

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

072100	THERMAL INSULATION
072200	ROOF INSULATION
072713	APP SBS MODIFIED BITUMINOUS TEMPORARY ROOF MEMBRANE
074113.16	STANDING-SEAM METAL ROOF PANELS
074213.13	FORMED METAL WALL PANELS
074293	SOFFIT PANELS
075419	POLYVINYL-CHLORIDE (PVC) ROOFING
076200	SHEET METAL FLASHING AND TRIM
077100	ROOF SPECIALTIES
078413	PENETRATION FIRESTOPPING
079200	JOINT SEALANTS

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Mineral wool blankets.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product test reports.
- C. Research reports.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET (Thermal and Acoustical)

- A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Knauf Insulation; QuietTherm blanket insulation, or a comparable product by one of the following:
 - a. CertainTeed Corporation (AcoustaTherm).
 - b. Johns Manville; a Berkshire Hathaway company (Therma SHIELD Thermal Insulation).
 - c. Owens Corning (EcoTouch Insulation).

2.2 MINERAL-WOOL BLANKETS (Fire Safing Insulation)

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Industrial Insulation Group, LLC (IIG-LLC) (JM MinWool).
 - b. Roxul Inc. (ROXUL SAFE).
 - c. Thermafiber Inc.; an Owens Corning company (FS-15).

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
- C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

END OF SECTION 072100

SECTION 072200 - ROOF INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Work shall include, but is not limited to, the following:
 - 1. Preparation of existing Built-Up Roof and roof decks and all flashing substrates.
 - 2. Insulation
 - 3. Cover-board
 - 4. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

1.02 RELATED SECTIONS

- A. Division 010000 – General Requirements
- B. Division 011000 – Summary of Work
- C. Division 075419 – Polyvinyl-Chloride (PVC) Roofing
- D. Division 076200 – Sheet Metal Flashing and Trim

1.03 DEFINITIONS

- A. ASTM D 1079-Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.04 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 726 - Standard Specification for Mineral Wool Roof Insulation Board.
 - 2. ASTM C 728 - Standard Specification for Perlite Thermal Insulation Board.
 - 3. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 4. ASTM C 1278 - Standard Specification for Fiber-Reinforced Gypsum Panel.
 - 5. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board.
 - 6. ASTM C 1325 – Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
 - 7. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):
 - 1. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

2. ANSI/SPRI IA-1, Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates.
 3. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- D. CANADIAN GENERAL STANDARDS BOARD (CGSB):
1. CGSB 37-GP 56M- Standard for: Modified Bituminous, Prefabricated, and Reinforced for Roofing.
- E. FACTORY MUTUAL (FM):
1. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
 2. FM 4470 - Approval Standard - Class I Roof Covers.
- F. FLORIDA BUILDING CODE (FBC):
1. 2021 Florida Building Code (FBC).
- G. INTERNATIONAL CODES COUNCIL (ICC):
1. 2021 International Building Code (IBC).
- H. NATIONAL ROOFING CONTRACTORS' ASSOCIATION (NRCA).
- I. UNDERWRITERS LABORATORY (UL):
1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.
 2. UL 1256 – Fire Test of Roof Deck Constructions.
- 1.05 ACTION SUBMITTALS
- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
 - B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
 - C. Sample/Specimen Warranty from the manufacturer and contractor.
 - D. Shop Drawings: Provide roof plan and applicable roof system detail drawings.
- 1.06 INFORMATIONAL SUBMITTALS
- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.
- 1.07 CLOSEOUT SUBMITTALS
- A. Warranty: Provide manufacturers and contractor's warranties upon substantial completion of the roofing system.

1.08 QUALITY ASSURANCE

A. MANUFACTURER QUALIFICATIONS:

1. Manufacture shall have 20 years of experience manufacturing roofing materials.
2. Trained Technical Field Representatives, employed by the manufacturer, independent of sales.
3. Provide reports in a timely manner of all site visit reports.
4. Provide specified warranty upon satisfactory project completion.

B. CONTRACTOR QUALIFICATIONS:

1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
2. Applicators shall have completed projects of similar scope using same materials as specified herein.
3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
4. Applicators shall be skilled in the application methods for all materials.
5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
6. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.10 SITE CONDITIONS

A. SAFETY:

1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
2. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot work operations.

3. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified liquid-applied, or semi-solid roofing materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
4. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified hot asphalt-applied materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
5. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

B. ENVIRONMENTAL CONDITIONS:

1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
3. Mopping asphalt application: Primer, where used, shall be fully dry before applying hot asphalt. Take all necessary measures and monitor all conditions, to ensure the specified asphalt temperature is no less than 400°F (204°C) at the point of contact with the specified membrane as it is rolled into the hot asphalt.

1.11 PERFORMANCE REQUIREMENTS

A. FIRE CLASSIFICATION:

1. Roof construction performance testing shall be in accordance with UL 1256, FM 4450, or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
 - a. Roof construction meets requirements of UL 1256, or FM Class 1.

B. ROOF SLOPE:

1. Finished roof slope shall provide minimum positive slope for roof drainage.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. SINGLE SOURCE MANUFACTURER: All roofing materials shall be provided by a single supplier with 20 years or more manufacturing history in the US.
 - 1. Comply with the Manufacturer's requirements as necessary to provide the specified warranty.
- B. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company.
- C. ACCEPTABLE MANUFACTURER:
 - 1. Soprema
 - 2. Duro-Last
 - 3. Prior Approved Equal

2.02 ROOFING SYSTEM

2.03 THERMAL INSULATION SYSTEM

- A. RIGID INSULATION
 - 1. Tapered Polyiso Insulation: Closed cell polyisocyanurate foam core bonded on each side to a glass fiber-reinforced felt facer, tapered to provide slope.
 - a. Taper: ¼ in with ½ in Crickets per foot. Insulation, crickets, and saddles provided with taper as required for positive roof slope.
 - b. Dimensions: 4 x 4 ft boards
 - c. Meets or exceeds ASTM C578, Type II, Minimum 1.5 density
- B. COVER-BOARD
 - 1. GYPSUM ROOF BOARD
 - a. National Gypsum Company, DEXcell FA Glass Mat Roof Board:
 - i Gypsum core, glass fiber-faced, roof board:
 - ii Thickness: ¼ in
 - iii Dimensions: 4 x 8 ft boards
 - iv Facer: Glass fiber.
 - v Meets or exceeds ASTM C1177/C1177M.
 - b. Georgia Pacific Gypsum LLC, DensDeck Prime Roof Board:
 - i Gypsum core, glass fiber-faced, factory primed, roof Cover-board.
 - ii Thickness: ¼ in
 - iii Dimensions: 4 x 8 ft boards
 - iv Facer: Factory primed, glass fiber.
 - v Meets or exceeds ASTM C1177/C1177M.

