

SECTION 07550 - MODIFIED BITUMINOUS MEMBRANE ROOFING

1. GENERAL

1. AIA has provided a generic Modified Bitumen section number that can include both APP and SBS (AIA 07550). This particular specification is for new construction and steel decks. Modified bitumen products listed have a single reinforcement therefore the design is for 20 years. Verbiage in blue is for explanation or commentary purposes and should be deleted and not be a part of the completed specification.

2. RELATED DOCUMENTS

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

3. SUMMARY

- A. Modified bitumen roof systems typically consist of two plies of modified bitumen membranes; a smooth surface field ply and a granule surfaced cap sheet (FR fire rated available). Delete anything not being used.
- B. Section Includes:
 1. Modified bituminous membrane roofing.
 2. Roof insulation, taper, and cover board.
 3. Substrate board.
 4. Vapor retarder.
- C. If acoustical deck is not used, delete below paragraph.
- D. Section includes the installation of insulation strips in ribs of acoustical roof deck. Insulation strips are furnished under Section 053100 "Steel Decking."
- E. Related Requirements:
 1. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counter flashings.
 2. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

4. DEFINITIONS

- A. Third party involvement is a growing trend for roofing projects particularly for new construction. Third party agencies can be retained through warranty services or directly by the Owner. They can assist with inspections for installations of other trades that could have an adverse impact on roofing such as rough carpentry, plumbing, mechanical, sheet metal, and air barriers.
- B. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to Work of this Section.

- C. Third Party Agency: Agency retained by roofing manufacturer's warranty department or Owner to perform timely construction site visits to review installation of rough carpentry, mechanical, plumbing, sheet metal, or air barriers. Third party services should not be used to replace a membrane manufacturer's technical warranty services. Third party services should be used as supplemental and not as replacement services.

5. PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Wind loads for this specification is based on FM, not ASCE. A suggestion is to design around I-90. A Roof Nav Number should be used; which takes into consideration wind speeds and pressures, and provides information in the design phase, not the pre-construction phase. Maps and charts indicate Missouri and Kansas are in the severe hail area so design should be SH. That rating is best met using a gypsum type cover board (densities up to 1800 PSI).
- D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global' "Roof Nav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail-Resistance Rating: SH.
 - 3. Roof Nav Number:
- E. No product shall contain asbestos or asbestos-related products.

6. ACTION SUBMITTALS

- A. Select items that are particular to this project, delete those that are not. Below paragraph includes several items typically noted in the Informational Submittals section. Some manufacturers provide a review of submittals and shop drawings. Some manufacturers have added warranty services. A suggestion is to leave each line listed below and allow each bidder to determine where those services will come from to meet the required project services.
- B. Product Data and Informational Submittals: For each type of product indicated.
 - 1. Field membrane and cap sheet membrane.
 - 2. Base flashing backer membrane and cap sheet if different from field membrane and cap sheet membrane.
 - 3. Field membranes adhesive and base flashing adhesive.
 - 4. Roof insulation (include taper, tapered crickets and tapered edge).
 - 5. Cover board.

6. Insulation and cover board fasteners and/or adhesive.
 7. Substrate board.
 8. Vapor retarder.
 9. Sample warranty.
 10. Manufacturer certificate stating roofing installer is a certified applicator.
 11. Sample of roofing manufacturer's daily construction audit form.
 12. Safety data sheet for each product data submitted.
 13. Cover page for submittal package.
 14. Scope of work summary page for submittal package.
 15. Submittals shall be reviewed and accepted by roofing membrane manufacturer.
 16. If not by technical staff of manufacturer, submittals shall be reviewed and accepted by third party agency.
 17. Manufacturer certificate stating additional warranty services will be conducted by a technical representative.
 18. If not by technical staff of manufacturer, manufacturer certificate stating additional warranty services will be conducted by third party services.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Base flashings and membrane terminations.
 2. Strip in flashings.
 3. Tapered insulation, including slopes.
 4. Crickets, saddles, and tapered edge strips, including slopes.
 5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 6. Insulation adhesive patterns for corner, perimeter, and field-of-roof locations.
 7. Shop drawings shall be reviewed and accepted by roofing membrane manufacturer.
 8. If not by technical staff of manufacturer, shop drawings shall be reviewed and accepted by third party agency.
 9. Cover page for shop drawing package.
- D. Samples for Verification: For the following products:
1. Cap sheet, of color required.
 2. Flashing sheet, of color required.
 3. Walkway pads or rolls, of color required.
7. CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing system to include in maintenance manuals. Content should include daily log of roof construction activity by roofing contractor and be submitted with the roof warranty.
8. QUALITY ASSURANCE
- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed or FM Global approved for membrane roofing system identical to that used for this Project.
- B. [Manufacturers train contractor's employees not contract labor. Suggestion is to incorporate that in specification as indicated below. EMR is a safety rating provided by insurance companies. A rating of .90 has been established by the federal government. If deemed acceptable, include in below paragraph. If not delete.](#)

