

SECTION 07540

THERMOPLASTIC 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. Mechanically fastened thermoplastic polyolefin (TPO) membrane roofing system.
 - 2. Roof insulation related to single ply membrane roofing.
 - 3. Roof accessories and walkway pads.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking and for wood-based, structural-use roof deck panels.
 - 2. Division 7 Section "Building Insulation" for insulation beneath the roof deck.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counter flashings.
 - 4. Division 15 Sections for 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.

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. Exterior Fire-Test Exposure: Underwriters Laboratories UL Class A.
- E. 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. Submit in accordance with Section 01330.
- B. Product Data: For each type of product indicated. Provide installation instructions and general recommendations from manufacturer of thermoplastic membrane roofing 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, colors (as applicable), 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.
 - 2. Blank sample of manufacturer's and Contractor's warranty forms.
- 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. Maintenance Data: For roofing system to include in maintenance manuals.
- I. Warranties: Special warranties specified in this Section.
- J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is 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 TPO membrane roofing, including (but not limited to) 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 or 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 Management and Coordination." 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 temporary protection requirements for roofing system during and after installation.
 8. Review roof observation and repair procedures after roofing installation.
 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
 10. 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 and the following requirements:
 - 1. Store TPO membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. TPO membrane that has been exposed to the elements for approximately 7 days must be prepared with manufacture's recommended membrane cleaner and in accordance with written instructions prior to hot air welding.
 - 2. Store curable materials (adhesives and sealants) between **60 and 80 deg F (15.5 and 26.7 deg C)** in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to **60 deg F (15.5 deg C)** 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.
- 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. Damaged materials shall be removed and replaced at the Installer's expense.
- E. Materials shall be delivered in sufficient quantity to allow continuity of the Work.
- F. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
- G. 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. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.
- F. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains, if required. At completion, test drains to ensure the system is free running and drains are watertight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.
- G. If the exterior walls are not erected at the time of membrane installation, envelope the flutes of the metal deck to prevent moisture intrusion and wind damage.
- H. Coordinate work with that of other trades affecting or affected by the Work of this Section. Cooperate with such trades to ensure the steady progress of all work under this contract.

1.09 WARRANTY

- A. General: 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. Warrantor shall be the manufacturer of the roofing membrane. Warranty shall be written to the building Owner.
 - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, substrate board, walkway products, and other components of membrane roofing system.
 - 2. Warranty Period: 15 years from date of Project Substantial Completion.
- C. When the warrantor is notified that there is a problem (leak or damage) with the warranted roofing system and/or accessories by telephone, and/or in writing (fax or mail), the response time to physically start the repairs shall be within twenty-four hour from time of telephone or date of written notification.
- D. No "Early Bird" warranties shall be issued.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where 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 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

- A. Fabric-Reinforced Thermoplastic Polyolefin (TPO) Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:
1. Products:
 - a. Sure-Weld Roofing System; Carlisle SynTec Incorporated.
 - b. UltraPly TPO Roofing System; Firestone Building Products Company.
 2. Thickness: 45 mils, nominal. 60 mils under roof pavers.
 3. Exposed Face Color: Gray.
 4. Physical Properties:
 - a. Breaking Strength: 225 lbf; ASTM D 751, grab method.
 - b. Elongation at Break: 15 percent; ASTM D 751.
 - c. Tearing Strength: 55 lbf minimum; ASTM D 751, Procedure B.
 - d. Brittleness Point: Minus 22 deg F.
 - e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F and an ozone level of 100 pphm; ASTM D 1149.
 - f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F; ASTM D 573.
 - g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F; ASTM D 471.
 - h. Linear Dimension Change: Plus or minus 2 percent; ASTM D 1204.

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: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane, and bonding adhesive for base flashings. Provide adhesives that will withstand project wind uplift requirements.
- D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- F. Adhesives and Cleaners: Provide bonding adhesive, edge sealant, water cut-off mastic, splicing cement, sealer, and membrane cleaner specifically formulated by the roofing manufacturer for the intended purpose and as required for a complete roof system. Provide adhesives that comply with project requirements to withstand 90-psf uplift force.
- G. Pipe Flashing: Provide membrane manufacturer's standard pre-molded flashing boot for flashing around pipe and conduit roof penetrations. Provide cone shaped flashing boot, heat welded to membrane with stainless steel clamping ring. Field-formed pipe flashing not allowed.
- H. Miscellaneous Accessories: Provide preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.04 ROOF INSULATION

- A. 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'nerg'y 2; Johns Manville International, Inc.
 - 2. Provide roofing manufacturer's required insulation for total system warranty.
- B. 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: 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 FMG 4470, 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.

2.06 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.
 - 1. Products:
 - a. Carlisle SynTec Incorporated; Sure-Weld Walkway Rolls.
 - b. Firestone Building Products Company; UltraPly TPO Walkway Pad.

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 and that roof drains 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.
 - 3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 5 Section "Steel Deck."
 - 4. Verify that plywood sheathing joints are supported by framing and blocking and that installation is within flatness tolerances specified in Division 6 Section "Rough Carpentry."
 - 5. 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 TPO 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. 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 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. Provide two layers of 2 inch thick insulation at locations indicated as 4 inch insulation.
- D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. 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.
- F. 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.
 - 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 the fastener into the plate.
- G. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.
- 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 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
 - 1. Flashing details shall be done in accordance with the drawing details and approved shop drawings. Base flashing shall be properly terminated and covered with counterflashing, providing not less than a 4-inch overlap.
 - 2. Provide a 10-foot by 10-foot additional layer of membrane at kitchen exhaust fans.
- E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
 - a. Cut out and repair membrane defects at the end of each day's work.
- G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- H. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
- I. Install roofing membrane and auxiliary materials to tie in to asphalt shingle roofing.
- J. Perimeter membrane areas left exposed prior to fascia installation shall either be fully adhered to the vertical face or retained by a continuous cleat. Membrane shall extend down wall at least 1-inch past the bottom of the wood nailer, lapping over the wall finish, but not exposed below the flashing.

3.05 FLASHING INSTALLATION

- A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using TPO reinforced membrane. TPO non-reinforced membrane can be used for flashing pipe penetrations, scuppers, as well as inside and outside corners when the use of pre-fabricated accessories is not feasible. Sealant pockets are not permitted.
- B. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions and approved shop drawing flashing details.

- C. At parapets and roof edges, flashing shall run under metal coping and flashing full length and width. Membrane shall extend down wall at least **1-inch (25 mm)** past the bottom of the wood nailer, lapping over the wall finish, but not exposed below the flashing.
 - D. Flash all projections including pipes, conduits, and curbs passing through the membrane.
 - E. Base Flashing: Tops of elastomeric base flashing shall be secured with a continuous aluminum termination bar and counterflashed.
 - F. All vertical flashings and membranes shall be adhered to substrates regardless of height.
 - G. Apply solvent-based 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.
 - H. Flash penetrations and field-formed inside and outside corners with sheet flashing conforming to manufacturer's requirements. A minimum overlap of 3-inches is required.
 - I. Flash pipes and conduits with pre-molded cone type flashing boots. Do not field fabricate pipe flashing.
 - J. Weld side and end laps to ensure a watertight seam installation.
- 3.06 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products to and around all mechanical equipment. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.07 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.

3.08 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. Retain below if coating membrane or if using fluid-applied bonding materials.

END OF SECTION 07540