C. INSULATION CANT AND TAPERED STRIP

1. TAPERED EDGE STRIP AND BOARDS:

- a. Expanded perlite, blended with binders and fibers.
 - i Dimensions: Size as required.
 - ii Meets or exceeds ASTM C728.

D. INSULATION ADHESIVE

1. POLYURETHANE FOAM INSULATION ADHESIVE

- a. SOPREMA DUOTACK 365: Two-component, polyurethane foam insulation adhesive, applied in ribbons from cartridges or two-component bulk packaging with pump-driven delivery system.
 - i Ribbon size: 1/2 in to 3/4 in wide.
 - ii Ribbon spacing: As required to meet specified wind uplift resistance performance.
 - a) Field of Roof (Zone 1): 12 in on-centers
 - b) Field of Roof (Zone 1): 12 in on-centers
 - c) Perimeter of Roof (Zone 2): 6 in on-centers
 - d) Corners of Roof (Zone 3): 4 in on-centers

2.04 ACCESSORIES

A. INSULATION FASTENERS AND PLATES

- 1. SOPREMA #14 MP FASTENER and SOPREMA 3 IN INSULATION PLATE: Insulation system fasteners and metal stress plates.
- 2. SOPREMA #15 HD FASTENER and SOPREMA 3 IN INSULATION PLATE: Insulation system fasteners and metal stress plates.
- 3. SFS isoweld Fastener and Plate: Non-penetrating membrane fastener and plate.
- 4. TRUFAST Versa-Fast Fastener and Plate: Insulation system fasteners and metal stress plates.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. Conduct qualitative insulation adhesive adhesion tests, or quantitative bonded pull tests as necessary to ensure satisfactory adhesion is achieved.
- C. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- D. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- E. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

3.02 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.03 INSULATION FASTENER APPLICATION

- A. Pre-secure Insulation and Cover-board to the deck using specified insulation fasteners and plates.
- B. Evenly distribute fasteners as required by the board manufacturer's published requirements.
- C. Fasten the insulation to meet the specified wind uplift resistance performance requirements and warranty requirements.
- D. Minimum insulation fastening requirement: 5 fasteners per 4x8 ft board.
- E. For insulation and Cover-boards located partially within the defined perimeter and/or corners, install fastening for the entire board as specified herein.

3.04 INSULATION ADHESIVE APPLICATION

- A. DUOTACK 365
 - 1. Apply the specified two-component insulation adhesive to adhere Insulation Layers and Cover-board to the deck and insulation substrate(s).
 - 2. Follow insulation adhesive product data sheets and published general requirements for installation requirements.
 - 3. Apply insulation adhesive in uniform ribbons, 1/2 in to 3/4 in wide.
 - 4. Immediately install insulation components into insulation adhesive and apply weight to ensure the materials maintain full contact with all ribbons for complete adhesion. Do not allow insulation adhesive to skin-over before placing the insulation materials into the adhesive.
 - 5. Adhere the insulation system to meet the specified wind uplift resistance performance and specified warranty requirements.
 - 6. Minimum insulation adhesive ribbon spacing:
 - a. Field of Roof (Zone 1'): 12 in on-centers.
 - b. Field of Roof (Zone 1): 12 in on-centers.
 - c. Perimeter of Roof (Zone 2): 6 in on-centers.
 - d. Corners of Roof (Zone 3): 4 in on-centers.

3.05 INSULATION SYSTEM APPLICATION

- A. Follow insulation system component product data sheets, published general requirements and, approvals.

- B. Install all insulation system components on clean, dry, uniform and, properly prepared substrates.
- C. All insulation system boards shall be carefully installed and fitted against adjoining sheets to form tight joints.
- D. Insulation system boards that must be cut to fit shall be saw-cut or knife-cut in a straight line, not broken. Chalk lines shall be used to cut insulation components. Uneven or broken edges shall not be accepted. Remove dust and debris that develops during cutting operations.
- E. Stagger successive layers of insulation 12 in vertically and laterally to ensure board joints do not coincide with joints from the layers above and below.
- F. Crickets, saddles, and tapered edge strips shall be installed before installing Cover-boards.
- G. Install tapered insulation, saddles and crickets as required to ensure positive slope for complete roof drainage.
- H. Cover-boards shall be installed to fit tight against adjacent boards. When required by the Cover-board manufacturer, a uniform gap shall be provided between Cover-boards using a uniform guide placed between board joints to form a gap between all boards during installation.
- I. The finished insulation system surface shall be tight to, and flush with, adjacent substrates to form a satisfactory substrate to install specified roof membrane and flashings.
- J. Install specified cants where required for membrane flashing transitions.

3.06 CLEAN-UP

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION

SECTION 072713 - APP/SBS MODIFIED BITUMINOUS SHEET TEMPORARY ROOFING MEMBRANE

PART 1 GENERAL

1.01 SUMMARY

- A. Work shall include, but is not limited to, the following:
 - 1. Remove existing roofing systems and flashing substrates down to the two deck types, existing steel deck and lightweight insulating concrete over steel deck. Dispose of all removed roofing and insulation off-site.
 - 2. Install a 1/4" Gypsum Cover Board over both roof decks by mechanically fastening down to the steel deck. (minimum 5 fasteners and 3" steel plates per 4 foot x 8 foot board.
 - 3. APP/SBS-modified bitumen temporary roof heat welded to cover board.
 - 4. SBS-modified bitumen membrane flashings at penetrations
 - 5. Liquid-applied, reinforced flashings at penetrations.
 - 6. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

1.02 RELATED SECTIONS

- A. Division 010000 – General Requirements
- B. Division 011000 – Summary of Work
- C. Division 072200 – Roof Insulation
- D. Division 076200 – Sheet Metal Flashing and Trim

1.03 DEFINITIONS

- A. ASTM D 1079-Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.04 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - 2. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants
 - 3. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
 - 4. ASTM D 312- Standard Specification for Asphalt Used in Roofing.
 - 5. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 6. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - 7. ASTM D 3019 - Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered.

8. ASTM D 3746 - Standard Test Method for Impact Resistance of Bituminous Roofing System.
9. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
10. ASTM D 4601 - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
11. ASTM D 5147 - Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
12. ASTM D 5849 - Standard Test Method for Evaluating Resistance of Modified Bituminous Roofing Membrane to Cyclic Fatigue (Joint Displacement)
13. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
14. ASTM D 6222 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Polyester Reinforcement.
15. ASTM D 6223 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
16. ASTM D 6509 – Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements.
17. ASTM D 7379 - Standard Test Methods for Strength of Modified Bitumen Sheet Material Laps Using Cold Process Adhesive.
18. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)::
 1. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
 2. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- D. FACTORY MUTUAL (FM):
 1. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
 2. FM 4470 - Approval Standard - Class I Roof Covers.
- E. FLORIDA BUILDING CODE (FBC):
 1. 20XX Florida Building Code (FBC).
- F. INTERNATIONAL CODES COUNCIL (ICC):
 1. 20XX International Building Code (IBC).
- G. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA).
- H. UNDERWRITERS LABORATORY (UL):
 1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.
 2. UL 1256 – Fire Test of Roof Deck Constructions.