- C. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty. The installer must use company employees; contract labor is not acceptable. Full time supervision is required. The installer must use company employees; contract labor is not acceptable. Installer shall have an EMR rating of .90 or less.
 - D. Exterior Fire-Test Exposure ASTM E 108, Class A for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
 - E. Recommendation is to have the membrane manufacturer's technical representative at the pre-installation conference, not a sales person. If a third party service is to be included along with the manufacturer's technical rep, they should kept in the list below. If not, delete third party services from the below paragraph.
 - F. Pre-installation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, roofing Installer, roofing system manufacturer's technical representative or third party agency, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. 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, shop drawings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.
9. DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 - C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

10. FIELD 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.

11. WARRANTY

- A. AIA uses the term warranty and doesn't use guaranty or guarantee. Suggestion is to keep things consistent with AIA and use the term warranty. Manufacturers typically provide a final inspection and a 2-year follow up inspection for warranty services. Additional warranty services should be completed by a technical representative of the roofing manufacturer. If sheet metal coping is to be a part of the roofing membrane manufacturer's warranty, bidder can select one of the two methods listed below. Reference "Sheet Metal Flashing & Trim" for sheet metal warranty information. Warranty period for roofing is 20 years.
- B. Entire installation of roofing system and flashing work shall be of quality required for acceptance by membrane manufacturer in order to obtain a Full Systems No Dollar Limit material and workmanship warranty. Services may be provided by either the roofing membrane manufacturer's technical representative or by third party services. Provide guaranty from date of substantial completion of project.
 - 1. Includes membrane sheets, base flashings, roof insulation, fasteners, cover boards, roofing accessories, and other components of roofing system.
 - 2. Final inspection by membrane manufacturer's technical representative.
 - 3. Standard 2 year follow-up audit by roofing membrane manufacturer's technical representative.
 - 4. Project start up site visit, typically first or second day of construction by membrane manufacturer's technical representative.
 - 5. Interim site visit for every two weeks of construction by membrane manufacturer's technical representative.
 - 6. Moisture survey conducted by membrane manufacturer's technical representative.
 - 7. Pre-fabricated sheet metal coping (20 years).
 - 8. Fabricated sheet metal coping meeting ANSI SPRI ES-1; fabricated and installed by a certified ES-1 applicator (20 years).
 - 9. Roofing Warranty Period: 20 years from date of Substantial Completion.
- C. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarder, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

2.PRODUCTS

1. SUBSTRATE BOARDS

- A. If substrate board and vapor retarder are not used, delete.
- B. Substrate Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, ½ inch thick.
 - 1. Products: Subject to compliance with requirements, provide the following or equal:
 - a. USG Corporation; Securock.
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to load bearing portion of roof deck.

2. VAPOR RETARDER

- A. Self-Adhering Sheet Vapor Retarder: ASTM D 1970, minimum of 32-mil thick, polyethylene film laminated to layer of rubberized asphalt adhesive; maximum permeance rating of 0.1 perm. Provide primer when recommended by vapor-retarder manufacturer.
- B. Glass-Base Felt/Roofing Asphalt: ASTM D 4601 Type II, asphalt impregnated glass fiber felts (2-ply); ASTM D 312, Type IV roofing asphalt as recommended by roofing system manufacturer for application.
- C. Roofing Membrane Sheet: ASTM D 6509, Grade S, 120 mil modified asphalt base sheet (reinforced with a polyester mat or a glass fiber mat); smooth surfaced; suitable for application method specified.
- D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one-part, asbestos free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane.

