SECTION 075423 - THERMOPLASTIC-POLYOLEFIN ROOFING (TPO)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. TPO membrane roofing system and accessories.

B. Cover board.

C. Insulation.

D. Deck sheathing.

1.2 RELATED REQUIREMENTS

A. Section 061001 - Rough Carpentry - Architecture: Wood nailers associated with roofing and roof insulation.

B. Section 076200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

C. Section 077100 - Roof Specialties: Manufactured copings, fascias, gravel stops, and other flashing-related items.

D. Section 077200 - Roof Accessories: Roof hatches, vents, and manufactured curbs.

E. Section 079100 - Preformed Joint Seals: Expansion joints.

1.3 REFERENCE STANDARDS

A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

B. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

C. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

D. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.

E. FM DS 1-28 - Wind Design.

F. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components.

G. NRCA (RM) - The NRCA Roofing Manual.

H. PS 1 - Structural Plywood.

I. PS 20 - American Softwood Lumber Standard.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with installation of associated counter flashings and roof drainage components installed under other sections.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Agenda:
      a. Sequence of construction.
      b. Coordination with substrate preparation.
      c. Roofing materials approved for use.
      d. Compatibility of materials.
      e. Coordination with installation of adjacent and covering materials.
      f. Construction details.
   2. Require attendance of parties directly influencing roofing work quality or affected by roofing work performance.

1.5 SUBMITTALS

A. See Section 013300 - Submittal Procedures for submittal procedures.

B. Product Data:
   1. Provide membrane manufacturer's printed data showing roofing system components, including insulation and fasteners, comply with specified requirements and with membrane manufacturer's requirements and recommendations for system type specified; include data for each product used in conjunction with roofing membrane.
   2. Where UL or FM requirements are specified, provide documentation showing roofing system is UL classified or FM approved, as applicable; include data-itemizing components of classified or approved system.
   3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show how components will be installed; where instructions allow installation options, clearly indicate which option will be used.

C. Shop Drawings: Indicate membrane manufacturer's standard details, drawn to scale and customized for project for relevant conditions.
   1. Include flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
   2. For tapered insulation, indicate project-specific layout, slopes, thicknesses, and dimensions.

D. Samples: Submit samples of the following:
   1. Sample of roof membrane.

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

F. Preinstallation Notice: Provide copy of manufacturer's approved preinstallation notice.

G. Installer's qualification statement.

H. Executed warranty.

I. Specimen Warranty: Submit prior to starting work.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this section with minimum five years of documented experience installing specified system and having the following:
   1. Certified by roof membrane manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather-protective covering.

C. Keep combustible materials away from ignition sources.

D. Protect foam insulation from direct exposure to sunlight.

E. Store materials so that they are secured from any movement from wind uplift or any other environmental factor.

1.8 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather or when ambient conditions conflict with manufacturer's installation instructions.

B. Schedule applications so no partially completed sections of roof are left exposed at end of workday.

1.9 WARRANTY

A. See Section 017700 - Closeout Procedures for additional warranty requirements.

B. Comply with warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

C. System Warranty: Manufacturer's limited warranty covering membrane, roof insulation, and other specified system components for term indicated.
   1. Liability Limit: No dollar limitation.
   2. Scope of Coverage: Repair leaks in roofing system caused by:
      a. Ordinary wear and tear of elements.
      b. Manufacturing defect in materials.
      c. Defective workmanship used to install materials.
      d. Damage due to winds up to 100 mph.
      e. Hail up to 2 inches in diameter.

D. Metal Roof Edging:
   1. System Warranty: Include edge metals in membrane manufacturer's full system warranty.
   2. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Membrane Roofing System:
   1. Basis of Design: GAF Materials, LLC: www.gaf.com.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Insulation Manufacturer: Same manufacturer as roof membrane.

C. Metal Roof Edging Manufacturer: Same manufacturer as roof membrane.
   1. Metal roof edging products by other manufacturers are unacceptable.
   2. Field- or shop-fabricated metal roof edgings are unacceptable.