1.05 ACTION SUBMITTALS

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
- C. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

1.06 INFORMATIONAL SUBMITTALS

- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

1.07 CLOSEOUT SUBMITTALS

- A. Warranty: Provide manufacturers and contractor's warranties upon substantial completion of the roofing system.

1.08 QUALITY ASSURANCE

- A. MANUFACTURER QUALIFICATIONS:
 - 1. Manufacture shall have 20 years of experience manufacturing SBS-modified bitumen roofing materials.
- B. CONTRACTOR QUALIFICATIONS:
 - 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
 - 2. Applicators shall have completed projects of similar scope using same materials as specified herein.
 - 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
 - 4. Applicators shall be skilled in the application methods for all materials.
 - 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
 - 6. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Carefully store roof membrane materials delivered in rolls on-end with selvage edges up. Store and protect roll storage to prevent damage.
- F. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.10 SITE CONDITIONS

- A. SAFETY:
 - 1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
 - 2. Heat-welding shall include heating the specified membrane ply using propane roof torches or electric hot-air welding equipment. The contractor shall determine when and where conditions are appropriate to utilize heat-welding equipment. When conditions are determined by the contractor to be unsafe to proceed, equivalent SBS-modified bitumen materials and methods shall be utilized to accommodate requirements and conditions.

3. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot work operations.
 4. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified liquid-applied, or semi-solid roofing materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
 5. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified hot asphalt-applied materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
 6. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.
- B. ENVIRONMENTAL CONDITIONS:
1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
 2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
 3. Heat-Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to proceed with the use of torches and hot-air welding equipment. Combustibles, flammable liquids, and solvent vapors that represent a hazard shall be eliminated and primers shall be fully dry before proceeding with heat-welding operations. Refer to NRCA CERTA recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company. A 'Quality Compliance Certificate (QCC) for reporting/confirming the tested values of the SBS-Modified Bitumen Membrane Materials will be supplied upon request.
- B. ACCEPTABLE MANUFACTURER:
 1. Soprema
 2. Garland
 3. Siplast
 4. Performance Roof Systems
 5. Prior Approved Equal

2.02 APP/SBS-MODIFIED BITUMEN VAPOR RETARDER

A. TEMPORARY ROOF, HEAT-WELDED:

1. SELECT APP POLY FLAM GR WHITE APP-modified bitumen membrane with Granulated top surface. Polyester reinforcement. Meets or exceeds ASTM D6222, Type I, Grade G,:
 - a. Thickness: 161 mils (4.1 mm)

2.03 ACCESSORIES

A. PRIMERS

1. Asphalt cut-back primer. Primer for the preparation of roof membrane and flashing substrates for asphalt, heat-welded, hot asphalt and SOPREMA COLPLY ADHESIVE, solvent-based, cold adhesive-applied and cement applications.
 - a. Meets or exceeds ASTM D41
 - b. VOC content: 350 g/L or less.

B. GENERAL PURPOSE ROOFING CEMENT AND MASTIC (TEMPORARY SEALS)

1. SBS Mastic. Fiber-reinforced, roofing cement, packaged in 5 gallon pails. General purpose roofing cement for low-slope roofing used for sealing membrane T-joints and membrane edges along terminations, transitions and at roof penetrations.
 - a. VOC Content: 190 g/L or less.
 - b. Meets or exceeds ASTM D4586, Type I, Class II.
2. APP Plastic Cement . Fiber-reinforced, roofing cement, packaged in 10.4 oz caulk tubes. General purpose roofing cement for low-slope roofing used for sealing membrane T-joints and membrane edges along terminations, transitions and at roof penetrations.
 - a. Meets or exceeds ASTM D4586, Type I, Class II.

C. GYPSUM COVER BOARD

1. National Gypsum Company, DEXcell FA Glass Mat Roof Board:
 - a. Gypsum core, glass fiber-faced, roof board:
 - b. Thickness: ¼ in
 - c. Dimensions: 4 x 8 ft boards
 - d. Facer: Glass fiber.
 - e. Meets or exceeds ASTM C1177/C1177M.
2. Georgia Pacific Gypsum LLC, DensDeck Prime Roof Board:
 - a. Gypsum core, glass fiber-faced, factory primed, roof Cover-board.
 - b. Thickness: ¼ in
 - c. Dimensions: 4 x 8 ft boards
 - d. Facer: Factory primed, glass fiber.
 - e. Meets or exceeds ASTM C1177/C1177M.

D. FASTENERS AND PLATES

1. SOPREMA #14 MP FASTENER and SOPREMA 3 IN INSULATION PLATE: Insulation system fasteners and metal stress plates.
2. SOPREMA #15 HD FASTENER and SOPREMA 3 IN INSULATION PLATE: Insulation system fasteners and metal stress plates.
3. SFS isoweld Fastener and Plate: Non-penetrating membrane fastener and plate.
4. TRUFAST Versa-Fast Fastener and Plate: Insulation system fasteners and metal stress plates.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

3.02 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.03 COVER BOARD FASTENER APPLICATION

- A. Pre-secure Insulation and Cover-board to the deck using specified insulation fasteners and plates.
- B. Evenly distribute fasteners as specified elsewhere in this specification. Minimum 5 fasteners per board.

3.04 PRIMER APPLICATION

- A. Examine all substrates, and conduct adhesion peel tests as necessary, to ensure satisfactory adhesion is achieved.
- B. Apply the appropriate specified primer to dry, compatible substrates as required to enhance adhesion of new specified materials.
- C. Apply primer using brush, roller, or sprayer at the rate published on the product data sheet.
- D. Asphalt Primer: Apply primer to dry compatible masonry, metal, wood, and other required substrates before applying asphalt and heat-welded membrane plies. Primer is optional for solvent based solvent based SBS adhesives and cements, refer to product data sheets.
- E. Self-Adhesive Membrane Primer: Apply self-adhered primer to dry, compatible substrates as required to enhance adhesion of self-adhesive membrane plies. Ensure self-adhered membrane primer is tacky to-the-touch, but not wet. Primer should not transfer to the fingertips when touched.
- F. Primer is not required for SOPREMA COLPLY EF Adhesive and SOPREMA COLPLY EF Flashing Cement.
- G. Project conditions vary throughout the day. Monitor changing conditions, monitor the drying time of primers, and monitor the adhesion of the membrane plies. Adjust primer and membrane application methods as necessary to achieve the desired results.

