

**SECTION 07 54 00
THERMOPLASTIC MEMBRANE ROOFING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Vapor retarder/ thermal barrier.
- D. Cover boards.
- E. Flashings.
- F. Roofing stack boots and walkway pads.
- G. Coordinate work of this Section with Section 07 62 00 for shop fabricated accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2022a.
- B. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing 2021.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).
- D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces 2011 (Reapproved 2019).
- E. FM (AG) - FM Approval Guide Current Edition.
- F. FM DS 1-28 - Wind Design 2015, with Editorial Revision (2022).
- G. NRCA (RM) - The NRCA Roofing Manual 2023.
- H. NRCA (WM) - The NRCA Waterproofing Manual 2021.
- I. UL (FRD) - Fire Resistance Directory Current Edition.

1.03 SUBMITTALS

- A. See Sections 01 33 00 and 01 33 23.
- B. Product Data: Include data substantiating that materials comply with requirements of this Section.
- C. Shop Drawings: Showing roof configuration, including layout of tapered insulation material, sheet layout, seam locations, colors (as applicable), details at perimeter, and special conditions such as expansion joints, gravel guards, and copings.
 - 1. Provide layouts at 1/4-inch scale and details at 3-inch scale.
- D. Qualification Letter: Clearly containing applicator's qualification and roofing manufacturer's approval as required under Quality Assurance in this Section.
- E. Certification Letter: Letter from manufacturer certifying in writing that roofing materials and installation methods comply with latest VOC regulations as required under Quality Assurance in this Section.

1.04 QUALITY ASSURANCE

- A. Materials furnished and installed under this Section, including membrane, fasteners, adhesives, and other roof related components, shall be manufactured or approved in writing by a firm specializing in adhered membrane roofing and able to demonstrate a minimum of ten years successful experience and with a "Single-Source" responsibility and warranty.
 - 1. Materials and methods: UL approved for the Design Assembly referenced on the Drawings.

2. Roofing products and installation methods: Comply with current federal, state, and regional VOC regulations.
 - a. Provide prefabricated (instead of shop fabricated) metal edge products as required by roofing membrane manufacturer to achieve warranty.
3. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
4. Installer Qualifications: Company specializing in performing the work of this section with at least five years of experience and approved by manufacturer.
5. Do not deviate from this specification and the approved shop drawings without prior written approval of the Designer and Roofing Manufacturer.
6. Inspection Upon Completion of Installation: To be conducted by an authorized Technical Representative of Roofing Manufacturer to verify that the roofing system has been installed in accordance with Roofing Manufacturer's most current published specifications and details, and approved shop drawings.
7. Comply with applicable seismic and wind load requirements for attachment to substrate and wind speed for warranty specified.
8. The specified roofing assembly must have been successfully tested by a qualified testing agency to resist the design uplift pressures calculated according to ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01 31 19 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.
- E. Store and protect sheet metal products in accordance with Section 01 60 00.
 1. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and provide ventilation.
 2. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is not within range recommended by the manufacturer.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.
- F. Phasing: Phasing is not allowed. Complete all items required to make the project watertight each day or before the start of inclement weather. Do not proceed with installation of roof or deck insulation unless the materials, equipment and tradesmen required for the installation of the roofing are at the project site. Schedule membrane work immediately (same day) behind the insulation work. Do not install more insulation each day than can be covered with membrane before the end of that working day and before the start of inclement weather.

- G. Work Organization:
 - 1. Plan and schedule progression of the work so that finished areas do not have to be walked over or otherwise used as routes for material transportation. Provide adequate protection for the new membrane on all such routes.
 - 2. Plan and administer all work by other trades associated with the roof. If trades cannot be scheduled to prevent their working over the completed roof an alternative (i.e. a temporary roof) must be approved and executed.
 - 3. When staging for or performing any new or existing roofing work, handle, store, and place adhesives, solvents and other hazardous fume materials so as to avoid any interaction with HVAC systems air intakes.
- H. Use precautions recommended by roofing system manufacturer to avoid excessive adhesive overspray.

1.08 WARRANTY

- A. See Sections 01 77 70 and 01 78 for additional warranty requirements.
- B. See Section 07 50 36 for additional warranty requirements.
- C. Contractor must warrant the roofing system and accessories for leak coverage for five years.
- D. Special Warranty: Manufacturer's standard or customized 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.
 - 1. Special warranty includes membrane roofing, base flashings, and all other components of membrane roofing system.
 - 2. Type / Warranty Period: Total System Warranty / 30 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle SynTec Systems: www.carlisle-syntec.com/#sle.
 - a. Other acceptable manufacturers:
 - b. Firestone Building Products: www.firestonebpco.com/#sle.
 - c. Johns Manville: www.jm.com/#sle.
 - d. Substitutions: See Section 01 25 13.
- B. Insulation:
 - 1. Provided or approved by Membrane manufacturer.

2.02 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over vapor retarder and insulation.
- B. Roofing Assembly Requirements:
 - 1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
 - a. Calculate SRI in accordance with ASTM E1980.
 - b. Field applied coating may not be used to achieve specified SRI.
 - 2. Thermal Emittance: 0.95, minimum, calculated in accordance with ASTM E408.
 - 3. Roof-Ceiling Fire Resistance Rating: Comply with UL (FRD) Assembly Design No. noted on drawings..
 - 4. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
 - 5. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
 - 6. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide insulation of thickness required.
- C. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.

1. Minimum 2 layers of polyisocyanurate board.
 2. Bottom layer of polyisocyanurate board covered with single layer of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application: Any type that meets requirements and is approved by membrane manufacturer for application.
- E. Edge Metal and Coping: Designed to meet ANSI/SPRI ES-1 and compatible with roof warranty specified.

203 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
 - a. Thickness: 80 mil, 0.080 inch, minimum.
 2. Sheet Width: Factory fabricated into widest possible sheets.
 3. Color: Gray.
 4. Tear Strength: 55 lbf, measured in accordance with ASTM D751.
 5. Ozone Resistance: No cracks, ASTM D1149.
 6. Brittleness Temperature: -40 deg F., measured in accordance with ASTM D2137.
 7. Water Absorption: Complies with ASTM D471.
 8. Resistance to Outdoor (UV) Weathering: No cracks, no crazing, ASTM G155.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Adhesive: FAST 100 as manufactured by Carlisle Syntec.
- D. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
1. Fire-retardant adhesive.
 2. Vapor Permeability: 0.5 perm inch, measured in accordance with ASTM E96/E96M.
 3. Product: Vapair MD manufactured by Carlisle SynTec.
- E. Flexible Flashing Material: Same material as membrane.

204 COVER BOARDS

- A. Cover Boards: Faced, and with high compressive strength polyisocyanurate (ISO) insulation complying with ASTM C1289, and the following characteristics:
1. Classifications: Type II, Class 4 - Faced with coated or uncoated glass fiber mat facers on both major surfaces of the core foam.
 2. Grade and Compressive Strength: Grade 1, 80 psi.
 3. Board Size: 48 by 96 inches.
 4. Board Thickness: 1/2 inch.
 5. Insulation Thermal Resistance, R-value: 2.4, nominal.
 6. Products:
 - a. Carlisle Syntec; SecurShield HD: www.carlisle.com.

205 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 2 - Faced with coated glass fiber mat facers on both major surfaces of the core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 1, 16 psi (110 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 2, 8.0 (1.41), minimum, at 75 degrees F.
 2. Board Size: 48 by 96 inches.
 3. Overall Board Thickness: As shown on Drawings.
 4. Water Vapor Perm (ASTM E96): Less than 1 perm.

5. Flame Spread (ASTM E84): Less than 50.
6. Tapered: As shown on Drawings and crickets.
7. Product: SecureShield Polyisocyanurate as manufactured by Carlisle SynTec.

206 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.
- C. Adhesive, Fasteners, Tape, In-Seam Sealants, Splicing Cements, Cut-off Mastic, Cleaners: As recommended or manufactured by membrane manufacturer.
- D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- E. Membrane Adhesive: As recommended by membrane manufacturer.
- F. Insulation Adhesive: As recommended by insulation manufacturer.
- G. Termination Bar: 1" wide and .098" thick extruded aluminum bar pre-punched 6" on center with a sealant ledge to support lap sealant.
- H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 1. Composition: Asphaltic with mineral granule surface.
 2. Surface Color: White or Yellow.

