

SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between //_____// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
3. Slopes: Do not use on slopes over 1:10 (one inch per foot) without providing gutters. Provide 1:50 (1/4 inch per foot) minimum to drains without any "Gutters" (no slopes between drains). Slope crickets double the roof slope or minimum 1/2-inch per foot. NO EXCEPTION TO MINIMUM SLOPE.
4. Coordinate with plumbing requirements for roof drains and drain locations at low points and mid span where maximum deflection occurs. Do not put drain at columns or on slopes. Coordinate with insulation to provide "sumps" at drains.
5. Coordinate details and systems used to provide code required fire rated roofing system. Do not use unsurfaced membranes over combustible insulation on decks.
6. Use adhered system.
7. Coordinate with Section 07 22 00, ROOF AND DECK INSULATION for roof insulation under the membrane.
8. Do not use over polystyrene, urethane, or wood fiberboard insulation under the membrane.
9. Do not use over bituminous materials where direct contact occurs, including grease, oil, or other substances not compatible with EPDM. Use a thin layer of insulation, slip sheet or separator sheet depending upon method of attachment.
10. Terminate base flashings not less than 200 mm (8 inches) above roof surface including curb for building expansion joints.
11. Do not put expansion joints at roof surface level.
12. Do not use "pitch pocket" or "sealant pocket" instead of base flashings and cap flashings.
13. Do not use pipe boots that do not provide less than 100 mm (4 inch) height above roof.

14. Specify the use of 3" Seam tape for all fully adhered applications.
15. Specify reinforced EPDM for mechanically attached assemblies.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Ethylene Propylene Diene Monomer (EPDM) sheet roofing adhered to roof deck.

1.2 RELATED WORK

- A. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY.
- B. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- C. Metal cap flashings, copings, fascias, and expansion joints: Section 07 60 00, FLASHING AND SHEET METAL.
- D. Roof hatches, equipment supports, dome type skylights, and gravity ventilators: Section 07 72 00, ROOF ACCESORIES.
- E. Mechanical equipment supports: Section 23 34 00, HVAC FANS and Section 23 31 00, HVAC DUCTS AND CASINGS, Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 PERFORMANCE REQUIREMENTS

- A. 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.

SPEC WRITER NOTES:

1. Retain one or more paragraphs below for typical roofing applications based upon current Federal mandates, which may include one or more of the following: 1) Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings incorporated in Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management, dated January 24, 2007; 2) Energy Policy Act of 2005 (EPA 2005); 3) Energy Independence and Security Act of 2007 (EISA 2007); 4) LEED mandate; 5) Conformance with locally-applicable requirements.
- B. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that that have been successfully tested

by a qualified independent testing and inspecting agency to meet the following requirements:

SPEC WRITER NOTES:

1. Retain paragraph below for roofs that must comply with DOE's ENERGY STAR requirements: www.energystar.gov.

1. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

SPEC WRITER NOTES:

1. Retain paragraph below for LEED project requirements; note that LEED Credit SS 7.2 is not geographic location specific.
2. Use of cool roof systems needs to be examined for cold region climates.

2. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.

SPEC WRITER NOTES:

1. Retain paragraph below for roofs that must comply with California Energy Commission CEC-Title 24: www.coolroofs.com.

3. Energy Performance, CRRC-1: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

SPEC WRITER NOTES:

1. Typically retain below for new construction and reroofing projects in ASHRAE Climate Zones 1 through 3 and elsewhere where cool roof technology is indicated as cost-effective. Also refer to Exceptions in ASHRAE 90.1 Appendix f that address ballasted, vegetated, and ventilated roofs.

4. Energy Performance, Aged: Provide roofing system with minimum three-year aged solar reflectance not less than 0.55 when tested in accordance with ASTM C1549 or ASTM E1918, and in addition, a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408.

Where tested aged values are not available for proposed product, submit calculations to adjust initial solar reflectance to demonstrate compliance as indicated in ASHRAE 90.1-2010 Addendum f.