3.05 HEAT WELDING

- A. The Contractor is responsible for project safety. Where conditions are deemed unsafe to use open flames, manufacturer's alternate membrane application methods shall be used to install SBS modified bitumen membrane and flashings. Acceptable alternate installation methods include hot asphalt, cold adhesive-applied, self-adhered membranes and mechanically fastened plies. Hot-air welding equipment may be used in lieu of roof torches to seal membrane side and end laps where heat welding the laps is necessary. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.
- B. Single or multi-nozzle, hand-held propane roof torches shall be used to install heat-welded plies. Multi-nozzle carts (dragon wagons) may also be utilized to install plies. Seven (7) nozzle carts are recommended for more uniform heat application in lieu of five (5) nozzle carts.

3.06 SBS MASTIC AND GENERAL-PURPOSE ROOFING CEMENT APPLICATION

- A. Apply general purpose APP/SBS mastic or plastic cement to seal drain leads, new retrofit metal flanges/anchoring, seal along membrane edge at terminations, and where specified and required in detail drawings.

3.07 HEAT-WELDED, FULLY ADHERED TEMPORARY ROOF APPLICATION

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Ensure environmental conditions are safe and satisfactory, and will remain safe and satisfactory, during the application of the heat-welded vapor retarder membrane.
- C. Ensure all primers are fully dry before beginning heat-welding operations.
- D. Unroll membrane onto the roof surface and allow time to relax prior to heat welding.
- E. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.
- F. Ensure all roofing and flashing substrates are prepared and acceptable to receive the heat-welded membrane.
- G. Cut membrane to working lengths and widths to conform to rooftop conditions and lay out to always work to a selvage edge.
- H. Ensure specified side-laps and end-laps are maintained. End-laps should be staggered 3 ft apart.
- I. Direct roof torch on the roll as necessary to prevent overheating and damaging the membrane and substrates.
- J. As the membrane is unrolled, apply heat to the underside of the membrane until the plastic burn-off film melts away. Continuously move the torch side-to-side across the underside of the roll to melt the bitumen on the underside of the sheet, while continuously unrolling the membrane.
- K. While unrolling and heating the sheet, ensure a constant flow hot bitumen approximately ¼ to 1/2 in flows ahead of the roll as it is unrolled, and there is 1/8 to 1/4 in bleed out at all laps.
- L. Adjust the application of heat to the underside of the membrane and to substrate as required for varying substrates and environmental conditions.
- M. At end-laps, cut a 45-degree dog-ear away from the selvage edge.
- N. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight. Where necessary, use a torch or hot-air welder and a clean trowel to ensure all laps are fully sealed.

- O. Inspect the installation each day to ensure the plies are fully adhered. Repair all voids, wrinkles, open laps, and all other deficiencies.

3.08 CLEAN-UP

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Standing-seam metal roof panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.4 WARRANTY

- A. 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. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Weathertightness Warranty (Standing Seam Roof System): 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration, ASTM E 1680: Maximum 0.09 cfm/sq. ft. (0.457 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 12 lbf/sq. ft. (575 Pa).
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 90.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced 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 mechanically seaming panels together.
1. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI; a division of NCI Group, Inc.; SuperLok, 16" wide panel, or a comparable product by one of the following:
 - a. Architectural Metal Systems Loc Seam 360, 16" wide with intermediate ribs.
 - b. McElroy Metal, Inc. 238T, 16" wide with intermediate ribs.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating

designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

- a. Nominal Thickness: 24 gauge.
 - b. Exterior Finish: Signature 300 (Kynar).
 - c. Color: As selected by Architect from manufacturer's full range.
3. Clips: Two-piece low floating clip as recommended by manufacturer.
 - a. Material: Manufacturer's recommended clip, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 4. Joint Type: Double folded.
 5. Panel Coverage: 16 inches (406 mm).
 6. Panel Height: 2.0 inches (51 mm) minimum.

2.3 THERMAL INSULATION AT RETROFIT ROOF AND WALL PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Bay Insulation Systems, WMP-VR-R Plus, composite insulation product, in thicknesses indicated on the Drawings, or comparable product by one of the following:
 1. Other prior approved manufacturers.
- B. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- C. Retainer Strips (if required): For securing insulation between supports, 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- D. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Desiccant Method.
- E. Fire Resistance: The complete faced insulation product shall have a fire hazard classification of 25 maximum flame spread index and a 50 maximum smoke developed index when tested in accordance with ASTM E 84 or UL 723. The composite product shall be UL labeled as a laminated insulation package.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. 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- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. 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.
- D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match roof fascia and rake trim.
- E. Roof Curbs: Fabricated from same base material as roof panels, 0.048-inch (1.2-mm) nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- G. Panel Sealants: Provide sealant type 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; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621[, meeting solar reflectance index requirements].
2. Basis of Design: MBCI, Signature 300.

B. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 THERMAL INSULATION INSTALLATION

- A. Insulation system is specified in Section 072116. Install system per manufacturer's instructions.

3.3 SELF-ADHERING SHEET ROOFING UNDERLAYMENT

- A. Cover entire plywood roof area with self-adhering underlayment smoothly per manufacturer's instructions.

3.4 METAL PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 4. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.5 CLEANING AND PROTECTION

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

END OF SECTION 074113.16

SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed fastener metal wall panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.4 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

2.2 CONCEALED-FASTENER METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush Profile, Concealed Fastener Metal Wall Panels: Metal wall panel consisting of formed metal sheet with vertical edges, flat panel surface and two intermediate stiffening beads symmetrically placed between panel joints, installed by fastening female flange of panel to substrate, and inserting male edge of next panel into female slot of panel.
 - 1. Basis of Design: MBCI, FW120-2 with Beads Panel, www.mbc.com/pbr.html.
 - 2. Coverage Width: 12 inches.
 - 3. Major Rib Spacing: 12 inches on center.
 - 4. Panel Depth: 1-1/2 inch (and 1" with some manufacturers).
 - 5. Nominal Coated Thickness: 0.028 inch/24 gage.
 - 6. Panel Surface: Smooth.
 - 7. Exterior Finish: Fluoropolymer system equal to KYNAR 500.
 - 8. Color: As selected by Architect from manufacturer's standard colors.
 - 9. Other Acceptable Manufacturers:
 - a. McElroy Metal, Inc.: FW Series Panel with stiffening beads.
 - b. Petersen Aluminum Corporation: PAC-CLAD Flush Soffit Panel with stiffening beads.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. 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 rakes, 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- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. 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, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae,

parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. At exposed fastener panels, provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type 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; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