2.2 MEMBRANE ROOFING SYSTEM

A. Description: TPO single-ply membrane.
   1. Membrane Attachment: Fully adhered.
   2. Warranty: Full system warranty; 30-year Platinum limited warranty covering membrane, roof insulation, and membrane accessories.
   3. Comply with applicable local building code requirements.
   4. Provide assembly having Underwriters Laboratories, Inc. (UL) Class B fire hazard classification.
   5. Provide assembly complying with Factory Mutual Corporation (FM) roof assembly classification, FM DS 1-28 and FM DS 1-29, and meeting minimum requirements of FM 1-90 wind uplift rating.

B. Roofing System Components: Listed in order from top of roof down:
   1. Membrane: Thickness as specified.
   2. Insulation (including combination insulation/coverbo:
      a. Maximum Board Thickness: 2.5 inches; use as many layers as necessary; stagger joints in adjacent layers.
      b. Total System R-value: 25, minimum.

2.3 MEMBRANE MATERIALS

A. Membrane: Flexible, heat-weldable sheet composed of TPO polymer and ethylene propylene rubber; complying with ASTM D6878/D6878M, with polyester weft-inserted reinforcement and the following additional characteristics:
   1. Polyester fleece backing.
   2. Thickness: 0.08 inch plus/minus 10 percent, with coating thickness over reinforcement of 0.03 inch plus/minus 10 percent.
   3. Sheet Width: Provide widest available sheets to minimize field seaming.
   4. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C1549.
   5. Color: White.
   6. Products:
      a. Everguard Extreme 80-mil fleece back TPO Membrane

B. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge eliminating need for seam sealing flashing-to-roof splice; precut to 18 inches wide.

C. Formable Flashing: Nonreinforced, flexible, heat-weldable sheet, composed of TPO polymer and ethylene propylene rubber.
   1. Thickness: 0.06 inch plus/minus 10 percent.
   2. Product: Elevate; UltraPly TPO Flashing.

D. Pourable Sealer: Manufacturer's recommended two-part polyurethane, two-color for reliable mixing.

E. Cut Edge Sealant: Use manufacturer's recommended sealant for exposed membrane reinforcement.

F. General Purpose Sealant: Manufacturer's recommended, one part, white.

G. Molded Flashing Accessories: Unreinforced TPO membrane premolded to suit variety of flashing details, including pipe boots, inside corners, outside corners, etc.
   1. Product: Elevate; UltraPly TPO Small and Large Pipe Flashing.

H. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.1 inch thick.
   1. Product: Elevate; Termination Bar.

2.4 INSULATION

A. Polyisocyanurate Board Insulation (bottom layer): Closed-cell polyisocyanurate foam laminated to facers, complying with ASTM C1289, Type II, Class 1, with the following additional characteristics:
   1. Compressive Strength: 20 psi when tested in accordance with ASTM D1621.
   2. Ozone Depletion Potential: Zero; made without CFC- or HCFC-blowing agents.
   3. Recycled Content: 19 percent post-consumer and 15 percent pre-consumer (post-industrial), average.

B. Composite OSB and Polyisocyanurate Board Insulation (top layer): Closed-cell polyisocyanurate foam complying with ASTM C1289, Type V, laminated to oriented-strand board (OSB), with glass-fiber-reinforced mat on other face and the following characteristics:
   1. OSB Thickness: 7/16 inch.
   2. Foam Compressive Strength: 20 psi when tested in accordance with ASTM D1621.
   3. Recycled Content, Foam Component: 19 percent post-consumer and 15 percent pre-consumer (post-industrial), average.

2.5 EXPANSION JOINTS

A. See Section 079100 - Preformed Joint Seals.

2.6 ACCESSORIES

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Do not use asphaltic or creosote-treated lumber.
   2. Do not use lumber treated with wood preservatives, such as pentachlorophenol, copper naphthenate, or copper 8-quinolinolate.
   3. Width: 3-1/2 inches, nominal minimum, or as wide as nailing flange of roof accessory attached.

