

SECTION 07 53 23 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING
(ADDENDUM 001)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Adhered ethylene-propylene-diene-monomer (EPDM) roofing system.
 2. Self-adhering, ethylene-propylene-diene-monomer (EPDM) roofing system.
 3. Loosely laid and ballasted, ethylene-propylene-diene-monomer (EPDM) roofing system.
 4. Roof insulation.
 5. Cover board.
 6. Walkways.
 7. Perimeter roof edge trims.
 8. Nailers / Anchor Bolts
 9. Flashing and Sheet Metal Materials.
- B. Related Requirements:
1. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
 2. Section 22 10 06 "Plumbing Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. **Submit a completed Pre-Installation "Notice PIN" or "Notice of Award"** sent to the manufacturer from the Architect for review and approval. The PIN shall be reviewed by the roofing membrane system manufacturer's engineering department and be approved and signed off by a technical representative.
 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 4. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 5. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
 6. Review structural loading limitations of roof deck during and after roofing.

7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.
11. Re-roofing for existing roof nailers / blocking to remain: Field verify all existing nailers / blocking will comply to meet the wind loads requirements as stated in this spec or drawings

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. For insulation and roof system component fasteners
- C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 1. Thickness of insulation with Long Thermal Resistance (LTTR) values for polyisocyanurate materials for general field state specifically the density of all insulation types used on the project.
 2. Base flashings and membrane termination details.
 3. Flashing details at penetrations.
 4. Shop drawing showing cover board and insulation board stock size with fastening patterns for corner, perimeter, and field-of-roof locations for mechanically fastened of roofing system to comply with Wind Uplift Resistance and Warranty / Wind Speed coverage.
 5. Perimeter roof edge trim: Submit manufacture's specifications and other data required to demonstrate compliance with the specified requirements. If NRCA (National Roofing Contractors' Association) Embedded Edge Detail No.3 is used, then provide verification that supplier and installer are listed as approved current NRCA fabricator / installer. Provide data sheet for nails and verify length and gauge.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates:
 1. Project must be inspected by roofing manufacturer's representative to be eligible for warranty. Components must be supplied by or approved by roofing system manufacturer.
 2. Make all required notifications and secure all required inspections by the manufacturer of the approved materials to facilitate issuance of the specified roof warranty. Upon completion of the installation, an inspection shall be conducted by a Technical Representative of the manufacturer to ascertain that the membrane roofing system has been installed according to the manufacturer's published specifications and details applicable at the time of bid. The contractor shall notify the Architect and Owner's representative of the upcoming inspection so that both may attend the manufacturer's inspection. A copy of the field representative's written inspection report shall be faxed, mailed or emailed to the Architect within 3 days after inspection by the technical representative.
 3. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- C. Evaluation Reports: For components of roofing system, from ICC-ES.

1. Field Test Reports:
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Roof system installed exclusively by a licensed applicator authorized by the manufacturer. Applicator shall supply certificate of licensing to Architect at time of bid. The system shall be inspected and approved by an authorized manufacturer's representative.
- B. Qualifications of Installer:
 1. The contractor and his personnel shall be currently approved by the manufacturer of the approved products as qualified to install the materials of the Section.
 2. Qualified installers shall have installed the below system for a period of not less than five (5) years.
 3. Qualified installers shall have successfully completed a project of similar size and scope.

1.9 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.

1.10 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.

1.11 WARRANTY

- A. Warranty:
 1. Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
 2. Provide "Certification Letters" from secondary suppliers providing components that are not manufactured by but are still covered under the roof system manufacturer's "Total System" Warranty. Certification letter shall state this supplying manufacturer will provide full warranty coverage of their products within the total system warranty requirements of the roof membrane manufacturer.

3. Warranty Period: 20 years from Date of Substantial Completion.
4. Warranty Wind Speed Coverage 72-mph.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system 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 flashings shall remain watertight.
 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to UL 580, or UL 1897 see drawings for ASCE-7 Wind Uplift Design Loads

2.2 ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

- A. EPDM Sheet: ASTM D 4637/D 4637M, Type I, non-reinforced, adhered or self-adhering EPDM sheet with factory-applied seam tape for adhered application, contractor's option.
 1. EPDM "Black" Membrane Materials at adhered roofing areas:
 - a. Carlisle SynTec; Sure-Seal with SecurTape (adhered) or Sure-Seal SAT (self-adhered technology www.carlisle-syntec.com)
 - b. Firestone Building Products Co.; RubberGuard with QuickSeam Tape (adhered) or FullForce (self-adhered technology: www.firestonebpc.com)
 - c. Johns Manville; JM EPDM FIT (adhered): www.jm.com
 2. Thickness: 60 mils nominal.
- B. EPDM Sheet: ASTM D 4637/D 4637M, Type II, non-reinforced, loose laid EPDM sheet with factory-applied seam tape, contractor's option at ballasted roofing areas.
 1. EPDM "Black" Membrane Materials:
 - a. Carlisle SynTec; Sure-Seal with SecurTape: www.carlisle-syntec.com
 - b. Firestone Building Products Co.; RubberGuard LSFR with QuickSeam Tape: www.firestonebpc.com
 - c. Johns Manville; JM EPDM FIT: www.jm.com
 2. Thickness: 60 mils nominal.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components and total system warranty.
 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8-inch-thick; with anchors.