- A. Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: 0.2 – 0.3 mil primer with 0.7 – 0.8 mil, 70 percent PVDF resin by weight in color coat.
 - 2. Basis of Design: MBCI, Signature 300.
 - 3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

- A. Concealed-Fastener Formed Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer. Fasten panel to support structure through leading flange. Snap-fit back flange of subsequent panel into secured flange of previous panel. Where indicated, fasten panels together through flush-fitted panel sides.
- B. Installation (General):
 - 1. Cut panels in field where required using manufacturer's recommended methods.
 - 2. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
 - 3. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- C. Joint Sealers: Install liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
 - 1. Seal panel base assembly, openings, panel head joints, and perimeter joints using joint sealers indicated in manufacturer's instructions.
 - 2. Seal perimeter joints between window and door openings and adjacent panels using elastomeric joint sealer.
 - 3. Prepare joints and apply sealants per requirements of Division 07 Section "[Joint Sealants](#)."
- D. Watertight Installation:
 - 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 - 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - 3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

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

END OF SECTION 074213.13

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal soffit panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/120 of the span.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint

sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

- A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and intermediate stiffening "pencil" ribs symmetrically spaced between panel edges; with flush joint between panels.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI; a division of NCI Group, Inc., Artisan L12 with Beads, or a comparable product by one of the following:
 - a. McElroy Metals, Marquee-Lok, 12" panel with pencil ribs, 24 ga.
 - b. Pac-Clad, Flush Soffit, 12" panel with stiffener ribs, 24 ga.
 - c. Other prior approved products.
 2. Material: Same material and finish as metal roof panels.
 3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 24 gauge.
 - b. Exterior Finish: Two-coat fluoropolymer (Signature 300).
 - c. Color: As selected by Architect from manufacturer's full range.
 4. Panel Coverage: 12 inches (305 mm).
 5. Panel Height: 1.0 inch (25 mm).

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. 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. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. 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; 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

- A. Panels and Accessories:
 1. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.2 METAL PANEL INSTALLATION

- A. Metal Soffit Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 1. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
- B. Watertight Installation:
 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

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

END OF SECTION 074293

SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Work shall include, but is not limited to, the following:
 - 1. PVC membrane, mechanically fastened.
 - 2. PVC membrane flashings, adhered.
 - 3. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

1.02 RELATED SECTIONS

- A. Division 010000 – General Requirements
- B. Division 011000 – Summary of Work
- C. Division 072200 – Roof Insulation
- D. Division 076200 – Sheet Metal Flashing and Trim

1.03 DEFINITIONS

- A. ASTM D 1079 - Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.04 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM D 751 - Standard Test Methods for Coated Fabrics.
 - 3. ASTM D 4434 - Standard for Polyvinyl Chloride Sheet Roofing.
 - 4. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
 - 5. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)::
 - 1. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
 - 2. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- D. COOL ROOF RATING COUNCIL (CRRC)
- E. FACTORY MUTUAL (FM):
 - 1. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
 - 2. FM 4470 - Approval Standard - Class I Roof Covers.
- F. INTERNATIONAL CODES COUNCIL (ICC):
 - 1. 2021 International Building Code (IBC).
- G. NATIONAL ROOFING CONTRACTORS' ASSOCIATION (NRCA).

- H. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION INC. (SMACNA) Architectural Sheet Metal Manual.
- I. SINGLE PLY ROOFING INDUSTRY (SPRI)
- J. UNDERWRITERS LABORATORY (UL):
 - 1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.

1.05 ACTION SUBMITTALS

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- B. Quality Compliance (QC)/Certificate of Analysis (COA): Submit manufacturers QC or COA signed by company's Quality Department certifying membrane materials meet the specified properties listed in the specification.
- C. Material Safety Data Sheets: Submit manufacturer's Material Safety Data Sheets (MDS) for each component.
- D. Sample/Specimen Warranty from the manufacturer and contractor.
- E. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

1.06 INFORMATIONAL SUBMITTALS

- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

1.07 CLOSEOUT SUBMITTALS

- A. Warranty: Provide manufacturers and contractor's warranties upon substantial completion of the roofing system.

1.08 QUALITY ASSURANCE

- A. MANUFACTURER QUALIFICATIONS:
 - 1. Manufacturer shall have 20 years of experience manufacturing roofing materials.
 - 2. Trained Technical Field Representatives, employed by the manufacturer, independent of sales.
 - 3. Provide reports in a timely manner of all site visit reports.
 - 4. Provide specified warranty upon satisfactory project completion.
- B. CONTRACTOR QUALIFICATIONS:
 - 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
 - 2. Applicators shall have completed projects of similar scope using same materials as specified herein.
 - 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
 - 4. Applicators shall be skilled in the application methods for all materials.
 - 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
 - 6. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.10 SITE CONDITIONS

- A. SAFETY:
 - 1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
 - 2. Hot-air welding shall include heating the specified membrane ply using electric hot-air welding equipment. The contractor shall determine when and where conditions are appropriate to utilize hot-air welding equipment. When conditions are determined by the contractor to be unsafe to proceed, materials and methods shall be utilized to accommodate requirements and conditions.
 - 3. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.
- B. ENVIRONMENTAL CONDITIONS:
 - 1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
 - 2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
 - 3. Hot-air Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to proceed with the use hot-air welding equipment. Combustibles, flammable liquids, and solvent vapors that represent a hazard shall be eliminated and primers shall be fully dry before proceeding with hot air welding operations.

1.11 PERFORMANCE REQUIREMENTS

- A. WIND UPLIFT RESISTANCE:
 - 1. Performance testing shall be in accordance with ANSI/FM 4474, FM 4450, FM 4470, UL 580 or UL 1897.

- a. Roof System Design Pressures: Calculated by the roof system manufacturer in accordance with ASCE 7-16, or applicable standard, for the specified roof system attachment requirements:

B. FIRE CLASSIFICATION:

- 1. Performance testing shall be in accordance with UL 790, ASTM E108, FM 4450 or FM 4470 to meet the 1/4:12 roof slope requirement.
 - a. Meets requirements of UL Class A or FM Class A.
- 2. Performance testing shall be in accordance with UL 1256, FM 4450, or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
 - a. Meets requirements of UL 1256, or FM Class 1.

C. ROOF SLOPE:

- 1. Finished roof slope for PVC surfaces shall provide positive movement for roof drainage.

D. IMPACT RESISTANCE:

- 1. Performance testing for impact resistance shall be in accordance with FM 4450, FM 4470, or ASTM D4272 to meet the specified impact resistance requirements.
 - a. Meets requirements for FM-SH (Severe Hail).