3. ROOF INSULATION

- A. This specification allows for fastening the base layer and subsequent layer of insulation simultaneously as long as the joints between layers are offset. Insulation R-values requirements and insulation thickness per board thickness should be defined. The listed R-values and thicknesses of roof insulation below are illustration purposes and should be changed to meet the project requirements. Details can then be generic. An individual layer of roof insulation should not exceed 2.7" thick. The fastener is to penetrate the load bearing portion of the steel deck ¾". Taper, crickets, and cover boards should be adhered to break thermal bridging. This specification allows for the adhesion to be either asphalt or low rise foam based on project conditions and building occupancy.
- B. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated that produce FM Global-approved roof insulation.
- C. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. Provide in minimum of two layers, overall thickness to achieve an R-value of 25 for the insulation only. Tapered insulation is not included in this R-value.
 - D. Polyisocyanurate Board Insulation (base layer): ASTM C 1289, Type II, Class 1, Grade 2, glass-fiber mat facer on both major surfaces, 2.2 inches thick (R-12.6). For fastening to steel deck, 4' by 8' board is preferred.
 - E. Polyisocyanurate Board Insulation (subsequent layer): ASTM C 1289, Type II, Class 1, Grade 2, glass-fiber mat facer on both major surfaces, 2.2 inches thick (R-12.6). For fastening to steel deck, 4' by 8' board is preferred.
 - F. [If structure is sloped, delete paragraph listed below.](#)
 - G. Tapered Insulation: Provide factory-tapered insulation boards with ½" start fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
 - H. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
4. INSULATION ACCESSORIES
- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
 - B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to load bearing portion of roof deck and acceptable to roofing system manufacturer.
 - C. Bead-Applied Polyurethane Adhesive (option 1):
 1. Dual component polyurethane adhesive and primer (where applicable), used to attach taper roof insulation and crickets to roof insulation.
 - D. Roofing Asphalt (option 2): ASTM D 312, Type III as recommended by roofing system manufacturer for application used to attach taper insulation and crickets to roof insulation.
 - E. Modified cant strips: 1 ¾" x 1 ¾" x 2".
 - F. Tapered Edge Strip: Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - G. Cover Board:
 1. ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 3/8 inch thick. When adhering, 4' by 4' boards are preferred.
 - a. USG Corporation; Secureck.
 - H. Cover Board Bead-Applied Polyurethane Adhesive (option 1):
 1. Dual component polyurethane adhesive and primer (where applicable), used to attach roof cover board to roof insulation.
 2. Regular, summer or winter formula shall be bid and installed, such that manufacturer's installation criteria are met.
 - I. Cover Board Roofing Asphalt (option 2): ASTM D 312, Type III as recommended by roofing system manufacturer for application.

5. There are different standards and ASTM requirements for SBS and APP modified bitumen products which can lead to confusion. The intent of this specification is to simplify. Modified bitumen is typically a two-ply system, so we should stress total mil thickness much like we do in single ply. A typical standard is a minimum 120 mil thick for the roofing membrane sheet and a minimum 155 mil thick for the granules surfaced roofing membrane cap sheet. The manufacturers selected have similar products and contractor base. Most cap sheets are fire-rated. Most granule surfaced membranes are white. If different than white, make change in sentence listed below. The following paragraphs are for standard modified bitumen products.