- Alternatively, provide roofing system with minimum three-year aged Solar Reflectance Index of not less than 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft² (12 W/m²K).
- C. Wind Uplift Resistance: Provide complete roof system assembly rated and installed to resist wind loads // indicated // // calculated in accordance with ASCE 7 // and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Do not install non-rated systems except as approved by the RE/COR. Submit licensed engineer's wind uplift calculations and substantiating data to validate any non-rated roof system. Base wind uplift measurements based on a design wind speed of // _____ km/h (_____ mph) // in accordance with ASCE 7 and/or other applicable building code requirements.

1.4 QUALITY ASSURANCE

- A. Approved applicator by the membrane roofing system manufacturer, and certified by the manufacturer as having the necessary expertise to install the specific system.
- B. Pre-Roofing Meeting:
1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and RE/COR.
 2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 3. Inspect roof deck at this time to:
 - a. Verify that work of other trades which penetrates roof deck is completed.
 - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and un-level surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
 - c. Examine samples and installation instructions of manufacturer.
 - d. Perform pull out test of fasteners; refer to Part 3 of this section.

- C. Energy Performance: Provide roofing system that is listed on DOE's Energy Star Roof Products Qualified Product List for "low-slope" roof products.

1.5 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project // local/regional materials, // low-emitting materials, // recycled content, // _____// requirements.
- B. Biobased Material: For products designated by the USDA's BioPreferred® program, provide products that meet or exceed USDA recommendations for biobased content, subject to the products compliance with performance requirements in this Section. For more information regarding the product categories covered by the BioPreferred® program, visit <http://www.biopreferred.gov>.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Applicators approval certification by manufacturer.
- C. Shop Drawings:
 1. Sheet membrane layout.
 2. Fastener pattern, layout, and spacing requirements.
 3. Termination details.
- D. Manufacturers installation instructions revised for project.
- E. Samples:
 1. Sheet membrane: One 150 mm (6 inch) square piece.
 2. Sheet flashing: One 150 mm (6 inch) square piece.
 3. Fasteners: Two, each type.
 4. Welded seam: Two 300mm (12 inch) square samples of welded seams to represent quality of field welded seams.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials as specified by manufacturer.
- B. Store volatile materials separate from other materials with separation to prevent fire from damaging the work, or other materials.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install EPDM sheet roofing during high winds or inclement weather, or when there is ice, frost, moisture, or visible dampness on the substrate surface, or when condensation develops on surfaces during application. Unless recommended otherwise by the EPDM sheet

manufacturer and approved by the RE/COR, do not install EPDM sheet when air temperature is below 4 degrees C 40 degrees F or within 3 degrees C 5 degrees F of the dew point. Follow manufacturer's printed instructions for installation during cold weather conditions.

1.9 SEQUENCING

- A. Coordinate the work with other trades to ensure that components which are to be secured to or stripped into the roofing system are available and that permanent flashing and counterflashing are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Application of roofing must immediately follow application of insulation as a continuous operation. Coordinate roofing operations with insulation work so that all roof insulation applied each day is covered with roof membrane installation the same day.

1.10 WARRANTY

- A. Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to five years.

1.11 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

SPEC WRITER NOTES:

1. Remove reference citations that do not remain in Part 2 or Part 3 of edited specification.
2. Verify and make dates indicated for remaining citations the most current at date of submittal; determine changes from date indicated on the TIL download of the section and modify requirements impacted by the changes.

- B. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):

ASCE/SEI-7-10	Minimum Design Loads for Buildings and Other Structures
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- C. American Society for Testing and Materials (ASTM):

A167-99(2009)	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
B209-10	Aluminum and Aluminum-Alloy Sheet and Plate

- C1371-04a Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
- C1549-09 Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
- D2103-10 Polyethylene Film and Sheeting
- D4637/D4637M-13 EPDM Sheet Used in Single-Ply Roof Membrane
- E408-71 Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
- E1918-06 Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
- E1980-11 Calculating Solar Reflectance of Index of Horizontal and Low-Sloped Opaque Surfaces
- D. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE):
- ASHRAE 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f
- E. Cool Roof Rating Council:
- CRRC-1 Product Rating Program, www.coolroofs.org
- F. FM Approvals: RoofNav Approved Roofing Assemblies and Products:
- 4470-12 Approved Standard for Class 1 Roof Coverings
- 1-28-09 Loss Prevention Data Sheet: Design Wind Loads.
- 1-29-09 Loss Prevention Data Sheet: Above-Deck Roof Components
- 1-49-09 Loss Prevention Data Sheet: Perimeter Flashing
- G. National Roofing Contractors Association (NRCA):
- 2013 Edition The NRCA Roofing and Waterproofing Manual
- H. U.S. Environmental Protection Agency (EPA):
- EPA 600/R13/116-02 Method for the Determination of Asbestos in Bulk Building Materials
- I. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov
- J. U.S. Department of Energy (DoE): Roof Products Qualified Product List, www.energystar.gov

PART 2 - PRODUCTS

SPEC WRITER NOTES:

1. Make material requirements agree with applicable requirements specified in

the referenced Applicable Publications.

2. Update and specify only that which applies to the project.
3. Use fire retardant membrane when not protected by ballast or pavers. Verify for FM, UL, or WH approval.

2.1 EPDM SHEET ROOFING

- A. Conform to ASTM D4637, Type I //, white color//.
- B. Thickness:
 1. Use 2 mm (60 mil) thick sheet for adhered system.
- C. Pipe Boots:
 1. Molded EPDM designed for flashing of round penetrations, 200 mm (8 inch) minimum height.
 2. Color same as roof membrane.

2.2 EPDM FLASHING SHEET

- A. Conform to ASTM D4637, Type I, unreinforced.
- B. Partially cured or cured.

2.3 MISCELLANEOUS ROOFING MEMBRANE MATERIALS

- A. Sheet roofing manufacturers specified products.
- B. Seam Tape: Double-sided synthetic rubber tape, minimum 0.76 mm 0.03 inch thick, minimum 75 mm (3 inch) wide. The roof membrane manufacturer must supply seam tape recommended by the manufacturer's printed data for forming watertight bond of EPDM sheet materials to each other for the application specified and conditions encountered. 150 mm (6 inch) wide tape is required for seam seals along lines of mechanical attachment of membrane.
- C. Splice Adhesive: For roofing and flashing sheet; low volatile organic compound (VOC).
- D. Lap Sealant: Manufacturer's standard single component sealant.
- E. Bonding Adhesives: Manufacturer's standard bonding adhesive; low volatile organic compound (VOC).
- F. Fastener Sealer: Manufacturer's approved sealer.
- G. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.
- H. Water Cutoff Mastic/Water Block: As supplied by the roof membrane manufacturer and recommended by the manufacturer's printed data.

2.4 FASTENERS

- A. Fasteners: Factory coated steel fasteners and metal or plastic plates, complying with FM approvals 4470 and designed for fastening membrane to substrate and acceptable to roofing system manufacturer.
- B. Pipe Compression Clamp or Drawband:
 - 1. Stainless steel or cadmium plated steel drawband.
 - 2. Worm drive clamp device.
- C. Surface Mounted Base Flashing Clamp Strip (Termination Bar):
 - 1. //Stainless steel strip, ASTM A167, Type 302 or 304, dead soft temper, minimum 0.5 mm (0.018-inch) thick.//
 - 2. //Aluminum strip: ASTM B209 24 mm (.094-inch) thick.//
 - 3. For exposed location, form strips with 6 mm (1/4 inch) wide top edge bent out 45 degrees (for sealant) from 40 mm (1-1/2 inch) wide material; 2400 mm (8 feet) maximum length with slotted 6 mm x 10 mm (1/4 by 3/8-inch) holes punched at 200 mm (8 inch) centers, centered between bend and bottom edges.
 - 4. For locations covered by cap flashings, form strips 30 mm (1-1/4 inch) wide, 2400 mm (8 feet) maximum length with slotted holes 6 mm x 10 mm (1/4 by 3/8 inch) punched at 200 mm (8 inch) centers, centered on strip width.

2.5 VAPOR RETARDER

- A. Polyethylene Film: ASTM D2103, 0.2 mm (6 mils) thick.

2.6 FLEXIBLE TUBING

- A. Closed cell neoprene, butyl polyethylene, vinyl, or polyethylene tube or rod.
- B. Diameter approximately 1-1/2 times joint width.

2.7 WALKWAY PADS

- A. Rubber walkway pad approximately 450 mm x 450 mm (30 by 30 inches) square or manufacturer's standard size with rounded corners.
- B. Approximately 13 mm (1/2 inch) thick.
- C. Ultraviolet light stabilized.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Do not apply if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected.
- B. Dry out surfaces //, including the flutes of metal deck, // that become wet from any cause during progress of the work before roofing work is resumed.

- C. Apply materials only to dry substrates.
- D. Do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, fog, ice, or frost) is present in any amount in or on the materials.
 - 1. Do not apply materials to substrate having temperature of 4°C (40 degrees F) or less, or when materials applied with the roof require higher application temperature.
 - 2. Do not apply materials when the temperature is below 4°C (40 degrees F).

SPEC WRITER NOTES:

- 1. Use pull out tests for all decks; wood and wood blocking are some of the most critical due to inconsistent values.

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.
- B. Prevent material from entering and clogging roof drains and conductors, and from spilling or migrating onto surfaces of other construction.

3.3 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install membrane roofing over area to receive roofing according to manufacturer's written instructions. Unroll roofing membrane and allow it to relax before installing.
- B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at a rate required by roofing manufacturer' and allow to partially dry before installing membrane. Do not apply bonding adhesive to splice area of membrane roofing.
- D. Apply roofing membrane with side laps located in the direction of the slope of the roof deck.
- E. Field form seams, or lap splices, with seam tape in accordance with membrane manufacturer's printed instructions and as specified. Clean and prime mating surfaces in the seam area. After primer has dried or set in accordance with membrane manufacturer's instructions, apply seam tape to bottom membrane and roll with a 75 mm to 100 mm (3 inch to 4 inch) wide smooth silicone or steel hand roller, or other manufacturer approved rolling device, to ensure full contact and adhesion of tape to bottom membrane. Tape end laps must be minimum 25 mm (1 inch). Roll top

membrane into position to check for proper overlap and alignment.

Remove release paper from top of seam tape and form seam splice. Ensure top membrane contact with seam tape as release paper is removed. Roll the closed seam with a smooth silicone or steel hand roller, rolling first across the width of the seam then along the entire length, being careful not to damage the membrane. Seal lap edge with water cutoff.

- F. Repair tears, voids, and lapped seams in roofing that does not meet the quality requirements stated in this specification and the manufacturer's written standards.
- G. Spread sealant or mastic bead over deck drain flange at deck drains, and securely seal roofing membrane in place with clamping ring.

3.4 BASE FLASHING INSTALLATION

- A. Install sheet flashing and preformed flashing accessories and adhere to substrate according to membrane roofing 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 at 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 flashing and mechanically anchor to substrate through termination bars.

3.5 WALKWAY PADS

- A. Clean membrane where pads are applied.
- B. Adhere pads to membrane with splicing cement.
- C. Allow not less than 1 inch break between pads and 2 inch maximum break.

3.6 FIELD QUALITY CONTROL

- A. Arrange for roofing system manufacturer's personnel to inspect roofing installation upon completion.
- B. Notify RE/COR 48 hours prior to schedule inspection.
- C. Remove or replace repair areas of roofing where test results or inspections indicate failure to comply with specified requirements and manufacturer's recommended installation requirements.

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