

SECTION 075556 - FLUID-APPLIED PROTECTED MEMBRANE ROOFING

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 reinforced, hot fluid-applied protected membrane roofing.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 - 3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
 - 4. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. Roofing Terminology: See 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.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, 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. Review substrate requirements for conditions and finishes, including flatness.
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 affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing during and after installation.
9. Review interior and exterior environmental conditions including the operation and protection of outside air intakes adjacent to roof installation.
10. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

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2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
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1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
 1. Show locations, extent, and details of roof pavers.
- C. Samples for Verification: For each of the following products:
 1. Flashing material, of color required.

2. Roof paver, in each color and texture required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 1. Submit evidence of compliance with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports and manufacturer's final roof inspection report.
- E. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. 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.
- B. Mockups: Install roofing on 100 sq. ft. (9.3 sq. m) of deck to demonstrate surface preparation, joint and crack treatment, thickness of roofing, and execution quality. Install insulation and roof pavers over roofing membrane.
 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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. Handle and store roofing materials, and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

- 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.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer. