SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanically fastened TPO membrane roofing system.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashing and membrane terminations
2. Tapered insulation, including slopes
3. Insulation fastening patterns
4. Membrane seaming plan (indicating additional perimeter and corner attachments)

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

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article. Submit evidence of meeting performance requirements.

E. Qualification Data: For Installer and manufacturer.

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

G. Research/Evaluation Reports: For components of membrane roofing system.

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

I. Warranties: Special warranties specified in this Section.

J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's year warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.

C. Source Limitations: Obtain components for membrane roofing system either from or approved by the roofing membrane manufacturer.

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

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

F. Surface Burning Characteristics of Insulation: Provide materials that meet requirements of FM/Global 4450 or UL 1256 (provide written confirmation to authorities having jurisdiction upon request).

G. Pre-installation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination."

1. Review methods and procedures related to roofing system including, but not limited to, the following:
    a. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
    b. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
    c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    d. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
    e. Review structural loading limitations of roof deck during and after roofing.
    f. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
    g. Review governing regulations and requirements for insurance and certificates if applicable.
    h. Review temporary protection requirements for roofing system during and after installation.
    i. Review roof observation and repair procedures after roofing installation

1.4 DELIVERY, STORAGE AND HANDLING

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

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

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

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.6 WARRANTY

A. Special Roof System and Flashing Warranty: Manufacturer's warranty to include labor and material payment without monetary limitation (NDL), in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, metal edge and associated sheet metal flashings, and other components of the membrane roofing system, and as follows: Non-prorated, and fully transferable (not limited to original Owner) Warranty limit up to 72 MPH wind speed (calculated at ground level) No Owner’s signature required for execution of warranty, and Dispute settlement to be held in the state where the project is located.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified. Alternative manufacturers must be proposed as "substitutions" per Division 01 requirements:

    a. Carlisle SynTec Incorporated.
    b. Firestone Building Products Company.
    c. GAF Materials Corporation.
    d. GenFlex Roofing Systems.
    e. Sarnafil Inc.
    f. Stevens Roofing Systems; Division of JPS Elastomerics.

2. Thickness: 45 mils, nominal.

3. Exposed Colors:
    a. Roof membrane surface: White, unless otherwise specified.
    b. Parapet wall flashings: Beige or tan, unless otherwise specified.

4. Physical Properties:
    a. Breaking strength: 225 lbf ; ASTM D 751, grab method
    b. Elongation at break: 15 percent; ASTM D 751
    c. Tearing strength: 55 lbf minimum; ASTM D 751, Procedure B
    d. Brittleness point: Minus 22 deg F
    e. Ozone resistance: No cracks after sample, wrapped around a 3-inch-diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F and an ozone level of 100 pphm; ASTM D 1149
    f. Resistance to heat aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F ; ASTM D 573
    g. Water absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F; ASTM D 471
    h. Linear dimension change: Plus or minus 2 percent; ASTM D 1204

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

    1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane. Alternative un-reinforced flashing: polyolefin sheet flashing of 55 mils minimum of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 AIR RETARDER

A. Vapor Retarder: ASTM D 4397 polyethylene sheet, 6 mils thick minimum, with maximum permeance rating of 0.13 perm.

2.4 ROOF INSULATION

A. Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate board insulation: ASTM C 1289, Type II, with felt or glass-fiber mat facer on both major surfaces.

1. Minimum insulation thickness: Provide multiple layers of insulation with minimum thickness of 1-1/2 inch at drains and scuppers, and as required to maintain an overall average minimum aged (15 year time-weighted LTTR) insulation value only (not including substrate or air surfaces) of R = 25.
2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for positive sloping to drain. Fabricate to slopes indicated

2.5 INSULATION ACCESSORIES

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

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

2.6 ROOF PROTECTION PADS

A. Provide non-porous protection pads consisting of a minimum 45 mil membrane matching primary roofing material and color, approved for use by membrane roofing system manufacturer, intended either for heat-welded or self-sticking application to the roof membrane, and as approved for use by membrane roofing system manufacturer, factory-formed or field-cut with corners trimmed to a 2” radius minimum.

2.7 WALKWAY PADS

A. Provide units 24” x 24” minimum or as otherwise indicated on the Drawings.

2.8 PIPING SUPPORT REINFORCMENT

A. Size to extend 6” outside of all piping supports.

2.9 PIPING-SUPPORT PROTECTION PADS

A. 45 mil minimum self-stick membrane matching primary roofing membrane color and type - sized to extend 6” outside of all piping supports setting on top of roof membrane with corners trimmed to 2” radius minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

C. Verify that wood blocking, curbs and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

D. Verify that surface plane flatness and fastening of steel roof deck comply with requirements for decking.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 AIR BARRIER INSTALLATION

A. Loosely lay air barrier in a single layer, side and end lapping each sheet a minimum of 4 inches. Do not seal joints or seams.

3.4 INSULATION INSTALLATION

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

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

C. Install multiple layers of insulation under area of roofing to achieve required thickness, with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

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

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

F. Fasten insulation according to requirements in FMG’s "Approval Guide" for specified Windstorm Resistance Classification -for “Grade-C” metal deck unless otherwise indicated. Fasten insulation as required for a “fully-adhered” membrane installation (with air-barrier noted above).

3.5 ROOF MEMBRANE INSTALLATION - GENERAL

A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

B. Layout membrane sheets with primary seams perpendicular to ribs of metal decking, and with seams lap-shingled with slope of deck when possible

C. Mechanically fasten all roofing membrane securely at terminations, penetrations, and perimeter of roofing, and seal all edges. Space fasteners for “Grade-C” metal deck unless otherwise indicated. Spread sealant or mastic bed over drain-flanges at deck-drains and securely seal membrane in place with clamping ring.

D. Full weld seams: Clean entire seam areas, overlap roofing membrane, and hot-air weld full-surface of seams according to manufacturer's written instructions to ensure a watertight seam installation.

1. Probe all seams after welds have cooled to verify seam weld continuity.
2. Apply lap sealant to seal cut edges of roofing membrane.
3. Verify field strength of seams a minimum of twice daily and repair seam sample areas. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

E. At adhered membrane apply bonding-adhesive to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

3.6 MECHANICALLY-FASTENED ROOFING-MEMBRANE INSTALLATION

A. In-splice attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.

B. Through-membrane attachment: Secure roofing membrane using fastening plates or metal battens and mechanically fasten roofing membrane to roof deck. Cover battens and fasteners with a continuous cover strip.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 WALKWAY AND PIPING SUPPORT SHEET INSTALLATION

A. Provide walkway pads around sides of all rooftop equipment requiring service or maintenance, leading from the roof-hatch or other access point(s) in a regular pattern, and where specifically indicated on the Drawings.

1. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

2. Place individual units with 6” minimum space between each pad.

B. Install piping support protection pads (self-stick waste sheet) below all piping supports units provided by others.

1. Clean roofing of dirt and debris prior to installation.
2. Peel-back protective sheeting from protection pad and apply pad securely to surface of roofing membrane.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner reserves the right to engage a qualified independent testing and roof inspecting entity to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

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

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 075423