

# TECHNICAL SPECIFICATIONS

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## SECTION 07 54 23

### ADHERED THERMOSPLASTIC POLYOLEFIN (TPO) ROOFING

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES:

- A. The Work specified in this Technical Specifications Section consists of providing Adhered TPO roofing as required to complete work.

##### 1.02 RELATED SECTIONS

- A. 07 21 11 – Building Insulation.
- B. 07 60 00 – Flashing and Sheet Metal.

##### 1.03 MEASUREMENT AND PAYMENT

- A. Separate measurement or payment will not be made for Work required under this Technical Specifications Section. All costs in connection with the Work specified in this Technical Specification Section will be considered to be included with the related item of Work in the Pricing Schedule or incidental to the Work.

##### 1.04 SUBMITTALS

General: Refer to Technical Specifications Section 01 33 00, Submittal Procedures; Technical Specifications Section 01 33 23 Shop Drawings, Product Data, and Samples; and Technical Specifications Section 01 78 39. Project Record Documents, Submittals shall be staged in accordance with the requirements specified in this Technical Specifications Section.

- A. Prior to starting work, the roofing contractor must submit the following:
  - 1. Shop drawings showing layout, details of construction and identification of materials.
  - 2. A sample of the manufacturer's Membrane System Warranty.
  - 3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
  - 4. Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal 15 mil or thicker.

5. Certification of the manufacturer's warranty reserve.
- B. Upon completion of the installed work, submit copies of the manufacturer's final inspection to VTA prior to the issuance of the manufacturer's warranty.

#### **1.05 EXTENT OF WORK**

- A. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the Sure-Weld 60-mil thick white in color reinforced TPO (Thermoplastic Polyolefin) reinforced membrane Adhered Roofing System including flashings and insulation as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details.
- B. The Contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.

#### **1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.
- B. Comply with the manufacturer's written instructions for proper material storage.
  1. Store TPO membrane in the original undisturbed plastic wrap in a cool, shaded area. Sure-Weld membrane that has been exposed to the elements for approximately 7 days must be prepared with Weathered Membrane Cleaner prior to hot air welding.
  2. Store curable materials (adhesives and sealants) between 60°F and 80°F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60°F minimum temperature before using.
  3. Store materials containing solvents in dry, well ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.
- C. Insulation must be on pallets, off the ground and tightly covered with waterproof materials.
- D. Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

## 1.07 WORK SEQUENCE

- A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.
- B. Do not disrupt activities in occupied spaces.

## 1.08 QUALITY ASSURANCE

- A. The Sure-Weld Membrane Roofing System must achieve a UL Class.
- B. 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" American Society of Civil Engineers (ASCE 7), or International Building Code (IBC).
- C. The membrane must be manufactured by the material supplier. Manufacturers supplying membrane made by others are not acceptable.
- D. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.
- E. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least five (5) years successful experience installing single-ply TPO roofing systems and having installed at least one (1) roofing application or several similar systems of equal or greater size within one year.
- F. Provide adequate number of experienced workers regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least one thoroughly trained and experienced superintendent on the job at all times roofing work is in progress.
- G. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the specifier. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead, and presented for the VTA consideration.
- H. The TPO White membrane meets CRRC (Cool Roof Rating Council) for reflectance and emittance. When tested in accordance with ASTM C1549, the White TPO material has an initial solar reflectance of 0.79 and a 3-year aged

reflectance of 0.70. The material has also been tested for emittance in accordance with ASTM C1371; an initial emittance of 0.90 and a 3-year aged emittance of 0.86 were achieved.

- I. The White TPO membrane meets the emittance requirements set forth by the USGBC (U. S. Green Building Council) for their LEED (Leadership in Energy and Environmental Design) Program. The Sure-Weld White TPO material has an emittance of 0.95 (when tested in accordance with ASTM E408) and an SRI (solar reflectance index) of 110 (calculated using ASTM E 1980).
- J. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the VTA seventy-two (72) hours prior to the manufacturer's final inspection.

#### **1.09 JOB CONDITIONS, CAUTIONS AND WARNINGS**

- A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.
- B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.
- C. When loading materials onto the roof, the TPO Authorized Roofing Applicator must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.
- D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.
- E. 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.
- F. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.
- G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

- H. TPO roofing shall be complete and weather tight at the end of the work day.
- I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

### **1.10 WARRANTY**

- A. Provide manufacturer's 20 years Total System Warranty covering both labor and material with no dollar limitation. The maximum wind speed coverage shall be peak gusts of 90 measured at 10 meters above ground level.
- B. Pro-rated System Warranties shall not be accepted.
- C. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

## **PART 2 - PRODUCTS**

### **2.01 TPO MEMBRANE ROOFING**

- A. Subject to compliance with requirements provide "Sure-Weld" Carlisle Syn Tec Incorporated (Basis of Design) "or equal" Product.
- B. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet, and as follows:
  - 1. Thickness: 60 mils, nominal.
  - 2. Exposed Face Color: Tan (SRI 88)

### **2.02 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. Single-Ply Roof Membrane Adhesives: 250 g/L.
    - b. Other Adhesives: 250 g/L.
    - c. Nonmembrane Roof Sealants: 300 g/L.
    - d. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California

Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard.
- C. Slip Sheet: Manufacturer's standard, of thickness required for application.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), pre-punched.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

### **2.03 VAPOR RETARDER**

- A. Polyethylene Film: ASTM D 4397, 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
  - 1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
  - 2. Adhesive: Manufacturer's standard lap adhesive, FM Approvals approved for vapor-retarder application.

