboratory Test Reports: Thermal values of insulation products.
- G. Documentation of supervisors' and inspectors' qualifications.

1.7 DELIVERY, STORAGE AND MARKING

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation requirements.

1.8 QUALITY ASSURANCE:

- A. Insulation shall meet physical properties of ASTM C1289, Type II; Class 1 and provide a minimum Long Term Thermal Resistance (LTTR) value of 6.0 per inch (the basis for establishing thickness).
- B. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.
1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.
2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."

3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.

2.2 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Roof Insulation System:
 1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
 2. Cut to provide high and low points with crickets and slopes as shown.
 3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
 4. Minimum slope 1:48 (1/4 inch per 12 inches).
- D. Composite Nail Base Insulated Roof Sheathing:
 1. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: polyisocyanurate thermal insulation ASTM C1289, Type V, insulation thickness as indicated, with oriented strand board laminated to top surface.
 2. Oriented Strand Board: NBS DOC PS 1, Exposure 1, 5/8 inch thick.
 3. Bottom surface faced with felt facers.

2.3 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
 1. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
 2. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
 - a. Cellulosic Fiberboard: ASTM C208.
 - b. Mineral Fiberboard: ASTM C726.
 - c. Perlite Board: ASTM C728.

C. Vapor Retarder:

1. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).

D. Cover Board:

1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 5/8 inch thick, factory primed.

2.4 FASTENERS

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

- A. Comply with requirements of Division 07 roofing section.

3.3 SUBSTRATE BOARD INSTALLATION

- A. Fasten substrate board to top flanges of steel deck to resist uplift pressures according to roofing system manufacturer's instructions and requirements of FM Approvals listing for specified roofing system.

3.4 VAPOR RETARDER INSTALLATION

A. General:

1. Install continuous vapor retarder on roof decks where indicated.
2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.
4. Seal penetrations with roof cement.

B. Steel Deck:

1. Material and method of application of roofing systems used on metal decks shall meet the requirements of FM Approvals for Class I-A Insulated Steel Roof Deck.
2. Attach substrate board and subsequent components to meet the requirements of FM Approval's "RoofNav" listing for specified system

meeting Fire/Windstorm Classification indicated in Division 07 roofing section.

3. Locate the long dimension edge joints to have solid bearing on top of decking ribs; do not cantilever over rib openings or flutes.

3.5 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:

1. Install roof insulation in accordance with roofing system manufacturer's written instructions, final Shop drawings, and meeting Performance Requirements of roofing system.

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
2. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).

C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.

D. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.

E. Cut to fit tight against blocking or penetrations.

F. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

G. Installation Method:

1. Mechanically Fastened Insulation:

- a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
- b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.

2. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Mechanically Fastened Insulation" requirements.

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SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS, VAPOR PERMEABLE

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies fluid-applied vapor-permeable membrane air barrier material and accessories used for exterior above grade wall assembly air barriers and their extension and connection to adjacent air barrier components in roof and opening construction to provide a durable, continuous, air- and moisture- impermeable full-building system.

1.2 RELATED WORK

A. LEED Sustainable Construction Specification Section 018111

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

1. Air Barrier Association of America (ABAA):Quality Assurance Program
2. American Society of Testing and Materials (ASTM):
 - C920-10.....Standard Specification for Elastomeric Joint Sealants
 - C1193-09.....Standard Guide for Use of Joint Sealants
 - D412-06.....Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
 - D2369-10.....Standard Test Method for Volatile Content of Coatings
 - E96/E96M-05.....Standard Test Methods for Water Vapor Transmission of Materials
 - E162-09.....Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
 - E783-02.....Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
 - E1186-03(2009).....Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems

- E2178-03.....Standard Test Method for Air Permeance of
Building Materials
- E2357-05.....Standard Test Method for Determining Air
Leakage of Air Barrier Assemblies
3. U.S. Environmental Protection Agency (EPA)
40 CFR 59, Subpart D....National Volatile Organic Compound Emission
Standards for Consumer and Commercial
Products
4. SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD):
1168-89(2003).....Adhesive and Sealant Applications

1.4 PERFORMANCE REQUIREMENTS

- A. General: Membrane air barrier shall be capable of performing as a continuous vapor- permeable air barrier and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Membrane air barriers shall accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. per ASTM E 2357.
- C. Material Compatibility: Provide membrane air barrier materials that are compatible with one another and with adjacent materials under conditions of service and application required, as demonstrated by membrane air barrier manufacturer based on testing and field experience.

1.5 QUALIFICATIONS:

- A. Approvals: Approval by Contracting Officer is required of products and services of proposed manufacturers, and installers, and will be based upon submission by Contractor that:
- B. Manufacturer Qualifications: Manufacturer regularly and presently manufactures fluid-applied membrane air barrier material meeting section requirements as one of its principal products.
1. Manufacturer's product submitted has been in satisfactory and efficient operation on five similar installations for at least five years.

2. Accreditation: Manufacturer is accredited by the Air Barrier Association of America.
- C. Installer Qualifications: Installer has technical qualifications, experience, certifications, trained personnel, membrane air barrier manufacturer's approval, and facilities to install specified items.
 1. Accreditation: Installer shall be accredited by the Air Barrier Association of America (ABAA) and whose installers are certified in accordance with the site Quality Assurance Program used by ABAA.
 2. Installer's applicators shall be trained and certified or otherwise approved by manufacturer of air barrier system.
 3. Installer's full time on-site field supervisor shall have completed three projects of similar scope within last year, be able to communicate verbally with Contractor, Architect, testing agency, and employees.
 - a. Accreditation: Installer's supervisor shall be a Level 3 Accredited Installer by the ABAA.
- D. Testing Agency Qualifications: Testing laboratory accredited by International Accreditation Service, Inc. or American Association for Laboratory Accreditation.
 1. Testing agencies personnel shall be experienced in the installation of specified air barrier system and qualified to perform observation and inspection specified in Field Quality Control Article to determine Installer's compliance with the requirements of this Project.
 2. Accreditation: Contractor's testing agency performing Field Quality Control testing and inspection shall also be certified by ABAA to perform ABAA Quality Assurance Program installer audits.