E. COOL ROOF RATING COUNCIL (CRRC):

- 1. SOPREMA® SENTINEL® P150 smooth backed, bright white PVC membrane shall be listed by the Cool Roof Rating Council (CRRC) with the following minimum published values:
 - a. Solar Reflectance: Initial: 0.85 3 Year: 0.73
 - b. Thermal Emittance: Initial: 0.89 3 Year: 0.88
 - c. Solar Reflectance Index (SRI): Initial: 108 3 Year: 90

1.12 WARRANTY

- A. Manufacturer's No Dollar Limit (NDL) Warranty. The manufacturer shall provide the owner with the manufacturer's warranty providing labor and materials to for 20-years from the date the warranty is issued.
- B. The contractor shall guarantee the workmanship and shall provide the owner with the contractor's warranty covering workmanship for a period of 2 years from completion date.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company.
- B. ACCEPTABLE ROOFING SYSTEM MANUFACTURERS:
 - 1. Soprema
 - 2. Duro-Last
 - 3. Carlisle Syntec

2.02 PVC MEMBRANES

A. MECHANICALLY FASTENED MEMBRANE:

1. PVC MEMEBRANE, MECHANICALLY ATTACHED

- a. SENTINEL® P150: Polyester reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
 - i Manufacturer shall provide membrane at specified minimum 60 mils
 - ii ASTM D4434 +/- tolerance for membrane thickness will not be accepted.
 - iii Thickness over Scrim (ASTM D7635): 30 mils minimum
 - a) Manufacturer shall provide membrane with minimum 30 mils compound thickness above reinforcement/scrim
 - iv Width: 5 ft or 10 ft
 - v Length: 100 ft (30.5 m)
 - vi Physical Properties ASTM D4434.

a) Breaking Strength, lbf/in: 430 (MD)	300 (XMD)
b) Elongation at Break - %: 25 (MD)	25(XMD)
c) Tear Strength, lbf: 150 (MD)	80 (XMD)
d) Linear Dimensional Change - %:	<0.1%
 - vii Color: White

2. PVC FLASHING, ADHERED:

- a. SENTINEL® P150: Polyester reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
 - i Manufacturer shall provide membrane at specified minimum 60 mils
 - ii ASTM D4434 +/- tolerance for membrane thickness will not be accepted.
 - iii Thickness over Scrim (ASTM D7635): 30 mils minimum
 - a) Manufacturer shall provide membrane with minimum 30 mils compound thickness above reinforcement/scrim
 - iv Width: 10 ft (3.0 m)
 - v Length: 100 ft (30.5 m)
 - vi Physical Properties ASTM D4434.

a) Breaking Strength, lbf/in: 430 (MD)	300 (XMD)
b) Elongation at Break - %: 25 (MD)	25(XMD)
c) Tear Strength, lbf: 150 (MD)	80 (XMD)
d) Linear Dimensional Change - %:	<0.1%
 - vii Color: White

2.03 ACCESSORIES

A. FLASHING ADHESIVES:

1. BONDING ADHESIVE: Solvent-based adhesive. Formulated to adhere smooth back PVC flashings.
 - a. VOC Content: 199.5 g/L or less.

B. SEALANTS:

1. Universal Sealant: Gun grade, moisture curing, polyether, elastomeric sealant for SENTINEL® PVC membrane terminations.
 - a. VOC Content: 20 g/L or less
 - b. Meets or exceeds ASTM C920, Type S, Grade NS, Class 25
 - c. Color: White

2. BUTYL SEALANT TAPE: Butyl rubber and polyisobutylene water resistant sealant tape for concealed sheet metal joints and water cutoff.
- C. BUTYL SEALANT: Butyl rubber and polyisobutylene water resistant sealant for concealed sheet metal joints and water cutoff.
- D. MEMBRANE FASTENERS AND PLATES
 1. SOPREMA® SOPRAFIX® #15 HD Fastener: Membrane fastener.
 2. SOPREMA® SOPRAFIX® 2.4 IN STRESS PLATE: Membrane seam plate.
 3. SFS isoweld Fastener and Plate: Non-penetrating membrane fastener and plate.
- E. MEMBRANE ACCESSORIES:
 1. 60 MIL PVC DETAILING MEMBRANE: Fiberglass reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside.
 - a. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
 - i Colors: White
 - ii Size: 2.5 ft x 100 ft (0.76 m x 30 m)
 2. T-JOINT PATCHES: 4.5 in Round T-Joint Patch
 - a. Color: White
 3. PVC PIPE FLASHING: Prefabricated PVC pipe flashing.
 - a. Size: Size as required.
 - b. Color: White
 4. PVC SPLIT PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 1"-6"
 - b. Color: White
 5. PVC CLOSED PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 1"-6"
 - b. Color: White
 6. PVC SPLIT PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 6"-12"
 - b. Color: White
 7. PVC CLOSED PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 6"-12"
 - b. Color: White
 8. WALKWAY PAD: PVC walkway protection mat.
 - a. Width: 30 in (0.762 m)
 - b. Length: 50 ft (15.24 m)
 - c. Color: Grey
- F. SHEET METAL FLASHING:
 1. Contractor shall furnish all sheet metal flashings, counter flashings, roof edge system, and all other related sheet metal flashings and associated fasteners necessary to flash and counter flash the specified roofing system.
 2. Sheet metal flashing materials and fasteners shall be compatible with adjacent materials, to accommodate all project related exposures.
 3. Vinyl Coated Metal: 24-gauge galvanized sheet steel with a 20 mil, UV-resistant PVC coated topside.
 - a. SOPREMA® SENTINEL® VCM: PVC coated metal.
 - i Width: 4 ft (1.219 m)
 - ii Length: 10 ft (3.048 m)
 - iii Color: White
 4. Pre-Finished (Mill Finished) Sheet Metal Flashing Material: Aluminum or Galvanized Steel.
 5. Roof Edge System: Tested per ANSI/SPRI ES-1 to exceed design pressures at roof edge.

G. LIQUID-APPLIED REINFORCED FLASHING SYSTEM:

1. Catalyzed polymethyl methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form fully reinforced waterproofing membrane flashings.
 - a. VOC Content: No VOC content.
 - b. Polymethyl methacrylate (PMMA) liquid resin.
 - c. CATALYST POWDER: Reactive agent added to the PMMA liquid resin to induce curing.
 - d. FLEECE: Polyester reinforcement fabric.
 - e. Color: Flash color and finish to match Field.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

3.02 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.03 HOT-AIR WELDING

- A. The Contractor is responsible for project safety. Hot air shall be used to seal membrane side and end laps. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.
- B. Position the membrane so that it overlaps the adjacent membrane at the required side lap width. Ensure the laps are dry, clean, and free of foreign material.
- C. Weld the laps together with an automatic welding machine or hand welder maintaining a minimum 1.5 in continuous weld. All seams shall be inspected for a continuous weld.
- D. At end-laps of bare back membranes, round the corners by cutting a radius on both corners.
- E. Fleece back membrane end laps shall be butted to one another and a 6 in membrane cover strip welded on top.
- F. SOPREMA® T-JOINT PATCHES shall be hot-air welded to the membrane at all t-joint intersections. Chamfer the welding seam prior to installing T-Joint patches using an edging tool or by heating the edge and rolling.
- G. SOPREMA® SENTINEL® PVC CUT EDGE SEALANT shall be installed at all non-factory cut edges.

