

## SECTION 07531

### EPDM MEMBRANE ROOFING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Adhered membrane roofing system.
  - 2. Roof insulation related to membrane roofing.
  - 3. Roof drains, roof accessories and walkway pads.
  - 4. Repairs to existing EPDM roof at tie-ins and new penetrations.
- B. This Section includes the installation of acoustical roof deck rib insulation strips furnished under Division 5 Section "Steel Deck."
- C. Related Sections include the following:
  - 1. Division 5 Section "Steel Deck" for furnishing acoustical deck rib insulation.
  - 2. Division 6 Section "Rough Carpentry" for material description and installation requirements for wood nailers, curbs, and blocking.
  - 3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
  - 4. Division 7 Section "Joint Sealants."
  - 5. Division 15 Section "Plumbing Specialties" for connections to roof drains.

##### 1.03 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1-inch (25.4 mm) thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

##### 1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-90.

D. Roof flashing details shall be consistent with those shown on the Drawings. Where cap flashing is shown, a standard manufacturer's bar anchor only detail is not acceptable. Membrane manufacturer's recommended flashing detail may be considered by the Architect when no detail is provided.

#### 1.05 SUBMITTALS

A. General: Submit in accordance with Section 01300.

B. Product Data: For each type of product indicated. Provide installation instructions and general recommendations from manufacturer of EPDM membrane system for types of roofing materials required.

C. Shop Drawings: Submit shop drawings for roofing system approved by the manufacturer showing roof configuration, sheet layout, seam locations, details at perimeter, penetration and flashing details, attachments to adjacent Work, and special conditions. Customized detail sheets shall be prepared by manufacturer, showing each condition and approved installation method conforming with the construction drawing constraints and details.

1. Base flashings and membrane terminations.
2. Layout of tapered insulation and cricket materials, including slopes.
3. Insulation fastening patterns.

D. Samples for Verification: For the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch square of roof insulation.

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

F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

G. Qualification Data: For Installer.

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

1. Insulation Test Reports: Evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

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

J. Warranties: Special warranties specified in this Section.

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

#### 1.06 QUALITY ASSURANCE

A. Installer Qualifications: Shall be approved, authorized, factory trained, and licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty. Contractor shall have a minimum of 3 years experience installing the system, have installed a minimum of 500,000 square feet and shall employ personnel experienced and skilled in the application of the manufacturer's roofing system.

1. Work associated with EPDM membrane roofing, including (but not limited to) wood blocking and nailers associated with roofing, insulation, flashing, and membrane sheet joint sealers, shall be performed by Installer of this Work.
- B. **Manufacturer Qualifications:** A qualified manufacturer that has UL listing and FMG approval for membrane roofing system identical to that used for this Project.
- C. **Source Limitations for Roofing Products:** Obtain components for membrane roofing system from same manufacturer as roofing membrane or as approved by roofing membrane manufacturer.
- D. **Source Limitations for Insulation Products:** Obtain each type of roof insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
  1. Insulation shall be approved by roofing manufacturer for use with roofing system for a total system warranty.
- E. **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.
  1. **Exterior Fire-Test Exposure:** Class A; ASTM E 108, for application and roof slopes indicated.
- F. **Insulation Fire Performance Characteristics:** Provide insulation and related materials with the fire-test-response characteristics specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  1. **Surface Burning Characteristic:** ASTM E 84.
  2. **Fire Resistance Ratings:** ASTM E 119.
  3. **Combustion Characteristics:** ASTM E 136.
- G. Roofing work shall be applied in strict accordance with the provisions of the specification criteria. No deviations shall be permitted without written consent from the Architect. Should a conflict between this specification and the manufacturer's requirements arise, the most restrictive provision as determined by the Architect shall govern.
- H. Upon completion of the installation, an inspection shall be made by the system manufacturer to ascertain that the roofing system has been installed according to the applicable manufacturer's specifications and details. No "early bird" warranty will be accepted. The results of the warranty inspection shall be submitted in writing to Owner and Architect for their review and records.
- I. **Preinstallation Conference:** Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to roofing system including, but not limited to, the following:
  1. 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, skylights, and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
  5. Review structural loading limitations of roof deck during and after roofing.
  6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
  7. Review governing regulations and requirements for insurance and certificates if applicable.
  8. Review temporary protection requirements for roofing system during and after installation.
  9. Review roof observation and repair procedures after roofing installation.

10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
11. Provide 72-hour minimum advance notice to participants prior to convening preinstallation conference.

#### 1.07 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. Comply with the manufacturer's written instructions for proper material storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Insulation and protection board shall be stored on pallets, at least 4 inches off the ground and tightly covered with waterproof, "breathable" materials. Insulation shall be protected from direct sunlight.
- E. Materials, which are damaged, shall be removed and replaced at the Installer's expense.
- F. Materials shall be delivered in sufficient quantity to allow continuity of the Work.
- G. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
- H. Do not overload any portion of the building, either by use of or placement of equipment, storage of debris, or storage of materials. The loads of construction shall not exceed 25 pounds per square foot.

#### 1.08 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.
- B. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.
- C. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition. All surfaces shall be smooth, dry, clean, free of fins or sharp edges, loose or foreign materials, oil or grease. No work shall proceed when moisture is present on the roof or in the substrate materials.
- D. Temporary waterstops shall be installed at the end of each workday and shall be removed before proceeding with the next day's work.
- E. If the exterior walls are not erected at the time of membrane installation, envelop the flutes of the metal deck to prevent moisture intrusion and wind damage.

## 1.09 WARRANTY

- A. General: The special warranties specified in this Section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Roofing Contractor shall furnish to the Owner the manufacturer's standard form, without monetary limitation, 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. The maximum wind speed coverage shall be peak gusts of 72 mph (116 kmp) measured at 10 meters above ground level.
  - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, walkway products, and other components of membrane roofing system.
  - 2. Warranty Period: 15 years from date of Project Substantial Completion.
- C. No "Early Bird" warranties shall be issued.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.02 EPDM ROOFING MEMBRANE

- A. EPDM Roofing Membrane: ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM, and as follows:
  - 1. Manufacturers:
    - a. Carlisle SynTec Incorporated.
    - b. Firestone Building Products Company.
    - c. GenFlex Roofing Systems.
  - 2. Thickness: 60 mils, nominal.
  - 3. Exposed Face Color: Black

### 2.03 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
  - 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.
- C. Bonding Adhesive: Manufacturer's standard bonding adhesive.
- D. Sheet Seaming System: Manufacturer's standard splice tape for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.
- E. Lap Sealant: Manufacturer's standard single-component sealant.
- F. Membrane Adhesive: As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand minimum 90-psf uplift force.
  - 1. Provide adhesives that comply with local requirements limiting amounts of volatile organic compounds.

- G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- H. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- I. Crickets and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.
  - 1. Crickets: Johns Manville tapered factory pre-cut crickets, extending to roof drain sumps, 1/2-inch taper.
- J. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- K. Miscellaneous Accessories: Provide preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.
- L. Roof Drains: Drains with flexible bellows to accommodate movement between drain and plumbing; sized to accommodate plumbing.
  - 1. Product: Flex-I-Drain; Johns Manville Corporation.
  - 2. Rigid Components: GE Noryl resin with high UV-resistance, tensile strength modulus, and heat deflection temperature resistance, meeting UL94V-1 requirements.
  - 3. Bellows: Molded neoprene flexible boot attached to integral deck flange with no hub pipe connection. Bellows shall allow differential movement up to one inch in any direction between the roof deck and piping. Provide rubber adaptor bushings as required for pipe size.
  - 4. Strainer: 4 inch (102mm) high basket strainer. Color black.
  - 5. Outlet Size: See drawings for pipe size.
- M. Roof walkways shall be pre-molded 2'-6" x 2'-6" rubber walkways as supplied by the membrane manufacturer.