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 1. Fluid-applied membrane air barrier.
 2. Primer.
 3. Mastic.
 4. Counterflashing strip.
 5. Modified bituminous strip.
 6. Sprayed polyurethane foam sealant.

7. Opening transition assembly.
8. Joint sealant.
9. Printed installation instructions for conditions specified.

C. Certificates:

1. Indicating membrane air barrier manufacturer's qualifications as specified.
2. Indicating approval of installer by membrane air barrier manufacturer.
3. Indicating qualifications of installer and installer's personnel.
4. Indicating air barrier manufacturer's determination that proposed materials are chemically and adhesively compatible with adjacent materials.
5. Indicating products meet project limitations on VOC content.

- D. Inspection Reports: Daily reports of testing agency and reports of testing and inspection agency. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.7 COORDINATION:

- A. Coordinate installation of work of this Section with adjacent and related work to ensure provision of continuous, unbroken, durable air barrier system.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to job in manufacturer's original unopened containers.
- B. Do not store material in areas where temperature is lower than 10 degrees C (50 degrees F,) or where prolonged temperature is above 32 degrees C (90 degrees F).

1.9 ENVIRONMENTAL REQUIREMENTS:

Ambient Surface and Material Conditions: Not less than 4 degrees C (40 degrees F), during application of waterproofing, visibly dry, and complying with manufacturer's written instructions.

1.10 WARRANTY:

Warrant membrane air barrier installation against air and moisture leaks subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period is two years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturer was used for environmental calculations of the wall assembly:
 - 1. ExoAir 230 by Tremco Commercial Sealants & Waterproofing
- B. Products of other manufacturers will be considered provided they equal or exceed the material requirements and design qualities of the specified product. Submit requests for Architect's approval with complete technical data for evaluation.

2.2 MATERIALS

- A. Source Limitations: Obtain membrane air barrier materials and accessories from single manufacturer.
- B. VOC Content: Maximum 250 g/L per 40 CFR 59, Subpart D (EPA Method 24).
- C. See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.

2.3 MEMBRANE AIR BARRIER:

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane, meeting the following:
 - 1. Air Permeance, ASTM E 2178: 0.02 L/s x sq. m of surface area at 75-Pa (0.004 cfm/sq. ft of surface area at 1.57-lbf/sq. ft.) pressure difference.
 - 2. Vapor Permeance, ASTM E 96/E96M: Minimum 580 ng/Pa x s x sq. m (10 perms).
 - 3. Elongation, Ultimate, ASTM D 412, Die C: 200 percent, minimum.
 - 4. Combustion Characteristics: Flame spread, not greater than 25; smoke developed, not greater than 450, ASTM E 84.
 - 5. Thickness of Membrane Air Barrier: Not less than 1.0 mm (40 mils), applied in single continuous coat.

2.4 ACCESSORY MATERIALS:

- A. Primer: Liquid waterborne primer meeting VOC requirements, recommended for substrate by membrane air barrier manufacturer.
- B. Counterflashing Sheet: Modified bituminous, 1.0-mm- (40-mil- thick self-adhering composite sheet consisting of 0.9 mm (36 mils) of rubberized asphalt laminated to polyethylene film.
- C. Substrate Patching Material: Manufacturer's standard trowel-grade filler material.

- D. Sprayed Polyurethane Foam Sealant: Foamed-in-place, 24- to 32-kg.cu. m (1.5- to 2.0-lb/cu. ft) density, with flame-spread index of 25 or less per ASTM E 162.
- E. Flexible Opening Transition: Cured low-modulus silicone extrusion with reinforcing ribs, sized to fit opening widths, designed for adhesion to or insertion into aluminum framing extrusions, and compatible with air barrier system materials and accessories.
- F. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, approved by membrane air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories. Basis of Design: Tremco Dymonic 100.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Surface Condition: Before applying membrane air barrier materials, ensure substrates are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion.
- B. Verify concrete surfaces have cured for time period recommended by membrane air barrier manufacturer, free from release agents, concrete curing agents, and other contaminants.
- C. Verify masonry joints are flush and filled with mortar.

3.2 INTERFACE WITH OTHER WORK

- A. Commencement of Work: Commence work once membrane air barrier substrates are adequately protected from weather and will remain protected during remainder of construction.
- B. Sequencing of Work: Coordinate sequencing of work with work of other sections that form portions of building envelope air barrier to ensure that flashings and transition materials can be properly installed.
- C. Subsequent Work: Coordinate work with work of other sections installed subsequent to membrane air barrier to ensure complete inspection of installed membrane air barrier and sealing of membrane air barrier penetrations necessitated by subsequent work.

3.3 AIR BARRIER INSTALLATION

- A. General: Prepare substrates and install and apply air barrier components in accordance with air barrier manufacturer's written

instructions consistent with manufacturer's qualifying tested assemblies.

3.4 PREPARATION

- A. Prepare and treat substrate in accordance with membrane air barrier manufacturer's written instructions.
- B. Mask adjacent finished surfaces.
- C. Remove contaminants and film-forming coatings from concrete.
- D. Remove projections and excess materials and fill voids with substrate patching material.
- E. Prepare and treat joints and cracks in substrate per ASTM C 1193 and membrane air barrier manufacturer's written instructions.
- F. Apply primer to substrates.

3.5 APPLICATION OF TRANSITION STRIPS

- A. Install transition strips and accessory materials according to membrane air barrier manufacturer's written instructions.
- B. Connect and seal membrane air barrier material to adjacent components of building air barrier system, including, but not limited to, roofing system air barrier, exterior glazing and window systems, curtain wall systems, door framing, and other openings.
- C. Flexible Opening Transition: Prime concealed perimeter frame surfaces of windows, storefronts, curtain walls, louvers, and doors. Apply flexible opening transition so that a minimum of 75 mm (3 inches) over coverage is achieved over each substrate.
 - 1. Fill gaps at perimeter of openings with foam sealant.
- D. Penetrations: Fill gaps at perimeter of penetrations with foam sealant. Seal transition strips around penetrating objects with termination mastic.
- E. Flashings: Seal top of through-wall flashings to membrane air barrier with continuous transitions strip of type recommended by membrane air barrier manufacturer for type of flashing.

3.6 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. Apply fluid membrane air barrier material in full contact with substrate to produce a continuous seal with transition strips according to membrane air barrier manufacturers written instructions.
 - 1. Apply fluid membrane in thickness recommended by manufacturer, but not less than thickness specified in this section.

- B. Leave membrane air barrier exposed until tested and inspected by Owner's testing agency and approved by Resident Engineer.
- C. Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

3.7 TESTING:

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections, including documenting of membrane air barrier prior to concealment.
 - 1. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements, including the following:
 - 2. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 3. Continuous structural support of air-barrier system has been provided.
 - 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 5. Site conditions for application temperature and dryness of substrates have been maintained.
 - 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 7. Surfaces have been primed, if applicable.
 - 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 - 9. Termination mastic has been applied on cut edges.
 - 10. Strips and transition strips have been firmly adhered to substrate.
 - 11. Compatible materials have been used.
 - 12. Transitions at changes in direction and structural support at gaps have been provided.
 - 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 14. All penetrations have been sealed.
 - 15. Inspections and testing shall be carried out at the following rate:
 - a. Up to 10,000 square feet (930 square meters) - one inspection

- b. 10,001 - 35,000 square feet (931 - 3,250 square meters) - two inspections
 - c. 35,001 - 75,000 square feet (3,251 - 6,970 square meters) - three inspections
 - d. 75,001 - 125,000 square feet (6,971 - 11,610 square meters) - four inspections
 - e. 125,001 - 200,000 square feet (11,611 - 18,580 square meters) - five inspections
 - f. Over 200,00 square feet (18,580 square meters) - six inspections.
16. Forward written inspection reports to the Resident Engineer within 5 working days of the inspection and test being performed.
17. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.
- B. Inspections shall include:
- 1. Compatibility of materials within membrane air barrier system and with adjacent materials.
 - 2. Suitability of substrate and support for membrane air barrier materials.
 - 3. Suitability of conditions under which membrane air barrier will be applied.
 - 4. Adequacy of substrate priming.
 - 5. Proper application and joint and edge treatment of transition strips, flexible opening transitions, and accessory materials.
 - 6. Continuity and gap-free installation of membrane air barrier, transition strips, and accessory materials.

3.8 CLEANING AND PROTECTION

- A. Clean spills, stains, and overspray resulting application utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.
- B. Protect membrane air barrier from damage from subsequent work. Protect membrane materials from exposure to UV light in excess of that acceptable to membrane air barrier manufacturer; replace overexposed materials and retest.

- - - E N D - - -

**SECTION 07 41 13
METAL ROOF PANELS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Standing Seam metal roofing and fascia
 - 2. Flashing, closures, and cap trim
 - 3. Metal gutters and downspouts
 - 4. Underlayment

1.2 RELATED WORK

- A. LEED Sustainable Construction Specification Section 018111

1.3 QUALITY CONTROL

- A. Provide Mockup as specified in Section 01 33 23 Shop Drawings, Product Data and Samples.

1.4 REFERENCE STANDARDS

- A. AISC: "Steel Construction Manual," American Institute of Steel Construction
- B. AISI: "Cold Form Steel Design Manual," American Iron and Steel Institute
- C. ASTM A653: Specifications for steel sheet, hot dipped galvanized steel, coated aluminum-zinc alloy, coated steel-hot dipped aluminum zinc alloy or painted galvanized with exterior color specified by manufacturer
- D. ASTM A792-AZ55: Specifications for steel sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (galvalume)
- E. ASTM D2244: Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- F. ASTM D4214: Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
- G. ASTM E1592: Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static air Pressure Difference
- H. ASTM E1646: "Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference"
- I. ASTM E1680: "Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems"

1.5 PERFORMANCE REQUIREMENTS

- A. Design: The preformed metal roof system shall be designed to sustain the specified loads in accordance with FBC. Components of the preformed metal roof system shall meet the design loads and applied in load combinations as specified in governing building codes, without exceeding the allowable working stresses.
 - 1. Refer to Structural Drawings for wind pressures and other design loads.

2. Roof assemblies shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number.
 3. Design roof panels to be able to support walking loads without excessive distortion or telegraphing of the structural supports. For the maximum span used on the project, panels shall withstand a 250 pound concentrated load applied to a 4 square inch pad located at the center of the panel flat without buckling of the rib or noticeable permanent distortion of the panel.
 4. Design roof panel and flashing attachments to accommodate thermal expansion and contraction through a total of 150 degrees F temperature change.
 5. Design systems to provide movement of components without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effect when subject to seasonal temperature ranges.
- B. Structural: Uniform load capacity shall be determined by testing in accord with the principles of ASTM E1592, in a frequency required by the FBC, adapted to testing of formed sheet panels by clarifying specific sections of this standard as follows:
1. Roof test specimens shall be representative of the main body of the roof, free from influence of perimeter conditions. The setup shall be continuous over one or more supports and contain at least 5 panel widths.
 2. No roof attachments are permitted at the sides other than the standard gable or rake condition. For uplift tests, at least one end seal shall be flexible and in no way restrain the crosswise distortion of panels. One end may simulate an eave condition if at least 12 feet away from the mid-roof clip under evaluation.
 3. Roofing panels and accessories shall be production material of the same type and thickness proposed for use on the project.
 4. Longitudinal seals or plastic film shall not span any crevice or cracks that may tend to separate under pressure (e.g. plastic films used to seal the chamber must be applied into the side seam of the panel so as to apply a uniform static pressure to the entire cross section of the panel).
- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq.ft. of roof area when tested according to ASTM E1680 at the following test-pressure difference:
1. Test-Pressure Difference: Positive and negative 1.57 lbf/sq.ft.
 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq.ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.

3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- D. Water Penetration: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
 1. Test-Pressure Difference: 20 percent of positive design wind pressure, but not less than 6.24 lbf/sq.ft. and not more than 12.0 lbf/sq. ft.
 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
 3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F ambient; 180 deg F, material surfaces.
- F. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
- G. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E1980.
- H. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 1. Fire/Windstorm Classification: Class 1A-90
 2. Hail Resistance: Class1, Severe Hail Resistance (1-SH)

1.6 SUBMITTALS

- A. Product Data: Manufacturer's published data including panel profile, standard details, fasteners, and sealants.
 1. Include maintenance data
- B. Shop Drawings:
 1. Show profile and gage of items, location and type of fasteners; location, gage, and method of attachment of trim.
 2. Include methods of erection, elevations, plans of roof panels, edge coating methods, panel lengths, sections, details, anticipated loads, flashings, roof curbs, vents, interfaces with materials not supplied, and proposed identification of components parts and their finishes.

3. Shop Drawings shall bear the seal and signature of Structural Engineer registered in the State of Florida.
4. Calculations for wind load design shall be stamped, sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-10.
5. Identify system RoofNAV numbers for each specific assembly.
- C. Sample of Approved Product Label and location of attachment to assembly.
- D. Test Reports: Indicate compliance with preformed metal roofing system to Performance requirements.
- E. Color selection materials for type of finish specified
- F. Field Quality-Control Reports
- G. Pre-roofing conference meeting minutes
- H. Sample warranties
- I. Environmental Submittals:
 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 2. Product Test Reports for Credit SS 7.2: For roofing materials, documentation indicating that roofing materials comply with Solar Reflectance Index requirement.

1.7 QUALITY ASSURANCE

- A. General: Provide metal roof assemblies that comply with Performance Requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a nationally recognized independent testing agency.
- B. Design panels in accordance with sound engineering methods and practices and in accordance with the latest edition of AISI's "Specification for the Design of Cold Formed Steel Structural Members"
- C. Design roof structure with recognition for the "floating system" which must exist to have a roof panel that meets expansion and contraction requirements.
- D. Manufacturer's Qualifications: Minimum of 10 years experience in manufacturing panels of this nature, in a permanent, stationary, indoor production facility
- E. The installer shall have been actively installing the specified roofing system for a minimum of 5 years and authorized by roofing system manufacturer.
- F. The roofing manufacturer's representative shall inspect the roof within one year after the Date of Substantial Completion.
- G. Erection Tolerance: Maximum variation of sub-structure from true planes or lines is 1/4 inch in 20 feet, 3/8 inch in 40 feet or more.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels and other system components to Site packaged to protect against transportation damage.
- B. Unload, store, and erect panels to prevent banding, warping, twisting, and surface damage.
- C. Store materials and accessories above ground on platforms. Store under waterproof covering. Provide ventilation to prevent build-up of condensation. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 PRE-ROOFING CONFERENCE

- A. Prior to the installation of the roofing, meet at the Site with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 4. Review structural loading limitations during and after roofing.
 - 5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review required submittals, both completed and yet to be completed
 - 8. Review required inspection, testing, certifying, and accounting procedures
 - 9. Review temporary protection requirements for metal panel systems during and after installation.
 - 10. Review procedures for repair of metal panels damaged after installation.
 - 11. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be

performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

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

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.
- D. Repairs required, either permanent or temporary, to metal roofing or flashings under this guarantee to keep the roof watertight shall be started within 3 days after notice of the need for repairs.
- E. Warranty shall include, but not be limited to, metal roofing, fascias, roof insulations and attachments, flashings, cap flashings, closures and

trims, fasteners, accessories, sealants, gutters, and watertight connection to downspouts.

1. Warranty shall not be limited by windloading less than the design windloading and wind uplift. Include a wind warranty rider up to the designed wind and design pressures.

PART 2 - PRODUCTS

2.1 STANDING-SEAM METAL ROOF PANELS

- A. General: Factory-formed, standing seam metal roof panels with factory applied finish.
 1. Formed with vertical ribs at panel edges and intermediate stiffening ribs between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
 2. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 3. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
 4. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

2.2 MATERIALS

- A. See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.
- B. Clip Angle "Bearing Plate": Minimum of 16 gage 36,000 psi G90 hot dip galvanized steel. Concealed backing plate shall have recessed pre-punched holes matching deck attachment.
- C. Concealed Clips: Minimum 24 gage galvanized coated, 50 kis or nonmagnetic stainless steel. Clip design shall accommodate expansion and contraction requirements while being anchored to structure.
- D. Fasteners: Self-tapping screws designed to withstand design loads.
- E. Roofing Panels: Manufacture in continuous lengths to eliminate perpendicular panel end laps. End laps will not be allowed. Where lapped joints are unavoidable, space laps so that each sheet spans minimum three supports.
- F. Metal Panels: Fabricate nominal 16 inches wide maximum with concealed anchors that resist wind uplift yet permit expansion and contraction. Standing ribs 2 inches high minimum shall have a continuous groove capillary break. Ribs shall be securely locked over anchor clips with an electrically driven, field operated, roll forming tool. A minimum of two, 3/8-inch high intermediate stiffener ribs shall be located in the flat pan, striated panels are also acceptable.