- C. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, pre-punched.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening components to substrate, and acceptable to roofing system manufacturer.

2.4 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2 felt or glass-fiber mat facer on both major surfaces.
 - 1. InsulBase by Carlisle
 - 2. ISO 95+ by Firestone
 - 3. Enrgy-3 by Johns Manville
 - 4. Compressive Strength: 20 psi
 - 5. Size: 48 by 48 inches for adhered boards, 48 by 96 inches for mechanically fastened insulation respectively.
 - 6. Thickness:
 - a. Insulation shall be (1) layer of 1.5" for 8.6" LTTR at ballasted roofing areas.
 - b. Insulation shall be (1) layer of 1.0" for 5.7" LTTR at adhered roofing areas with cover board.
- B. Tapered Insulation: Provide factory-tapered insulation boards at areas where existing taper insulation needs to be replaced.
 - 1. Material: Polyisocyanurate
 - 2. Minimum Thickness: 1/4 inch.
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Mechanically Fasten Insulation Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Adhered Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as total system warranty dictates.
- D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
 - 1. DensDeck Prime with EONIC technology, 1/2" thick glass mat faced gypsum panel by Georgia-Pacific Gypsum LLC
 - a. Water Absorption (ASTM C473): Less than 5 percent of weight.
 - b. Surface Water Absorption (ASTM C473): Nominal 1.0 grams.

- c. Compressive Strength (applicable Sections of ASTM C472) Nominal 900 pounds per square inch.
2. Securock, 1/2" thick gypsum-fiber roof board by USG
3. Surface Finish: Factory primed for adhered installation.

2.6 WALKWAYS

- A. Concrete Roof Pavers: Furnish and install 24" square concrete pavers as noted on drawings. Pavers shall meet ASTM C140 with values of 28-day compression strength of 8,000lb per foot minimum and water absorption less than 5% (normal). Freeze/Thaw: Durability of the paver shall meet freeze/thaw tests in accordance with ASTM C67. Specimens, when tested, shall have no breakage and not greater than 1% loss in dry weight of any individual unit when subject to 50 cycles of freeze/thaw. Pavers shall be installed per manufacturer's recommendations. No lightweight pavers allowed. Color to be selected from manufacturer's Standard color by architect.
 1. Prest Walkway / Ballast Paver manufactured by Hanover, 1.13/16" thick, 23lbs/sf.
 2. Plaza Paver manufactured by Westile, 1.7/8" thick, 21lbs/sf.
 3. Terra-Paver manufactured by Wausau Tile, 2" thick, 24lf/s

2.7 BALLAST

- A. Ballast Criteria based on ANSI/SPRI RP-4 for 55-mph 20-year Warranty.
- B. Aggregate Ballast: Smooth, washed, riverbed gravel or other acceptable smooth-faced stone that withstands weather exposure without significant deterioration and does not contribute to membrane degradation, of the following size:
 1. Roof Areas 2, 3, 4, 5 ANSI/SPRI RP-4 system 2, Ballast Size: 1.5" nominal in the field at 1000 lbs. per square and 2.5" nominal in the perimeter and corners at 1,300 lbs. per sq.
 2. Roof Areas 6, 10, 11, 12 ANSI/SPRI RP-4 system 1, Ballast Size: 1.5" nominal in all zones at 1000 lbs. per square

2.8 PERIMETER ROOF EDGE TRIM

- A. High performance roof edge system shall be certified by the manufacturer to comply with ANSI/SPRI Standards ES-1. Roof edge shall meet performance design criteria according to the following test standards:
 1. ANSI/SPRI ES-1 Test Method RE-1 Test for Roof Edge Termination of Single-Ply Roofing membranes: The fascia system shall be tested to secure the membrane to minimum of 100 lbs. /ft. in accordance with the ANSI/SPRI ES-1 Test Method RE-1. Use the current edition of ANSI/SPRI ES-1 *Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems*.
 2. ANS/SPRI ES-1 Test Method RE-2 Pull-Off Test for Fascia: The fascia system shall be tested in accordance with the ANSI/SPRI ES-1 Test Method RE-2. Use the current edition of ANSI/SPRI ES-1 *Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems*.
 3. Perimeter Roof Edge Trim- Two-Piece (prefabricated with extruded aluminum rails) and Extenders as required:
 - a. Presto-Tite Fascia by Johns Manville.
 - b. AnchorGard SP (Single Ply) Fascia by Firestone.
 - c. SecurEdge 2000 Fascia by Carlisle.