#### 2.04 ROOF INSULATION

- A. General: 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, felt or glass-fiber mat facer on both major surfaces, CAN/ULC S770 Grade 2, 20 psi minimum, LTTR R-values.
  - 1. Products:
    - a. Polyiso HP-H; Carlisle SynTec Incorporated.
    - b. Hy-Therm AP; Celotex Corporation.
    - c. ISO 95+; Firestone Building Products Company.
    - d. E'nrg'y 2; Johns Manville International, Inc.
  - 2. Provide roofing manufacturer's required insulation for total system warranty.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated.
  - 1. Tapered insulation shall meet requirements specified for board roof insulation. Provide tapered boards where indicated for sloping to drains. Tapered insulation shall be manufactured by same manufacturer of board roof insulation.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

#### 2.05 INSULATION ACCESSORIES

- A. General: Furnish 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 FMG4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Adhesive for Bonding Insulation: Manufacturer's standard adhesive, complying with fire-resistant requirements, formulated to adhere roof insulation to substrate.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and set and braced.
  - 2. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Deck."
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. General: Comply with manufacturer's instructions to prepare substrate to receive EPDM membrane roof system.
- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. 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.
- D. 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.
- E. Install acoustical roof deck rib insulation strips, specified in Division 5 Section "Steel Deck," according to acoustical roof deck manufacturer's written instructions.
- F. Prime substrate where recommended by manufacturer of materials being installed.

### 3.03 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 manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation in two layers under area of roofing to achieve required thickness. Install layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 12 inches in each direction with no gaps, to form a complete thermal envelope.
  - 1. Install acoustical roof deck rib insulation strips, furnished and delivered to Project site under Division 5 Section "Steel Roof Deck," as roofing work progresses. Protect acoustical roof deck rib insulation strips from exposure to water.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

- F. 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.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  - 1. Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification, but in no case, provide less than one anchor per 4 sq. ft. of surface area.
    - a. In no case shall there be less than 2 fasteners per piece of insulation.
  - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
  - 3. Screws shall be installed utilizing automatic, positive clutch disengaged and adjustable nosepiece.
  - 4. Fasteners which require pre-drilling shall be drilled to a minimum depth as recommended by the fastener manufacturer or required by Factory Mutual to permit full seating of fastener into plate.
  - 5. Tapered insulation shall be mechanically attached using same procedures noted above.
  - 6. Install tapered edge strips at edges of tapered insulation to provide smooth transition to flat areas, free of gaps and voids.
  - 7. In areas where underside of metal deck will remain exposed, located fasteners so they penetrate high flutes only.
- H. Do not install more insulation in a day than can be covered with membrane before end of day or before start of inclement weather.

#### 3.04 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
  - 1. Cut out and repair membrane defects at the end of each day's work.
- C. Fully Adhered Membrane: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll into place when adhesive has properly cured. Adhere seams with splicing tape and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashings and counterflashings, and accessories at locations and as recommended by manufacturer.
  - 1. Flashing details shall be done in accordance with the approved shop drawings. Base flashing shall be properly terminated and covered with counterflashing, providing not less than a 4-inch overlap.
  - 2. Apply 6-inch wide strip of uncured EPDM to all field sheet seams, which will underlie walkway.
- D. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.
- E. Repair tears, voids, and lapped seams in roofing that do not meet requirements.
- F. Install roofing membrane and auxiliary materials to tie in to asphalt shingle roofing.

#### 3.05 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 bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.



D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

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

### 3.06 WALKWAY INSTALLATION

A. Rubber Roof-Paver Walkway: Install rubber roof-paver walkways according to manufacturer's written instructions in locations indicated. Install roof-paver walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the Drawings.

### 3.07 ROOF DRAIN INSTALLATION

A. Roof Drain System: Install roof drain and accessories in strict accordance with manufacturer's written instructions, providing a permanent weather tight installation.

1. Inspect and determine substrate to be in satisfactory condition, with deck fully anchored and aligned at proper location and elevation. All surfaces shall be smooth, dry, clean, free of sharp edges, and other irregularities.
2. Attach deck flange securely to substrate.
3. Assemble and flash gravel stop flange into roof system per roof system and roof drain manufacturer requirements.
4. Securely attach strainer basket.

### 3.08 FIELD QUALITY CONTROL

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

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

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

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

### 3.09 PROTECTING AND CLEANING

A. Protect membrane 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.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION