

## SECTION 07 53 23

## ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

## A. Section Includes:

1. Adhered EPDM membrane roofing system.
2. Roof insulation.
3. Walkway pads.
4. Expansion joints.

## B. Related Sections:

1. Division 01 Section "Alternates" for alternates related to this section.
2. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
3. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

## 1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

## 1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind speed of 100 mph (measured 30 feet above the ground).
- D. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
  - 1. Product Test Reports for Credit SS 3.2 if applicable: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement. To comply material shall have SRI equal to or greater than: Low slope roof ( $\leq 2:12$ ) SRI 78; Steep slope roof ( $\geq 2:12$ ) SRI 29 for 75% of roof area.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Base flashings and membrane terminations.
  - 2. Tapered insulation, including slopes.
  - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof areas.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes:
  - 1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
  - 2. Roof insulation.
  - 3. Six insulation fasteners of each type, length, and finish.
  - 4. Six roof cover fasteners of each type, length, and finish.
- E. Qualification Data: For qualified Installer and manufacturer.
- F. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.
  - 1. Submit evidence of complying with performance requirements.
- G. Manufacturer's installation rating of the roofing contractor.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- I. Maintenance Data: For membrane roofing system to include in maintenance manuals.
- J. Warranties: Sample of special warranties.
- K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

## 1.6 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project.
- B. **Installer Qualifications:** Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product. Contractor shall have installed a minimum of 500,000 square feet and have a manufacturer's installation rating of 9.0 or better.
  - 1. Installer for GAF products shall be a Master Select or Master Certified Contractor.
  - 2. Work associated with single-ply membrane roofing, including (but not limited to) insulation, flashing, and membrane sheet joint sealers, shall be performed by Installer of this Work.
- C. **Source Limitations:** Obtain components including roof insulation and fasteners Insert products for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- D. **Exterior Fire-Test Exposure:** ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- E. **Fire-Resistance Ratings:** Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. **Preliminary Roofing Conference:** Before starting roofing installation, conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, 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.
  - 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. Review requirements for deck substrate conditions and finishes, 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.

- G. 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 for their review and records.

#### 1.7 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, approval or listing agency markings, 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.
  - 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. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

#### 1.8 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.

#### 1.9 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. A manufacturer's sole source 15-year written Roofing System Warranty shall be provided with a peak gust wind speed limitation of 100 mph (measured 30 feet above the ground). Warranty shall cover both labor and materials with no dollar limitation and shall state that the Total roofing System will remain in a watertight condition. The contractor shall provide as part of the shop drawing submittal process, certification indicating that the manufacturer has reviewed and has agreed to such wind coverage indicated.
  - 1. Roofing System is defined as the following materials and provided by the roof system manufacturer: membrane, flashings, counterflashings, adhesives, sealants, insulation, overlayment, fasteners, fastener plates, fastener strips, hard rubber, metal edging. Metal

termination anchor bars, roof drain flashing and sealants, and any other product utilized in this system installation.

2. The warranty shall be for fifteen (15) years starting after final acceptance of the total roofing system by the roof system manufacturer. Defective materials or installation shall be removed, properly disposed of, and replaced at the manufacturer's expense.
3. The warranty shall provide that if within the warranty period the roofing system becomes non-watertight or if the elastomeric sheet splits, tears, or separates at the seams because of defective materials and/or materials and cost thereof shall be the responsibility of the manufacturer. Should the manufacturer or his approve applicator fail to perform repairs within 72 hours of notification, the warranty will not be voided because of work being performed by others to repair the roofing regardless of the manufacturer's warranty to the contrary.
4. The Roofing System shall be applied by a roofing Contractor approved by the system manufacturer. After inspection and acceptance of the installed roof system, the warranty will be issued.
5. Submit an Extended Wind Speed Request Form for acceptance of 85 mph wind warranty prior to start of work. Notify Architect if request form is rejected from the manufacturer.

## PART 2 - PRODUCTS

### 2.1 EPDM MEMBRANE ROOFING

- A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle SynTec Incorporated.
    - b. Firestone Building Products.
    - c. GAF Materials Corporation.
    - d. Versico Incorporated.
  2. Thickness: 60 mils, nominal.
  3. Exposed Face Color: White.

### 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.
  2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Gypsum Board and Panel Adhesives: 50 g/L.

- c. Multipurpose Construction Adhesives: 70 g/L.
  - d. Fiberglass Adhesives: 80 g/L.
  - e. Contact Adhesive: 80 g/L.
  - f. Single-Ply Roof Membrane Sealants: 450 g/L.
  - g. Nonmembrane Roof Sealants: 300 g/L.
  - h. Sealant Primers for Nonporous Substrates: 250 g/L.
  - i. Sealant Primers for Porous Substrates: 775 g/L.
  - j. Other Adhesives and Sealants: 250 g/L.
- B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.
  - C. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet, 55- to 60-mil-thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
  - D. Bonding Adhesive: Manufacturer's standard.
  - E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch- wide minimum, butyl splice tape with release film.
  - F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
  - 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. 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 roofing system manufacturer.
  - J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.
- 2.3 ROOF INSULATION
- A. General: Preformed roof insulation boards manufactured or approved by EPDM membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.
  - B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
    - 1. Thickness: Two layers of 3 inch thick insulation, providing a total in place thickness of 6 inches, unless indicated otherwise.
  - C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.4 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation[ **and cover boards**] to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: DOC PS 2, Exposure 1, OSB, 7/16 inch (11 mm) thick.

## 2.5 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

## 2.6 ROOF DRAINS

- A. All roof drains shall be furnished with 15 inch diameter cast iron body, integral flashing flange and clamp device, cast iron dome strainer, top-set deck clamp. Equal to Zurn ZC-100-DP. See plumbing riser piping for sizes.
- B. Roofing contractor to supply and install pressure-treated wood blocking as required for roof drains.

## 2.7 EXPANSION JOINTS

- A. Deck-To-Deck and Deck-To-Wall Expansion Joints: Provide manufacturers standard joint system consisting of expansion joint support or support sponge, anchor plates, and flashing.

## 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:
  1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 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 SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
  - 1. Fasten substrate board to top flanges of steel deck according to manufacturer's recommendations.
  - 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

### 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 tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- 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. Loosely Laid Insulation: Loosely lay insulation units over substrate.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.
  - 1. Fasten cover boards according to requirements of manufacturer's warranty.

### 3.5 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adheremembrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply 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.
- D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.
- G. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

### 3.6 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 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.

### 3.7 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.8 ROOF DRAIN INSTALLATION

- A. 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.

### 3.9 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.
- B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, 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 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 07 53 23