1. 24 gage Galvalume® panels finished with full strength Kynar 500 coating.
 2. Produce Galvalume sheet in accordance with ASTM A792 with coating designation of AZ55
 3. Use clean, dry gloves during handling and installation.
 4. Care shall be exercised to prevent the roofing panels from sliding over each other during shipment and installation.
- G. Fold panel ends up 90 degrees at ridge, headwall, and hip conditions, where applicable. Do not cut or otherwise perforate at folded ends.
- H. Joints: Factory-installed captive gaskets, sealants, or separator strips at panel joints to be provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movement.

2.3 ACCESSORIES

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Gutter, Downspout, Trim, and Flashings
1. Gutters, Downspouts, Ridge Cap, and Curbs: Minimum 24 gage, Galvalume "Plus" finish on all exposed sides and edges, matching the roof panel finish. Unexposed sides and edges shall be standard baked-on finish. Form to configuration indicated on the Drawings. Provide gutter straps of 24 gage Galvalume "Plus" finish to match gutters. Provide manufacturers standard gutter design if not detailed on Drawings.

2. Fascia, Eave, and Rakes: Minimum 22 gage, Galvalume "Plus" finish on all exposed sides and edges.
 - D. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.
 - E. Pipe Flashings: EPDM (ethylene propylene diene monomer) vent pipe penetrations in metal roof. Provide clamping rings, sealant, and fasteners recommended by manufacturer.
 - F. Closures: Factory precut closed cell foam meeting ASTM D1056 or ASTM D3575, enclosed in metal channel matching panels when used at hip, ridge, rake, head, and jamb.
 - G. Membrane Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer. The following have been reviewed for conformance with specification.
 1. WinterGuard HT by CertainTeed Corp.
 2. Grace Ultra by Grace Construction Products
 3. Blueskin PE200 HT by Henry Company
 4. Lastobond Shield HT by Soprema
 5. TW Metal and Tile Underlayment by Tamko Roofing Products
 - H. Slip Sheet: Manufacturer's recommended slip sheet of type required for application
 - I. Splashblocks: Refer to Division 07 Section, Flashing and Sheet Metal.
- 2.4 FINISH**
- A. Finish to be factory applied one mil thick full strength Kynar 500 fluorocarbon based coating over cleaned and pretreated galvanized coated steel in color as selected by the Architect. Coating to be applied prior to fabrication of roofing components.
 - B. Metal sheets or coils must be cut to size before receipt of finish coating or have cut edges specially coated with similar film of same

applied finish after being sized. Show edge coating method on final Shop Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive insulation and metal roofing. Do not proceed until unsatisfactory conditions have been corrected.
 - 1. Confirm erection tolerances specified in Part 01.
 - 2. Confirm water and air barrier has been installed in the correct location.

3.2 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed work will be free of water intrusion.
- B. Remove protective film from roof panels immediately prior to installation. Strip film without damaging prefinished surface.
- C. Separate dissimilar metals by applying a bituminous coating, peal-and-stick sheet, or other permanent method approved by roof panel manufacturer.
- D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

- A. Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
- B. Membrane Underlayment:
 - 1. Install over 100% percent of the roof area in accordance with the membrane manufacturer's written installation instructions.
 - 2. Membrane shall be installed directly on top of the cover board or insulation specified in Division 07 Section, Roof and Deck Insulation.
 - 3. Apply slip sheet, if required, over underlayment before installing metal roof panels.
- C. Erect metal roofing system in accordance with manufacturer's erection drawings, final Shop Drawings, and to meet Performance Requirements.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws.
 - 3. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 4. Install flashing and trim as metal panel work proceeds.

5. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 6. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
 8. Minimize field cutting of panels. Where field cutting is necessary, use methods that will not distort panel profiles. Do not use torch cutting.
- D. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- E. Set bearing plates on surface of insulation board at standing slip angle locations.
- F. Install concealed clips on top of bearing plates with self drilling shoulder screws into metal roof deck below. Size and length of screws and bearing plates shall be as recommended by manufacturer.
- G. Install concealed backing plates on surface of insulation at locations where panel end laps occur. The concealed backing plate shall be continuous under panel end laps. The backing plates shall be fastened to the metal deck with self drilling screws at 16 inches on center.
- H. Interlocking ribs shall be crimped together by an electric powered mechanical device in accordance with the roof manufacturer's instructions, after securing in place.
- I. Metal roofing, fascia, and gutter work shall be watertight and weathertight, lines and angles sharp and true, plain surfaces free from waves and buckles.
- J. Conceal fasteners wherever possible. Exposed fasteners shall be stainless steel painted to match.
- K. Brake formed cap, trim, closure, and flashings are to be furnished with a minimum of joints.
1. Brake formed members with exposed corner intersections shall have corner pieces shop fabricated. Other miscellaneous trim corners may be field cut, mitered, or butted.
 2. Trim shall be of the same material as, and have a finish to match, the metal roofing panels.
 3. Paint edges where field cuts are required.
- L. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end

closures and seal watertight with sealant. Provide for thermal expansion.

- M. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
- N. Install roof jacks at pipe penetrations in metal roofing and roof curbs at all roof mounted equipment locations. Provide required fasteners and sealant materials to provide watertight and weathertight construction.

3.4 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealers, handling marks, and debris from installation. Leave work clean and unmarked, free of dents, creases, waves, scratches, or other damages to the finish.
- B. Do not permit storage or traffic on finished roof installation. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect through the Date of Substantial Completion.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

- - -END - - -

SECTION 07 42 01
EXTERIOR WOOD PANEL CLADDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Pre-finished composite wood veneer panel exterior cladding. Will be installed in exterior and interior conditions.

1.2 RELATED WORK

- A. LEED Sustainable Construction Specification Section 018111

1.3 PERFORMANCE REQUIREMENTS

- A. Design exterior ceiling system to meet wind-loading requirements for the FBC. Refer to Structural Drawings for wind and design pressures.
 - 1. Exterior ceiling system assembly shall be compliant with Florida Building Code rule 9N-3 for statewide product approval and require a Florida Product approval number or manufacturer's equivalent engineer's judgment acceptable to local AHJ.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data sheet on each product to be used including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
- B. Certified test results from independent testing laboratory substantiating specified performance characteristics and physical properties.
- C. Shop Drawings: Show layout, profiles and product components, including anchorage, accessories, and finish colors.
 - 1. Wind loading Calculations shall be stamped, sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7-10.
- D. Samples: Two complete sets of color swatches representing manufacturer's full range of available colors, grain patterns, vein contrast and materials for each panel finish specified.
- E. Installer Qualifications

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Certified or otherwise approved by the manufacturer for application detailed on Drawings

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver Materials to site in Manufacturer's original, unopened packaging, with labels clearly identifying product name and

manufacturer.

- B. Storage: Place inspected products in a climate-controlled enclosed space.
 - 1. Horizontal Storage: Lay panels on an elevated flat surface with max .24 inches between supports to ensure even distribution of loads.
 - 2. Storage Time: Cannot exceed five months as of factory dispatch date. Protective peel-off sheet must be removed immediately after panel is installed.
- C. Handling: Open crate within 72 hours of material delivery. Remove extra top panel and inspect contents by lifting each panel vertically to prevent chafing of the decorative face. Protect materials during handling to prevent damage.

1.7 PROJECT CONDITIONS

- A. Do not install system under environmental conditions where it is likely to be immersed in water, or where the temperature is likely to exceed 120 degrees Fahrenheit for extended periods of time.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturer have been reviewed and approved:
 - 1. Prodex External Cladding by Prodema North America
- B. Products of other manufacturers will be considered provided they equal or exceed the material requirements and design qualities of the specified product. Submit requests for Architect's approval with complete technical data for evaluation.

2.2 MATERIALS

- A. See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.
- B. Composite Wood Veneer Exterior Wall Panel
- C. Panels: Grade A rotary cut hardwood veneer from farmed forests and bonded to a bakelite core.
- D. Fire Rating: Class A in accordance with:
 - 1. ASTM E-84 criteria for flame spread 0 and smoke development 125 and extended E-84 30-Minute Fire Test.
 - 2. Class 1 (M1) fire rating in accordance with UNE-EN 2372
 - 3. NFPA 285 Multi-Story Fire Test
 - 4. NFPA 268 Self-Ignition Test
- E. Panel Styles and Sizes: Light brown, 96 inches by 8 inches.

- F. Fasteners: Stainless steel, acceptable to manufacturer, meeting Performance Requirements for galvanized steel and aluminum substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Protect metal surfaces in contact with concrete, masonry mortar, plaster or other cementitious surface with isolation coating.
- C. Follow manufacturer's recommendations in the use of caulking, gaskets and sealants on panel faces or edges.

3.3 INSTALLATION

- A. Protect all sub-surfaces with appropriate weather barrier prior to installing subframe assembly.
- B. Maintain air circulation airspace as detailed on final Shop Drawngs.
- C. Gap (Joint space) along all panel edges: Approximately 5/16 inch. Consult manufacturer for actual gap conditions.
- D. Pre-drill holes for screws
1. Do not over tighten fasteners as this can damage the outer coating and inhibit thermal expansion.
 2. Screws placement as shown on final Shop Drawings, meeting Performance Requirements.

3.4 CLEANING

- A. Cleaning guidelines:
1. Use non-abrasive, neutral soap dissolved in water.
 2. Rinse with clean water to prevent the appearance of rings.
 3. To prevent damage to the surface use soft, clean cloths and sponges.
 4. Never use abrasive cleaning powders or pastes, steel wool, or Scotch Brite type scouring pads.

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SECTION 07 42 13
METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulated metal wall panels and accessories.

1.2 RELATED WORK

- A. LEED Sustainable Construction Specification Section 018111.

1.3 PERFORMANCE REQUIREMENTS

- A. Refer to structural drawings for applicable wind load and design pressure requirements.
1. Exterior assemblies shall be compliant with Florida Building Code rule 9B-72 for statewide product approval and require a Florida Product approval number.
 2. Deflection Limits: Withstand test pressures of inward and outward wind-load design pressures with maximum deflection of L/180 of the span with no failure.
 3. Secondary Framing: It shall be the responsibility of the metal wall panel installer to provide all secondary and tertiary steel as may be required to adequately support the wall panels from the primary structural columns and beams as shown in the contract documents. Factory trained panel installation contractor shall design secondary framing system according to AISI "Standard for Cold-Formed Steel Framing - General Provisions" and be designed and stamped by a Florida Professional Engineer.
- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (Does not apply for MWP-6).
- C. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft. (Does not apply for MWP-6).
- D. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/240 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.
1. Test Pressures: 150 percent of inward and outward wind-load design pressures.

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

1.4 SUBMITTALS

A. Shop Drawings:

1. Show profile and gage of items, location and type of fasteners; location, gage, and method of attachment of trim.
2. Include methods of erection, elevations, panel lengths, details, anticipated loads, flashings, penetrations, interfaces with materials not supplied, and proposed identification of component parts and their finishes.
3. Shop Drawings shall bear the seal and signature of Structural Engineer registered in the State of Florida.
4. Calculations for wind load design shall be stamped, sealed and signed by a Professional Engineer in the State of Florida verifying compliance with ASCE 7, latest edition.

B. Samples: Manufacturer's standard color selection materials, accessories, fasteners, closure and flashings to construct a complete system for each wall panel type.

C. Manufacturer's maintenance recommendations

D. Pre-Installation Conference meeting minutes

E. Mock-ups

F. Field quality-control test reports

G. Sample warranty

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Minimum of 10 years experience in manufacturing panels of this nature.
- B. The installer shall have been actively installing the specified panel system for a minimum of 5 years and be approved by the manufacturer.
- C. Mock-ups: Install minimum 100 square feet of each wall panel, including integrated window assembly (where applicable) to show assembled components and installation quality. Mock-up shall include all required accessories for a complete installation, including brackets and trims.

D. Pre-installation Conference: Prior to installation, meet at the project site. Review the following foreseeable methods and procedures related to the siding work including, but not necessarily limited to, the following:

1. Project requirements (Contract Documents)
2. Required submittals, both completed and yet to be completed
3. Mock-ups
4. Testing

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels to job site packaged to provide against transportation damage.
- B. Unload, store, and erect panels to prevent banding, warping, twisting, and surface damage.
- C. Store materials and accessories above ground on platforms. Store under waterproof covering. Provide ventilation to prevent build-up of condensation.

1.7 WARRANTY

- A. Furnish a written guarantee warranting the siding and flashing work against defects in materials and workmanship for a period of 2 years from the Date of Substantial Completion.
- B. Also furnish a written guarantee warranting the finish of exposed coated metal surfaces against blistering, peeling, cracking, flaking, checking, chipping, and excessive chalking and color change for a period of 20 years from the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design (for Exterior Wall Panels):
 1. FormaWall Dimension Series 51mm (2") Horizontal flat panel by Centria Architectural Systems
- B. Other manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required; and have performed the manufacturing of like systems for more than 10 years. Provide names and numbers of more than three contact persons for confirmation.

2.2 MATERIALS

- A. Basis of Design:
 1. Face sheet shall be 1mm (.040") aluminum, flat embossed.
 2. Liner Sheet: 26 gage, G-90 coating, embossed, planked with .2 mil primer and 0.6 mil acrylic finish

3. Foamed Insulation Core: Urethane or isocyanurate, density 2.7 lb/cu. ft. min., min. compressive strength 20 lb/sq. in., and containing no CFC or HCFC compounds.
- B. Flashings, closures, sill members, copings, corner, and cap trim connected to metal systems shall be same gauge material and finish as adjoining panels, except where indicated on plan and section details to be welded stainless steel, for example window sill pan flashings. Bent and extruded trim shall have a maximum 2" sight line and no exposed fasteners.
- C. Gutters, Fascia, Gravel Stops, and Downspouts: On metal wall systems, copings and flashings are intended to be provided and installed to be consistent with adjacent materials, except where shown to be different, for example at the window sill pan flashings. At the canopies, it is intended that the downspouts be constructed of, or concealed in clear anodized aluminum painted to match the shapes and finish of the window mullions behind them. Refer to Division 07, Section "07 62 00."
- D. Finish: "Kynar 500" or .8 mil clear coat PVDF over .8 mill PVDF Color coat and .8 mil primer coat on all exposed surfaces. Prime coat on all concealed surfaces. Color to be Silversmith, a mica 2 coat system Centria number 9946.
- E. "Z" Channels for Insulation: 18 ga. (min.) galvanized steel 2 by 2 inches for attachment to masonry walls or steel studs.
- F. Metal Studs, furring channels, etc. 18 gage galvanized, formed from steel that meets the requirements of ASTM A446, Grade B. Width and spacing as indicated on the Drawings. Provide runner channels, bridging, and accessories as required. (Refer to 092216 for non-structural framing and 05-40-00 for structural metal framing).
- G. Rigid Insulation Between "Z" Girts: Shall be 2 inches thick by 4 feet wide semi-rigid glass fiber, or reinforced EPS board, depending upon system and location per manufacturer's recommendations.
- H. Rigid or Semi-rigid Insulation over "Z" Girts: One inch thick by 4 feet wide.
- I. Batt Insulation: Where shown on plans provide thermal insulation, R=19 unfaced.
- J. Fasteners: Series 300 Stainless of type, size, configuration, and spacing as recommended by manufacturer. Provide required clips, cleats, and other accessories for a complete installation.

- K. Sealant: Two part Urethanes, or Silicone per Division 07 Section "Joint Protection." Exposed sealant colors shall be selected by Architect. Concealed sealants may be non-curing butyl or urethane per manufacturer's recommendations.
- L. See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of metal siding shall be in conformance with approved, final Shop Drawings, manufacturer's written instructions, Performance Requirements and current minimum requirements of Industry Standards for Quality Workmanship.
- B. Due to the column and beam spacing of primary structural members, a network of secondary supports may be required to connect some panel types to the primary structural systems as shown on the Structural drawings. It is the responsibility of the successful bidder to design this support network.
- C. The Contract Documents depict secondary member's sizes. Vertical tubes at 6' on center is the basis of design for the insulated Panels (EWP-1). A series of supporting brackets will fasten the panels to the tubes @ 4' on center. Tube sizes and spacing will be different for EWP-2, where vertical tubes may be farther apart. Standard manufacturer's fasteners will be utilized, both concealed and exposed. Refer to Architectural details for the intended fastener types and include in the shop drawings as such.
- D. Manufacturer's closure pieces, joint gaskets, butyl tape, extruded pieces, flashing and tested component parts shall be installed in such a way as to maximize protection against wind driven water.
- E. Where shown on plans and sections return panels for head and sill conditions at window, doors, soffits, etc.
- F. Coordinate reveals and edges of materials with Architect's modules indicate same on shop drawings.
- G. Where aluminum materials would come in contact with dissimilar materials, a bituminous paint or caulking tape shall be installed to insulate between the dissimilar materials.
- H. ALLOWABLE TOLERANCES
 - 1. +/- 1/4-inch in 20 feet
 - 2. +/- 1/2-inch across building elevation

3. +/- 1/8-inch within 5 feet of any change in plane

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Water Penetration: Test two areas of each installed system as directed by architect, or where indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft.
- C. Water-Spray Test: After completing the installation of approximately 300 square foot area of metal wall panel assembly, test each system assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect. As work nears completion on each system, test another 2 bay area.
- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.
- E. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 CLEANING AND PROTECTION

- A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK:

- A. Sealing of site work concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- B. Masonry control and expansion joint: Section 04 20 00, UNIT MASONRY.
- C. Glazing: Section 08 80 00, GLAZING.
- D. Glazed aluminum curtain wall: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
- E. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING
- F. LEED Sustainable Construction Specification Section 018111

1.3 QUALITY CONTROL:

- A. Provide Mockup as specified in Section 01 33 23 Shop Drawings, Product Data and Samples.
- B. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- C. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- D. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 - 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
1. Locate test joints where indicated or, if not indicated, as directed by Contracting Officer.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Resident Engineer seven days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
- F. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.
- G. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this section.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
1. Caulking compound
 2. Primers
 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- E. Environmental Submittals:
1. Certification by joint sealant manufacturer that sealants, primers, and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds (VOC) if more stringent than limits specified.

2. Certification by sealant manufacturer that sealants, primers, and cleaners comply with Regulation 8, Rule 51 of the Bay Area Air Quality Management District.
3. Certification by adhesive manufacturer that adhesives comply with the South Coast Air Quality Management District Rule 1168.
4. VOC's shall be highlighted for each product

1.5 PROJECT CONDITIONS:

A. Environmental Limitations:

1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 °C (40 °F).
 - b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 DELIVERY, HANDLING, AND STORAGE:

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32° C (90° F) or less than 5° C (40° F).

1.7 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.8 WARRANTY:

- A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to two years.

- B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
- C509-06.....Elastomeric Cellular Preformed Gasket and Sealing Material.
 - C612-10.....Mineral Fiber Block and Board Thermal Insulation.
 - C717-10.....Standard Terminology of Building Seals and Sealants.
 - C834-10.....Latex Sealants.
 - C919-08.....Use of Sealants in Acoustical Applications.
 - C920-10.....Elastomeric Joint Sealants.
 - C1021-08.....Laboratories Engaged in Testing of Building Sealants.
 - C1193-09.....Standard Guide for Use of Joint Sealants.
 - C1330-02 (R2007).....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 - D1056-07.....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
 - E84-09.....Surface Burning Characteristics of Building Materials.
- C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide

PART 2 - PRODUCTS

2.1 MATERIALS

- A. See LEED Sustainable Construction Requirements Specification Section 018111 for additional product requirements for LEED certification.

2.2 SEALANTS:

- A. S-2:
- 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.

4. Grade P.
 5. Shore A hardness of 25-40.
- B. S-6:
1. ASTM C920, silicone, neutral cure.
 2. Type S.
 3. Class: Joint movement range of plus 100 percent to minus 50 percent.
 4. Grade NS.
 5. Shore A hardness of 15-20.
 6. Minimum elongation of 1200 percent.

2.3 CAULKING COMPOUND:

- A. C-1: ASTM C834, acrylic latex.
- B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

2.4 COLOR:

- A. Sealants used with exposed masonry shall match color of mortar joints.
- B. Sealants used with unpainted concrete shall match color of adjacent concrete.
- C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.
- D. Caulking shall be light gray or white, unless specified otherwise.

2.5 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32° C (minus 26° F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint

where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 FILLER:

- A. Mineral fiber board: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.7 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.8 CLEANERS-NON POUROUS SURFACES:

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
 - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.

4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION:

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. As instructed by Manufacturer for condition and product selected for each specific joint.

3.5 INSTALLATION:

- A. General:

1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).
 2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
 4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
 5. Avoid dropping or smearing compound on adjacent surfaces.
 6. Fill joints solidly with compound and finish compound smooth.
 7. Tool joints to concave surface unless shown or specified otherwise.
 8. Finish paving or floor joints flush unless joint is otherwise detailed.
 9. Apply compounds with nozzle size to fit joint width.
 10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.
 11. Do not use any product that is within one month of or past its expiration date.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
 2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
 3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
 4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.

5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

- A. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- B. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

3.8 LOCATIONS:

- A. Exterior Building Joints, Horizontal and Vertical and interior movement joints:
 - 1. Metal to Metal: Type S-1, S-2
 - 2. Metal to Masonry or Stone: Type S-1
 - 3. Masonry to Masonry or Stone: Type S-1
 - 4. Stone to Stone: Type S-1
 - 5. Cast Stone to Cast Stone: Type S-1
 - 6. Threshold Setting Bed: Type S-1, S-3, S-4
 - 7. Masonry Expansion and Control Joints: Type S-6
 - 8. Wood to Masonry: Type S-1
- B. Horizontal Traffic Joints:
 - 1. Concrete Paving, Unit Pavers: Type S-2
- C. Interior Caulking: Types C-1 and C-2.

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