6. ROOFING SHEET MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products for a two-ply modified bitumen membrane system with a field ply and a granulated surface ply with a minimum of 275 mil system thickness by one of the following:
1. Derbigum Americas, Inc.
 2. Firestone Building Products.
 3. Siplast, Inc.
- B. Modified Bitumen Roof Membrane:
1. Two-ply modified bitumen membrane with an unsurfaced field ply and a fire-rated (FR) granular surfaced cap sheet ply. Granule color shall be selected by the Owner from the manufacturer's standard colors.
- C. Roofing Membrane Sheet: minimum 120 mil thick modified asphalt field ply (mid-reinforced with a polyester or glass mat); smooth surfaced; suitable for application method specified.
- D. Granule-Surfaced Roofing Membrane Cap Sheet: minimum 155 mil thick modified asphalt sheet (mid-reinforced with a polyester or glass mat); granular surfaced; fire rated (FR) suitable for application method specified.
- E. Granule Material and Colors:
1. Granule Material: Mineral.
 2. Granule Color: White.

7. BASE FLASHING SHEET MATERIALS

- A. Two-Ply Base Flashings:
- B. Modified Cant Strips: 1 3/4" x 1 3/4" x 2".
- C. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one-part, asbestos free, cold-applied adhesive specially formulated for compatibility and use with base flashings.
- D. Backer Sheet: Minimum 120 mil thick backer modified asphalt sheet membrane, smooth surfaced; suitable for application method specified.
- E. Vertical granule surfaced products used do not require fire ratings.
- F. Granule-Surfaced Flashing Cap Sheet: minimum 155 mil thick modified asphalt sheet granular surfaced; suitable for application method specified.

- G. Granule Material and Color:
 - 1. Granule Material: Mineral.
 - 2. Granule Color: White.
 - H. The fasteners listed below are not to be confused with insulation fasteners. These fasteners attach the base flashing membranes.
 - I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
 - J. Reinforcing Fabric: Shall comply with ASTM D 1668-1.
 - K. Mastic Sealant: Polyisobutylene, plain or modified bitumen; non-hardening, non-migrating, non-skinning, and non-drying.
8. STRIP-IN SHEET MATERIALS
- A. Granule-Surfaced Strip-in Flashings: minimum 155 mil thick modified asphalt fire-rated (FR) sheet granular surfaced; suitable for application method specified.
 - B. Granule Material and Color:
 - 1. Granule Material: Mineral.
 - 2. Granule Color: White.
9. AUXILIARY ROOFING MATERIALS
- A. SBS membranes can be mopped in with hot asphalt. Consider whether or not asphalt fumes should be near an occupied building and consider the neatness of a finished product. APP products can be heat welded. Consider substrates that could be combustible. This specification is middle of the road with cold adhesives.
 - B. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
 - C. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one-part, asbestos free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane.
 - D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one-part, asbestos free, cold-applied adhesive specially formulated for compatibility and use with base flashings.
 - E. Asphalt Primer: ASTM D 41/D 41M.
 - F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
 - G. Mastic Sealant: Polyisobutylene, plain or modified bitumen; non-hardening, non-migrating, non-skinning, and non-drying.

- H. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.
 - I. Metal pitch pans and pitch pan fillers, used for roof penetrations, are typically specified in “Sheet Metal Flashing & Trim”. Metal pitch pans are not a part of the roof warranty. However, liquid flashing can be used in lieu of metal pitch pans for roof penetrations and can be a part of the roof warranty. If metal pitch pans are to be used, reference them in this specification and delete liquid flashing for pitch pan use. If liquid flashing is to be specified, delete metal pitch pan information. Detail needs to coincide with specification.
 - J. Metal Pitch Pan Flashing: Reference “Sheet Metal Flashing & Trim” for type of sheet metal to be used, pitch pan filler material, and pitch pan lid information.
 - K. Liquid Pitch Pan Flashing: Roofing system manufacturer’s two-part resin/fleece monolithic membrane.
 - 1. Primer: Solvent free, cream color primer; rain proof in three hours; 8 days exposure time (MS Primer).
 - 2. Resin: Two-component cold fluid applied solvent free polyurethane; cream color; rain proof in 16 hours; sandwich fleece between layers (EF Resin).
 - 3. Fleece: Non-woven needle-punched polyester reinforcement fabric; white in color; 50 mils thick (HP Fleece).
 - 4. Urethane Caulking.
 - L. Roof drains and plumbing vents have traditionally been specified in the roofing specification and typically have included the use of lead (metal) flashing. Neither application is a part of a roof warranty. Liquid flashing can replace lead flashing in drains and plumbing vents and be a part of the roof warranty. Select which methods fit this project and delete the others. Detail needs to coincide with specified products.
 - M. Drains: 30” by 30” square, 4 pound per square foot lead.
 - N. Plumbing Vents: 4 pound per square foot lead.
 - O. Liquid Flashing Drains: Liquid flashing system consisting of one layer of primer, two layers of resin, and one layer of a 50 mil thick polyester fleece.
 - P. Liquid Plumbing Vents: Liquid flashing system consisting of one layer of primer, two layers of resin, and one layer of a 50 mil thick polyester fleece.
 - Q. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing membrane.
10. WALKWAYS
- A. Walkway granule color shall contrast the field membrane color; color as selected by the Owner from manufacturer’s full range.
 - B. Granule-Surfaced Roofing Membrane Cap Sheet: minimum 155 mil thick modified asphalt sheet; granular surfaced; fire rated (FR) suitable for application method specified.

11. OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation of the work in this Section shall be as selected by the Contractor, approved by the manufacturer, and subject to approval by the Owner.

3.EXECUTION

1. EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that cants, 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 complies with requirements in Section 053100 "Steel Decking."
 - 4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. [If acoustical deck is not used, delete paragraph below.](#)
- D. Install insulation strips on spacers to hold off of deck surface, in ribs of acoustical roof deck according to acoustical roof deck manufacturer's written instructions.
- E. [Delete Substrate Board and Vapor Retarder installations listed below if not required.](#)

3. SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' "Roof Nav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
 - 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions penetrating deck 3/4-inch.

4. VAPOR-RETARDER INSTALLATION

- A. Self-Adhering Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
- B. Built-up Vapor Retarder: Install two glass-fiber felt plies lapping each felt 19 inches over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt at a rate of 20 pounds per square. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 25 degrees F of equiviscous temperature.
- C. Roofing Membrane Sheet Vapor Retarder: Adhere 120 mil modified asphalt base sheet (reinforced with a polyester mat or glass fiber mat) using roofing system manufacturer's cold-applied adhesive at a rate of 1.5-2.5 gallons per square.
- D. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

5. INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions.
- B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. 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.
- E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces and at roof drains to create a 4' sump.
- H. [If an acoustical deck is not used, remove sentence 3 listed below.](#)
- I. Mechanically Fastened and Adhered Insulation System: Install base layer and subsequent 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 FM Global's "Roof Nav" for specified Windstorm Resistance Classification.
 - 2. Steel Roof Deck: Fasteners to be installed through raised ribs of deck only. No fasteners shall protrude below bottom of steel roof deck. Penetrate a minimum of 3/4 inches.

3. Acoustical Steel Roof Deck: Fasteners to be installed through raised ribs of deck only. No fasteners shall protrude below bottom of acoustical roof deck. Penetrate a minimum of $\frac{3}{4}$ inches and a maximum of $1\frac{1}{4}$ inches.
 4. Fasten base and subsequent layers of insulation according to requirements in FM Global's "Roof Nav" for specified Windstorm Resistance Classification.
 5. Set each taper insulation and insulation crickets in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 6. Set taper insulation and insulation crickets in hot asphalt, firmly pressing and maintaining insulation in place.
- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together. Adhere to roof insulation as follows:
1. Temperature of adhesive, substrate, and ambient conditions shall be within the manufacturer's recommended ranges during installation of insulation adhesive.
 2. Prepare substrate to receive polyurethane adhesive as recommended by the adhesive manufacturer.
 3. Seal around all penetrations and roof perimeters to ensure no adhesive drippage below the deck level.
 4. The minimum application rate shall be as required to meet FM Global performance requirements.
 5. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 6. Bead application patterns, and perimeter and corner areas shall be installed to achieve specified performance requirements.
 7. Set cover board in hot asphalt, firmly pressing and maintaining insulation in place.
6. ROOFING INSTALLATION, GENERAL
- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
1. Deck Type: I (insulated).
 2. Adhering Method: L (cold-applied adhesive).
 3. Number of Modified Asphalt Sheets: Two.
 4. Surfacing Type: M (mineral-granule-surfaced cap sheet).
- C. Start installation of roofing in presence of manufacturer's technical personnel.
- D. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
1. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
 2. Remove and discard temporary seals before beginning work on adjoining roofing.

7. MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. As a reminder, membranes are to be installed using cold adhesive. All laps to be hot air welded.
- B. Install modified bituminous roofing sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing sheets over and terminate beyond cants, installing as follows:
1. Adhere to substrate in cold-applied adhesive.
 2. Unroll roofing sheets and allow them to relax for minimum time period required by manufacturer.
 3. Temperature of adhesive, membrane and ambient conditions shall be within the manufacturer's recommended ranges during roof membrane application.
 4. Adhesive application methods shall conform to manufacturers accepted practices. Notched squeegees, adhesive spreaders, and spray equipment are acceptable, subject to manufacturer's approval.
 5. Adhesive shall be applied at the minimum rate of 1-1/2-to 2 1/2 gallons per 100 sq. ft. Where porous substrates exist, the application rate for the base ply may need to be increased to ensure full adhesion. Application rates shall be determined by the Contractor and manufacturer for bidding and installation purposes.
- C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
1. Repair tears and voids in laps and lapped seams not completely sealed.
 2. The following methods of lap adhesion shall be used for each listed component:
 - a. Field Membrane Base Ply: Hot air welding.
 - b. Field Membrane Top Ply: Hot air welding.
 - c. Flashing Base Ply: Hot air welding.
 - d. Flashing Top Ply: Hot air welding.
 - e. Flashing Strip-in Ply: Hot air welding.
 3. Where hot air welding of flashing laps is specified, all edges, including the flashing-to-field membrane lap, shall be prepared and hot air welded.
 4. Take care not to track, spill or apply adhesive over onto the finished exposed membrane. All exposed adhesive or excessive hot-weld bleed shall have #11 granules broadcast and pressed into the adhesive while still fluid, so that the finished appearance is uniform and neat.
 5. Follow manufacturer's recommendations regarding length of time first layer of modified bitumen membrane may be exposed to the weather, prior to installation of the second layer. Maximum time allowed shall be 60 calendar days.
- D. Install roofing sheets so side and end laps shed water.

8. BASE FLASHING INSTALLATION

- A. Prime all masonry and concrete substrates with asphalt primer at the rate of 3/4 gallons per 100 square feet. Allow primer to dry prior to adhesive application.
- B. Bridge all junctures of vertical and horizontal surfaces with 45-degree cant strips, except where an existing wood cant is specified to remain or a prefabricated metal curb cant already exists. Wood cants, where shown, shall be properly fastened, other cants shall be fully adhered with manufacturer's recommended adhesive.

- C. Install two-ply modified bitumen base flashings in adhesive according to the manufacturer's current published application instructions, unless superseded by the requirements of this Section. Stagger laps between flashing plies.
- D. All base flashings shall be installed in 39-inch long pieces cut from the end of the roll. Flashing lap shall be bonded to the selvedge edge of the preceding flashing.
- E. Uniform coat(s) of adhesive shall be applied using a glove or a notched trowel; 1/16th inch on substrate and 1/16th of back of membrane (1/8" total). Flashings shall be thoroughly rolled or rubbed in. Loose or poorly bonded flashings will not be accepted. Fasten top edge of base flashing using the specified securement devices immediately after flashing installation. Masonry anchor spacing shall be 8 inches on center maximum. Nail spacing shall be 6 inches on center maximum.
- F. Unless top edges of base flashings are covered by single-ply curb/wall coverings, top edges shall be thoroughly sealed with one ply of reinforcing fabric fully embedded in asphalt roof cement immediately after layup.
- G. All inside and outside corners shall be three-coursed with asphalt roof cement and reinforcing fabric with #11 granules broadcast and pressed into the asphalt roof cement while wet.
- H. Flashing height shall be a minimum of 8 inches above finished roof height.
- I. Avoid applying bituminous materials over locations to receive caulking during subsequent sheet metal work. All such materials shall be thoroughly removed to the substrate prior to caulk application.

9. STRIP-IN FLASHING INSTALLATION

- A. [Strip in flashing includes metal edge, plumbing vents, and drains. Need to select either sheet metal and lead sheet metal or liquid flashing. Liquid flashing can be a part of the roof warranty. Select one method or the other or a combination then delete items not used.](#)
- B. **Roof Edge with Sheet Metal:** Install field ply of membrane under location to receive metal flange. Install metal flange embedded in asphalt roofing cement. Metal flanges that are required to be fastened shall be fastened with annular or ring shank nails 3 inches on center staggered. Prime top of metal flanges, then install surface cap sheet in adhesive over metal flange. Seal edge of membrane to sheet metal surface with a tooled bead of approved sealant.
- C. **Roof Drains with Lead Metal:** Install a 4' by 4' drain sump using tapered edge strip. Install field membrane into drain under location to receive clamping ring. Set 30-by-30-inch square lead flashing in bed of roofing-manufacturer-approved asphaltic adhesive on completed roofing membrane. Prime surface of lead flashing and allow to dry. Cover lead flashing with roofing membrane cap-sheet stripping and under location to receive clamping ring. Clamp filed roofing membrane, lead flashing, and surface membrane into roof-drain clamping ring. Set clamping ring and drain strainer. Install stripping according to roofing system manufacturer's written instructions.
- D. **Plumbing Vents with Lead Metal:** Set 30-by-30-inch square lead flashing in bed of roofing-manufacturer-approved asphaltic adhesive on completed roofing membrane. Prime surface of lead flashing. Cover metal flashing with roofing membrane cap sheet and extend 4 inches beyond edge of metal flashing onto field of roof membrane. Bend top of lead flashing down into the penetration a minimum of two inches.

- E. Liquid Flashing (General): Asphalts and plastic cement must be kept out of contact with or encapsulated with urethane caulking at area where primer and resin will be applied. Liquid flashing can be applied only to granule or acrylic surfaces. Substrate needs to be cleaned which typically means that loose granules are swept away. Substrate must be completely dry prior to application of liquid flashing. Metal needs to be abraded and wiped clean with Methyl Ethel Ketone (MEK). Tape can be painter's tape or duct tape and is used to square up all strip in flashings. Primer requires three hours of cure time while resin may require up to sixteen hours to cure.
- F. Roof Edge with Liquid Flashing: Clean substrate, abrade metal penetration a minimum of 9 ½" vertical above the roof surface and wipe metal clean. Seal the penetration where the roof surface and penetration meet with urethane caulk. Install tape a minimum of nine-inches up the vertical of the penetration and eight-inches on the field of the roof. Pre-cut fleece to stop within 9" of the vertical and 7 ½" horizontal allowing for two-inch overlap. Install primer to within ¾" of vertical and horizontal tape. Allow primer to cure. Install resin to vertical and horizontal fields. Install pre-cut fleece, first the horizontal pieces, then the vertical pieces. Install additional resin to fully saturate the fleece. After 30 minutes, remove tape. Allow resin to cure. Granules; approximately 15 minutes after the top resin layer has been installed, cast granules into the still fluid liquid flashing. Granule color to match color of surface cap sheet.
- G. Plumbing Vents with Liquid Flashing: Clean substrate, abrade metal penetration a minimum of 9 ½" vertical above the roof surface and wipe metal clean. Seal the penetration where the roof surface and penetration meet with urethane caulk. Install tape a minimum of nine-inches up the vertical of the penetration and eight-inches on the field of the roof. Pre-cut fleece to stop within 9" of the vertical and 7 ½" horizontal allowing for two-inch overlap. Install primer to within ¾" of vertical and horizontal tape. Allow primer to cure. Install resin to vertical and horizontal fields. Install pre-cut fleece, first the horizontal pieces, then the vertical pieces. Install additional resin to fully saturate the fleece. After 30 minutes, remove tape. Allow resin to cure. Granules; approximately 15 minutes after the top resin layer has been installed, cast granules into the still fluid liquid flashing. Granule color to match color of surface cap sheet.
- H. Pitch Pans with Liquid Flashing: Clean substrate, abrade metal penetration a minimum of 9 ½" vertical above the roof surface and wipe metal clean. Seal the penetration where the roof surface and penetration meet with urethane caulk. Install tape a minimum of nine-inches up the vertical of the penetration and eight-inches on the field of the roof. Pre-cut fleece to stop within 9" of the vertical and 7 ½" horizontal allowing for two-inch overlap. Install primer to within ¾" of vertical and horizontal tape. Allow primer to cure. Install resin to vertical and horizontal fields. Install pre-cut fleece, first the horizontal pieces, then the vertical pieces. Install additional resin to fully saturate the fleece. After 30 minutes, remove tape. Allow resin to cure. Granules; approximately 15 minutes after the top resin layer has been installed, cast granules into the still fluid liquid flashing. Granule color to match color of surface cap sheet.
- I. Roof Drains with Liquid Flashing: Clean membrane surface, abrade metal, wipe clean cast iron bowl, and install tape one-inch outside of the drain sump. Pre-cut fleece to fit into drain bowl and overlap two-inches while covering sump. Install urethane caulking under clamping ring and install clamping ring to provide temporary moisture sealant. Remove clamping ring (keep holes covered or plugged to prevent primer & resin from entering bowl holes). Install primer in the abraded area of the drain bowl stopping ½" short of the beginning of the tape and off clamping ring. Allow primer to cure. Install resin in abraded portion of bowl, sump, and one-inch outside of sump. Install pre-cut fleece into drain and sump. Install additional resin to fully saturated fleece. Reinstall clamping ring while resin is still wet. After 30 minutes, remove tape around sump. Allow resin to cure.