3.04 MECHANICALLY FASTENED MEMBRANE APPLICATION

- A. Refer to agency approvals for fastening and other system requirements.
- B. Follow product data sheets and published detail requirements for additional installation instructions.
- C. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application.
- D. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.
- E. Remove all wrinkles from the sheet.
- F. Ensure all roofing and flashing substrates are prepared and acceptable to receive the mechanically fastened membrane.
- G. Ensure the specified side-lap and end-lap widths are maintained. End-laps should be staggered 3 ft. apart.
- H. Starting at one end of the sheet, install the mechanical fasteners in the 6 in side-lap 2 in from the edge of the sheet to the center of the fastener. Ensure spacing between fasteners in the laps meets specified wind uplift resistance requirements.
- I. Do not over-drive fasteners. Install fasteners as necessary to firmly set the fastener and seam plate tight against the sheet. Prevent wrinkles from forming in the sheet as the fasteners are installed.
- J. At the end of the sheet where it terminates at roof edges, walls, and curbs, fasten the perimeter of the membrane with appropriate fasteners and seam plates to the deck or vertical surface at the base of the upstand.
- K. Hot air weld all side and end laps.
- L. When rows of fasteners are installed through the membrane at perimeter and corner enhancements for example, a minimum 8 in wide sealing strip shall cover the fasteners. The sealing strip shall be hot air welded to the membrane with a minimum 1.5 in continuous weld on all sides.
- M. Temporary night seals are required to seal membrane and flashing terminations watertight. Temporary night seals should be removed upon resuming the installation.
- N. Probe all seams/laps once the hot air welds have thoroughly cooled.
- O. Repair all seam deficiencies the same day they are discovered.

3.05 PVC FLASHING MEMBRANE APPLICATION

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Ensure field membrane is fastened and secure to the substrate at all membrane terminations before PVC flashing is installed.
- C. Ensure PVC membrane and substrates are dry, clean, and free of asphalt and all bitumen-based products. Do not allow bare PVC to meet asphalt or bitumen-based products.
- D. Where required, cover walls and other flashing substrates using specified wood, gypsum or cement roof boards securely fastened in place.
- E. The ambient temperature shall be above 40°F (4.4°C) during adhesive application. Ensure temperature is well above the dew point temperature to prevent condensation during adhesive application.
- F. Apply SOPREMA® SENTINEL® S BONDING ADHESIVE using 3/8 in nap solvent resistant rollers to clean, dry and prepared flashing substrates, and onto the underside of the bare PVC membrane. Refer to product data sheet for application rate.
- G. Prevent adhesive from contacting the membrane at the side and end-laps that are to be hot-air welded.
- H. Allow the adhesive on both surfaces to dry to the touch. Adhesive may be tacky to-the-touch,

but not wet. Adhesive should not transfer to the fingertips when touched.

- I. Mate the PVC flashing membrane to the flashing substrate. Prevent air entrapment and wrinkles. Apply pressure with hands, roller, or broom to ensure complete adhesion.
- J. Hot air weld all laps with minimum 1-1/2 in welds.
- K. Probe all seams/laps once the hot air welds have thoroughly cooled.
- L. Repair all seam deficiencies the same day they are discovered
- M. Fasten top leading edge of vertical PVC flashings. Refer to detail drawings.

3.06 LIQUID-APPLIED, PMMA MEMBRANE AND FLASHING SYSTEM APPLICATION

- A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
- B. PVC membrane preparation:
 - 1. Ensure the PVC field membrane is fastened and secure to the substrate at all membrane terminations before liquid-applied flashing is installed.
 - 2. Install a welded PVC cover-strip over fasteners where applicable. Ensure cover-strip is welded tight, with no loose ends or open laps.
 - 3. Ensure PVC membrane and substrates are dry, clean, and free of asphalt and all bitumen-based products. Do not allow bare PVC to meet asphalt or bitumen-based products.
 - 4. Lightly abrade the PVC membrane surface where liquid-applied membrane is to be applied.
 - 5. Wipe PVC membrane surface clean using CLEANER and allow too fully dry.
- C. Pre-cut FLEECE polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
- D. Apply the base coat of catalyzed resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.
- E. Immediately apply the FLEECE reinforcing into the wet base coat of resin. Using a brush or roller, work the FLEECE reinforcing fabric into the wet resin while applying the second coat of catalyzed resin to completely encapsulate the fleece.
- F. Refer to reinforced, PMMA specification section and application instructions, details drawings, product data sheets and published general requirements for complete installation instructions.

3.07 SHEET METAL FLASHING APPLICATION

- A. Refer to sheet metal flashing detail drawings and follow product data sheets and published general requirements for installation instructions.
- B. Follow the most recent edition of the SMACNA Architectural Sheet Metal Manual for fabrication and installation requirements.

3.08 WALKWAYS

- A. At areas outlined on the drawings, and around the perimeter of all rooftop equipment and at all door and stair landings, install walkway protection.
- B. Cut walkway from end of SOPREMA® SENTINEL® WALKWAY PAD.
- C. Hot air weld the entire perimeter of the SOPREMA® SENTINEL® WALKWAY PAD to the membrane.

3.09 CLEAN-UP

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formed low-slope roof sheet metal fabrications.
2. Formed roof-drainage sheet metal fabrications.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

C. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of typical roof gutter, including fascia trim, approximately 12" long.

1.4 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Equal to KYNAR 500.
 - 2. Color: As selected by Architect from manufacturer's full range. Note: Use the same product and finish as supplied by the manufacturer of adjacent metal panels.

2.3 MISCELLANEOUS MATERIALS

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

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Zinc-Coated (Galvanized) and/or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Obtain field measurements for accurate fit before shop fabrication.
 - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 1. Hanger Style: As indicated on drawings.
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
 - b. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates.
 - 1. Fabricate from the Following Materials:
 - a. Galvanized Steel: 0.028 inch thick.
 - b. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- B. Base Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
 - 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- C. Counterflashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch thick.
 - 2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
 - 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch thick.
 - 2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

- F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.2 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.4 WALL FLASHING INSTALLATION

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

- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.5 CLEANING AND PROTECTION

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

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufactured units for the following applications:

1. Roof-edge specialties at flat roofs.
2. Roof-edge drainage systems at flat roofs.
3. Roof-to-wall counterflashing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

- A. Product data.

- B. Shop Drawings: For roof specialties.

1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre-manufactured- and field-assembled installation.
2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

- C. Samples: For each type of roof specialty indicated with factory-applied color finishes.

- D. Product test reports.

- E. Sample warranty.

- F. Maintenance data.

1.4 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 075419.

- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressures:
 1. Design Pressure: As indicated on Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 ROOF-EDGE SPECIALTIES

- A. Single-Ply Flat Roof Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of a PVC coated metal fascia cover in section lengths not exceeding 12 ft. (3.6 m) and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide the fascia cover with a factory-welded PVC skirt for heat welding to the single ply roof membrane. Provide matching corner units.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Edge Systems One, One Skirted Drip Edge w/o Cleat (as used by SOPREMA), or a comparable product by one of the following:
 - a. EXCEPTIONAL Metals.
 - b. Hickman; an MTL Company.
 2. PVC-Coated Steel Fascia Covers: PVC coating over zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal 24 gauge.
 - a. Surface: Smooth, flat finish.

- b. Finish: WHITE PVC.
- c. Dimensions: 3-1/2 inch horizontal flange; 2-1/2 inch vertical flange with drip edge.
- 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
- 4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
- 5. Receiver: Galvanized-steel sheet, nominal 24 gauge thickness.
- 6. Special Fabrications: N/A.
- 7. Fascia Accessories: N/A.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Seal-Tite Industrial Gutter IG-3-C8, 8 inch deep gutter with no optional gutter flange and no optional gutter bracket, or a comparable product by one of the following:
 - 1. EXCEPTIONAL Metals.
 - 2. Hickman; an MTL Company.
- B. Gutters: Manufactured in uniform section lengths not exceeding 12 ft. (3.6 m), with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 - 1. Metallic-Coated Steel Sheet: Nominal 24 gauge thickness.
 - 2. Gutter Profile: Offset profile as indicated on the Drawings.
 - 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
 - 4. Gutter Supports: 2 inch wide x 0.100 thick aluminum hangers spaced at 30" o.c.
 - 5. Special Fabrications: N/A.
 - 6. Gutter Accessories: N/A.
- C. Downspouts: Plain rectangular industrial style complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Metallic-Coated Steel Sheet: Nominal 24 gauge thickness.
 - 2. Size:
 - a. Face: 5 inches
 - b. Side Depth: 5 inches
 - 3. Formed Lengths: 10'-0" or 12'-0".
 - 4. Closure: Double seam lock on back of downspout.
 - 5. Attachment Straps:
 - a. Width: 2 inches.
 - b. Straps per 12' downspout length: 3.
 - 6. Elbows and Transitions:
 - a. Material: Match downspouts.
- D. Finishes:

1. Metallic-Coated Steel: Two-coat fluoropolymer.
 - a. Color: As selected by Architect from manufacturer's full range.

2.4 COUNTERFLASHINGS

- A. Surface Mounted Counterflashing: Manufactured, two-piece, counterflashings consisting of spring-lock metal flashing cover with integral drip-edge in section lengths not exceeding 12 ft. (3.6 m) and a continuous metal receiver. Provide matching corner units if necessary.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; "Counter-Flash", 2-piece surface mounted version counterflashing, Model CFW2-350R, 3-1/2 inch height, or a comparable product by one of the following:
 - a. Johns Manville.
 - b. Hickman; an MTL Company.
 2. Metallic-Coated Steel Components: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal 24 gauge.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
 4. Splice Plates: Concealed, of same material, finish, and shape as flashing components.

2.5 SHEET METAL MATERIALS

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality..
 1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.
 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.6 MISCELLANEOUS MATERIALS

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

- B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
 - 2. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.

5. Do not use graphite pencils to mark metal surfaces.

- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer's written installation instructions.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 ft. (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.2 INSTALLATION OF ROOF-EDGE SPECIALTIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.3 INSTALLATION OF ROOF-EDGE DRAINAGE SYSTEMS

- A. Install components to produce a complete roof-edge drainage system in accordance with manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 30 inches (762 mm) apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 ft. (15.2 m) apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.

1. Provide elbows at base of downspouts at grade to direct water away from building. Refer to Drawings for discharge conditions.
2. Connect downspouts to underground drainage system indicated and where shown on the Drawings.

3.4 INSTALLATION OF COUNTERFLASHINGS

- A. Install surface mounted receivers with appropriate fasteners at spacings as recommended by the manufacturer. Install manufacturer's recommended sealant.

3.5 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 099600 "High Performance Coatings."
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 077100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.2 SUBMITTALS

- A. Product Data: For each type of product, including test reports.
- B. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear UL classification marking of systems listed in the Underwriters Laboratory Fire Resistance Directory.

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.

- b. Hilti, Inc.
 - c. RectorSeal.
 - d. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Mildew-resistant joint sealants.
 - 5. Latex joint sealants.

1.2 SUBMITTALS

- A. Product Data: For each joint-sealant product, along with test reports.
- B. Samples: For each kind and color of joint sealant required.

1.3 WARRANTY

- A. Warrant the work specified herein for two years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials or workmanship.
 - 1. Warranty Period: Two years from date of Substantial Completion.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be experienced in building sealant installation whose work has resulted in a record of successful performance.
- B. Source Limitations: If at all possible, obtain each type of building sealant through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

- a. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
- b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
- c. Tremco Incorporated; Tremsil 200.

B. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

- a. Dow Corning Corporation; DOW CORNING® 758 SILICONE WEATHER BARRIER SEALANT.
- b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2350.
- c. Sherwin-Williams Company (The); Silicone Rubber All Purpose Sealant.

2.3 URETHANE JOINT SEALANTS

A. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.

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

- a. BASF Corporation; Construction Systems; MasterSeal NP 2 (Pre-2014: Sonolastic NP2).
- b. Sherwin-Williams Company (The); Stampede-2NS.

2.4 ACRYLIC LATEX MILDEW RESISTANT JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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

- a. Pecora Corporation; AC-20.
- b. Sherwin-Williams Company (The); 950A Siliconized Acrylic Latex Caulk, White.
- c. Tremco Incorporated; Tremflex 834.

2.5 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, [Type C (closed-cell material with a surface skin)] [Type O (open-cell material)] [Type B (bicellular material with a surface skin)] [or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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

- a. BASF Corporation; Construction Systems; MasterSeal 920 & 921(Pre-2014: Sonolastic Backer Rod).
 - b. Construction Foam Products; a division of Nomaco, Inc.; SOF Bi-Cellular, HBR Closed Cell, OC Foam Open Cell as required by condition.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 CLEANING

- A. Clean adjacent surfaces of sealant as work progresses, using solvent or cleaning agents recommended by manufacturer. Avoid staining sealant or adjacent surfaces. Leave all finished work in a neat, clean condition.

END OF SECTION 079200