4. Thickness: Same as thickness of roof insulation.

PART 3 EXECUTION

3.1 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for specified roofing system. Where manufacturer provides no instructions or recommendations, follow NRCA (RM) written requirements and industry standards. Comply with federal, state, and local regulations.

B. Obtain relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until preinstallation notice has been submitted to manufacturer.

D. Provide temporary closures to ensure moisture does not damage completed roofing. Use flashings, terminations, and temporary closures to provide watertight installation.

E. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
1. Protect from spills and overspray from bitumen, adhesives, sealants, and coatings.
2. Protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within range of windborne overspray.
3. Protect finished areas of roofing system from roofing-related work traffic and traffic by other trades.

3.2 EXAMINATION

A. Examine roof deck to determine deck is sufficiently rigid to support installers and mechanical equipment so deflection will not strain or rupture roof components or deform deck.

B. Verify surfaces and site conditions are ready to receive work. Correct defects in substrate before commencing with roofing work.

C. Examine roof substrate to verify adequate slope to drains.

D. Verify specifications and drawing details are workable and not in conflict with roofing manufacturer's recommendations and instructions; start of work constitutes acceptable project conditions and requirements.

3.3 PREPARATION

A. Remove existing roof system down to roof deck, including existing composition base flashings. Dispose of materials properly. Perform asbestos removal in accordance with federal, state, and local regulations, and dispose of waste in legal manner.
1. At penetrations, remove existing flashings, including lead, asphalt, and mastic.
2. Remove loose and unsecured flashings at walls, curbs, and other vertical and sloped surfaces; remove mineral-surfaced and coated flashings; remove excessive asphalt to provide smooth, sound surface for new flashings.

B. Take appropriate measures to ensure fumes from adhesive solvents are not drawn into building through air intakes.

C. Before proceeding, ensure roof surface is clean, dry, and smooth and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease, and other materials that may damage membrane.

D. Fill surface voids in immediate substrate greater than 1/4-inch wide with fill material acceptable insulation to membrane manufacturer.

E. Wood Nailers: Provide wood nailers at perimeters and other locations where indicated on drawings.
   1. Install with 1/8-inch gap between each length and at each change of direction.

3.4 INSULATION INSTALLATION

A. Install insulation in accordance with manufacturer's written instructions.

B. Install only as much insulation as can be covered with completed roofing system before end of day's work or before onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with manufacturer's recommended insulation. Do not leave roofing membrane unsupported over space greater than 1/4 inch.

E. Mechanical Fastening (Base Layer): Using specified fasteners and insulation plates, engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.
   1. Comply with specified Factory Mutual for FM Class requirements.

F. Cold Adhesive Attachment (Top Layers): Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

3.5 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax before attachment or splicing. Refer to membrane manufacturer's guidelines for minimum relaxation time.

B. Lay out membrane pieces so field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

E. Edge Securement: Secure membrane at locations where membrane terminates or goes through angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter

fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.

1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches wide.

3.6 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.

C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces.

1. Extend flashing minimum 8 inches above membrane surface unless otherwise shown.
2. Use longest practical flashing pieces.
3. Evaluate substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
4. Complete splices between flashing and main roof sheet with specified splice adhesive before adhering flashing to vertical surfaces.

D. Flashing at Penetrations: Flash penetrations passing through membrane; make flashing seals directly to penetration.

1. Pipes, Round Supports, and Similar Items: Flash with specified premolded pipe flashings wherever practical; otherwise, use specified self-curing elastomeric flashing.
2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1-inch clearance from penetration; fill with manufacturer's pourable sealer, and slope to shed water.
3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

3.7 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspection by Manufacturer: Provide final inspection of roofing system by technical representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes.

C. Perform corrections necessary for issuance of warranty.

3.8 CLEANING

A. Clean contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, and equipment from project site and surrounding areas.

3.9 PROTECTION

A. Where construction traffic continues over finished roof panels, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION 075423