10. WALKWAY INSTALLATION

- A. Walkway Strips: Install walkway cap-sheet strips over roofing membrane using manufacturer-recommended application method.
- B. Verify walkway locations with the Owner's representative prior to installation.
- C. Chalk line walkway locations prior to installation to ensure a neat appearance.
- D. Neatly prime area to receive walkway and allow primer to dry. Confine priming to areas being covered by walkways.
- E. Space panels with 2-inch gaps for drainage, granule side up.

11. FIELD QUALITY CONTROL

- A. Under the terms of the roof warranty, a roofing membrane manufacturer's technical representative or a third party agent should complete the services listed below. A suggestion is to leave each paragraph in place so each specified manufacturer has these services covered.
- B. Field Audits (option 1): As part of the warranty, the membrane manufacturer's technical representative shall attend the pre-installation conference, conduct a site visit on the first day of construction, and conduct a site visit for every two weeks of construction.
- C. Field Audits (option 2): As part of the warranty, a third party agent shall attend the pre-installation conference, conduct a site visit on the first day of construction, and conduct a site visit for every two weeks of construction.
- D. Quality Control Form (provided by roofing manufacturer):
 - 1. Contractor is to complete daily quality control form which is included in the documents. Contractor is to note on provided roof plan areas of daily construction. Completed forms are to be submitted with warranty completion notice.
- E. Roof Moisture Survey (option 1): As a part of the warranty, membrane manufacturer's technical representative shall check for moisture on completed work during designated site visits and final inspection. If wet areas are noted, contractor shall repair areas prior to final acceptance.
- F. Roof Moisture Survey (option 2): As a part of the warranty, third party services shall check for moisture on completed work during designated site visits and final inspection. If wet areas are noted, contractor shall repair areas prior to final acceptance.
- G. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- H. Roofing system will be considered defective if it does not pass tests and inspections.
 - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

12. PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

13. ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner: <Insert name of Owner>.
 - 2. Address: <Insert address>.
 - 3. Building Name/Type: <Insert information>.
 - 4. Address: <Insert address>.
 - 5. Area of Work: <Insert information>.
 - 6. Acceptance Date: _____.
 - 7. Warranty Period: <Insert time>.
 - 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. The wind speed listed below is not to be confused with wind riders to a roof warranty. The wind speed listed below is from a chart used for calculating wind loads.
- E. This Warranty is made subject to the following terms and conditions:
 - 1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 115 mph
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

F. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07550