- d. Sizes shall be 4", 5-1/2", 7" or 8-1/2" face heights as shown on drawings and details. All fasteners for this fascia edge system shall be stainless steel #2 x 2" long. The former #12 x 1.5/8" corrosion resistant fasteners will no longer be accepted.
- e. Acceptable substitution is NRCA Embedded Edge Detail No. 3 that is rated for 24 gauge, galvanized steel or 0.040" aluminum. Nails shall be W.H. Maze Co. 1-1/2" ring shank, .120-inch gauge, double hot-dipped galvanized, no substitutions. Nail coating shall meet ASTM A-153 hot-dipped galvanized nails; electro plated nails are not allowed.
- f. Material and Finish: 24 gauge, 0.024" galvanized steel finish standard color as selected by Architect. Provide matching concealed joint splice plates; factory-installed protective plastic film.
- g. Fascia Extender with cont. cleat: to match perimeter edge trim in material and color.
- h. Functional Characteristics: retainer supports while allowing for free thermal cycling of perimeter edge trim.
- i. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPSM splices to allow thermal expansion.
- j. Anchor Bar Cleat: 20 gauge, 0.036" G90 coated commercial type galvanized steel with pre-punched holes.
- k. Fasteners: Factory-provided stainless-steel fasteners, with drivers; no exposed fasteners permitted.

2.9 NAILERS

- A. Nailers: Wood shall be #2 or better lumber and "Wolmanized" or pressure treated for fire and rot resistance. Creosote and asphaltic preservatives are not acceptable. Nailers shall be provided and installed by Roofing Contractor. Sizes and number as shown on the drawings.
 - 1. Re-roofing for existing roof nailers / blocking to remain: Field verify all existing nailers / blocking will comply to meet the wind loads requirements as stated in this spec or drawings
- B. Nailers shall be secured per Roofing Manufacturer's specifications to meet wind load requirements and as required by manufacturer.
- C. Wood to wood blocking fastening: include the Fastening Enhancement at Corners Detail to define the screw spacing within 8'-0" of the building roof corner. Treated wood nailers shall be attached using two staggered rows of screws with spacing at 12" on center each row which results in screws being spaced 6" on center in alternating rows. Standard screw spacing at edges 8'-0" or more away from the corners shall be 24" on center in two rows (one inside and one outside at the wood nailers) to give essentially a spacing of 12" on center alternating.
- D. Wood blocking to masonry fastening: 1/2" anchor bolts cast into block grout cores at 24" O.C., HILTI screw anchors 1/2" diameter with 2 1/2" embed center on block grouted cores at 24" O.C.
- E. Metal Deck Nailers: Nailers on metal deck shall be fastened with No. 10 galvanized sheet metal screws with minimum of 5/8" dia. Steel washer at 24" O.C. Stagger screws at 12" o.c. Fasten wood nailers and blocking to deck in conformance with Factory Mutual Publication 1-49.

2.10 FLASHING AND SHEET METAL MATERIALS

- A. Flashing, Miscellaneous Trim and Spill out Scuppers:
- B. Material shall be 24-gauge G-90 galvanized steel with Kynar 500 finish. 0.040". All flashings and metals to be an EPDM compatible metal as required by Roofing manufacturer's warranty.

- C. Color shall be as selected by the Architect: Kynar –500 galvanized steel from standard colors.
- D. Provide a 20-year warranty for color fastness and material.
- E. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14" long legs on corner pieces.
- F. Sealant: FS TT-S-00227 E (3), Type II, Class A.
- G. Primer Coating: FS TT-P-641 G, Type II.
- H. Equipment Rails will be furnished and installed by Mechanical. Flash roofing to equipment rails; coordinate with Mechanical.
- I. Clips: Shall be minimum width 2" of same material and thickness as sheet metal.
- J. Wall Reglets: Flashing systems shall be surface mounted, masonry reglets, concrete reglet, and stucco reglet as detailed and shown on the drawings. Mill aluminum. Reglets shall be two-piece interlocking flashing or one piece flashing as detailed on drawings with .050" receiver (reglet head) and an .032 counter flashing piece. Reglets shall be by Ryerson, W.P. Hickman, Petersen Aluminum Corp., or Fry Reglet Corporation.