### **2.04 ROOF INSULATION**

- A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches(1:48) 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.
- E. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

## **2.05 COVER BOARD**

- A. Dens Deck Prime, or equal, –gypsum core that incorporates glass-mat facings on the top and bottom side. The top surface is pre-primed and provides excellent bond strength for adhered membrane for use as a cover board. Available in 1/4” to 5/8” and 4’ x 4’ or 4’ x 8’ size boards.
- B. SecurShield HD or equal, – a rigid insulation panel composed of a high-density, closed-cell polyisocyanurate foam core laminated to coated-glass fiber-mat facer for use as a cover board or recover board. Available 1/2” thick 4’ x 8’ panel weight 11 lbs with an R-value of 2.5.
- C. Securock Cover Board or equal, – A uniform composition of fiber-reinforced with no facer for use as a cover board or a thermal barrier. Available in 1/4” to 5/8” thick and 4’ x 4’ or 4’ x 8’ size boards. Long uninterrupted runs (>200’) may require slight gapping due to thermal expansion.
- D. Sure-Seal HP Recovery Board, or equal - A 1/2” or 1” thick high-density wood fiberboard with an asphalt coated facer for use as a cover board or recover board. Available 1/2” or 1” thick and 4’ x 4’ or 4’ x 8’ size boards.

## **2.06 WALKWAYS**

Protective surfacing for roof traffic shall be TPO Walkway Rolls installed per manufacturer’s requirements or concrete pavers loose laid over an approved slip sheet.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Comply with the manufacturer's published instructions for the installation of the fully adhered membrane roofing system including proper substrate preparation, job site considerations and weather restrictions.
- B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking the flow of water.

### **3.02 VAPOR RETARDERS**

- A. General: The use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly.

### **3.03 INSULATION PLACEMENT AND ATTACHMENT**

- A. Install insulation or membrane underlayment over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch. Stagger joints horizontally and vertically if multiple layers are provided.
- B. Secure insulation to the substrate with insulation adhesive in accordance with the manufacturer's specifications.

### **3.04 MEMBRANE PLACEMENT AND ATTACHMENT**

- A. Position TPO membrane over the acceptable substrate. Fold membrane sheet back onto itself so half the underside of the membrane is exposed.
- B. Apply Bonding Adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area. Do not apply Bonding Adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
  - 1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.
  - 2. Fold back the unbonded half of the sheet and repeat the bonding procedures.
- C. Position adjoining sheets to allow a minimum overlap of 2 inches to provide a minimum 1-1/2" hot air weld.
- D. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously.

### **3.05 MEMBRANE HOT AIR WELDING PROCEDURES**

- A. Hot air weld the TPO membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller immediately after welder crossed the membrane step-off to ensure a continuous hot air welded seam.



1. When using 60-mil thick or thicker membrane, all splice intersections shall be overlaid with T-joint covers or non-reinforced flashing.
- B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes).
- C. Repair all seam deficiencies the same day they are discovered.
- D. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete. Cut Edge Sealant is not required on vertical splices.

### **3.06 FLASHING**

- A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using TPO reinforced membrane. Sure-Weld non-reinforced membrane can be used for flashing pipe penetrations, Sealant Pockets, and scuppers, as well as inside and outside corners, when the use of prefabricated accessories is not feasible.
- B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging or coping and roof drain applications.

### **3.07 WALKWAYS**

- A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the drawings.
- B. Hot air weld walkway material to the membrane in accordance with the manufacturer's specifications.

### **3.08 DAILY SEAL**

- A. When the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

### **3.09 CLEAN UP**

- A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

- B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

### **3.10 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### **3.11 ROOF DRAIN TEST**

- A. After completing roofing but prior to VTA acceptance, perform the following test for water tightness. Plug roof drains and fill with water to edge of drain sump for not less than 8 hours. Do not plug secondary overflow drains at the same time as adjacent primary drain. To ensure some drainage from roof, do not test all drains at the same time. Measure water at beginning and end of the test period. When rain or other precipitation occurs during test period, repeat test. When water level falls, remove water, thoroughly dry, and inspect installation for leaks; repair or replace roofing at drains to provide for a properly installed watertight flashing seal. Repeat test until there is no water leakage.

**END OF SECTION07 54 23**