207 METAL ROOF EDGES

- A. Fascia System: Equivalent to SecurEdge 200 Snap-On Fascia, 24 gauge, to meet performance and warranty requirements and fascia details in drawings, color selected by Designer from manufacturer's Kynar coatings.
- B. Coping: Equivalent to SecurEdge 200 Coping, 24 gauge, to meet performance and warranty requirements and fascia details in drawings, color selected by Designer manufacturer's Kynar coatings.

208 METAL ROOF EDGE ACCESSORIES

- A. Fasteners: Same metal as flashing/sheet metal. Match finish of exposed heads with material being fastened. Type and size to suit application.
- B. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, free of sulfur, compounded for 15-mil dry thickness per coat.
- C. Sealant: Exterior quality conforming with Section 07 92 00.
- D. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- E. Polyethylene Underlayment: 4-mil minimum carbonated polyethylene film tested in accordance with ASTM E154.
- F. Neoprene Washers: Required for all fasteners which will remain exposed to the weather.
- G. Metal Accessories: Sheet metal clips, continuous cleats, straps, anchoring devices, as required for installation of work, matching or compatible with adjoining materials, noncorrosive, size and gage required for performance.
 1. Continuous cleats: 22 gauge galvanized metal, fastened 12" max. o.c., unless indicated otherwise.

PART 3 EXECUTION

301 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and edge strips are in place.

302 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

303 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

- A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Extend vapor retarder under cant strips and blocking to deck edge.
 - 2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
 - 3. Install over entire roof area for continuous barrier.
- B. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions.
 - 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- C. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions.
- D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- G. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- H. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
- J. Do not install more insulation than can be covered with membrane in same day.
- K. Install thermal barrier over metal deck as required by governing code.

304 INSTALLATION - MEMBRANE

- A. Gaps greater than 1/4" in substrate are to be filled with an appropriate material.
- B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- C. Shingle joints on sloped substrate in direction of drainage.

- D. Fully Adhered Application: Apply adhesive to substrate at rate of ____gallons per square foot. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- E. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- F. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- G. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.
- H. Around roof penetrations, seal flanges and flashings with flexible flashing.
- I. Coordinate installation of roof drains and related flashings.
- J. Walkway Protection: Install walkway protection units at locations shown and where required for access to roof-mounted equipment. Space pad joints to permit drainage.
 - 1. Do not allow membrane seams to fall under walkway pads.

305 SHEET METAL INSTALLATION

- A. Perform sheet metal work in accordance with approved shop drawings and installation instructions and recommendations of SMACNA "Architectural Sheet Metal Manual."
 - 1. Anchor work securely in place by methods indicated, providing for thermal expansion; conceal fasteners where possible.
 - 2. Set units true to line and level.
 - 3. Install work with laps, joints, seams watertight and weatherproof.
- B. Underlayment: For aluminum to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper or a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install counterflashing in reglets, either by snap-in seal arrangements or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant.
- E. Flashing Attachment:
 - 1. Secure all flashing 16 inches on centers.
 - 2. Install parapet cap flashing and gravel guards with continuous hold-down clips secured 12" o.c. maximum.
 - 3. Exposed fasteners: Complete with neoprene washers 16" o.c.
- F. Joints for Gravel Guards:
 - 1. Overlap base metal minimum 4 inches.
 - 2. Set in solid bed of plastic cement.
 - 3. Make allowances for expansion joints.

306 FIELD QUALITY CONTROL

- A. Start installation in presence of manufacturer's technical representative.
 - 1. Cut out and repair membrane defects at end of each day's work.
- B. Require site attendance of roofing material manufacturers periodically during installation of the Work.
- C. Wrinkled membrane in field or seams will not be accepted. Replace any sheets with wrinkles.
- D. A maximum of 3 patches are allowed in a 10 square foot area. If the patches are exceeded in an area, a minimum of a 10' by 10' membrane sheet is to be replaced.

307 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

- C. Repair or replace defaced or damaged finishes caused by work of this section.

308 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07 54 00