PART 3 - EXECUTION

3.1 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 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 complies with requirements in Section 05 31 00 "Steel Decking."
 - 4. Items 4-8 can be deleted when you are not putting roof on a concrete deck. Retain or revise subparagraphs below for concrete roof decks.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system 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. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 - 1. Submit test result within 24 hours of performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

- B. Install roof membrane and auxiliary materials to tie into existing roofing to maintain weather tightness of transition and to not void warranty for existing roofing system.
- C. Installation Over Metal Decking:
 - 1. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Install insulation to resist specified uplift pressure at corners, perimeter, and field of roof based on wind speed design.
 - b. Staggered end joints within each layer not less than 24 inches in adjacent rows for 48" x 48" boards.
 - c. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - d. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - e. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - f. At internal roof drains, use preformed 4'-0" x 4'-0" slope drain set. Polyisocyanurate foam core with glass fiber facer with a slope 0.5" per ft. to drain. Thickness as required to match adjacent insulation field to provide unrestricted flow to drain
 - 1) Gemini (DST) by Atlas Roofing or equal
 - g. Trim insulation so that water flow is unrestricted.
 - h. Fill gaps exceeding 1/4 inch with insulation.
 - i. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- D. Installation Over Ballasted Roofing:
 - 1. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Install insulation to resist specified uplift pressure at corners, perimeter, and field of roof based on wind speed design
 - b. Staggered end joints within each layer not less than 24 inches in adjacent rows for 48" x 48" boards.
 - c. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows for 48" x 96" boards.
 - d. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - e. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - f. At internal roof drains, use preformed 4'-0" x 4'-0" slope drain set. Polyisocyanurate foam core with glass fiber facer with a slope 0.5" per ft. to drain. Thickness as required to match adjacent insulation field to provide unrestricted flow to drain
 - 1) Gemini (DST) by Atlas Roofing or equal
 - g. Trim insulation so that water is unrestricted.
 - h. Fill gaps exceeding 1/4 inch with insulation.
 - i. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

3.4 INSTALLATION OF COVER BOARDS

- A. 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.
 - 1. Install cover boards to resist specified uplift pressure at corners, perimeter, and field of roof based on wind speed design
 - 2. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 3. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 4. Cut and fit cover board tight to nailers, projections, and penetrations.

3.5 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll membrane roof membrane and allow to relax before installing.
- C. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
 - 3. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.
- F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
- G. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
- H. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.6 INSTALLATION OF SELF-ADHERING ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow membrane to relax before installing.

- C. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Fold roof membrane to expose half of sheet width's bottom surface.
 - 1. Remove release liner on exposed half of sheet.
 - 2. Roll roof membrane over substrate while avoiding wrinkles.
- E. Fold remaining half of roof membrane to expose bottom surface.
 - 1. Remove release liner on exposed half of sheet.
 - 2. Roll roof membrane over substrate while avoiding wrinkles.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
 - 3. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.
- I. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
- J. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.
 - 1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
 - 2. Apply lap sealant and seal exposed edges of roofing terminations.
- K. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- L. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.
- M. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- N. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- O. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 INSTALLATION OF WALKWAYS

- A. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions.
 - 1. Install roof paver walkways at the following locations:
 - a. Locations indicated on Drawings.

3.9 FLASHING AND SHEET METAL

- A. Examination:
 - 1. Verify that substrates are smooth and clean to extent needed for sheet metal work.
 - 2. Verify that reglets, nails, cants and blocking to receive sheet metal are installed and free of concrete and soil.
 - 3. Do not start sheet metal work until conditions are satisfactory.
- B. Preparation: Before installing sheet metal, verify shapes and dimensions of surface to be covered.
- C. Installation:
 - 1. General:
 - a. Install work watertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
 - b. Hem exposed edges.
 - c. Angle bottom edges of exposed vertical surfaces to form drips.
 - d. Install flashing and sheet metal to comply with Architectural Sheet Metal and Air Conditioning Contractor's National Association, Inc.
- D. Spaced Clips:
 - 1. 2'-0" o.c.
 - 2. Secure to substrate with fasteners and cover heads with clip tabs.
- E. Concealed splice cleat at each material joint at 10' o.c. Install with continuous bed of sealant and color matching seam sealant.
- F. Sealant Installation: Apply 1/4" diameter bead, centered on full length of joint.
- G. Roof Counter flashing:
 - 1. Overlap base flashing 4" minimum.
 - 2. Install bottom edge tight against base flashing.
 - 3. Lap seam vertical joints 3" minimum and apply sealant.
 - 4. Miter, lap seam, and close corner joints with solder or sealant.
- H. Equipment Support Flashing:
 - 1. Fully cap support.
 - 2. Overlap base flashing 4".

3. Solder-lap joint.
 4. Provide sealant around penetration through flashing.
- I. Adjusting and Cleaning:
1. Leave work clean and free of stains, scrap and debris.
 2. Repair or replace damaged work.

3.10 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 system, inspect roofing system 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.

END OF SECTION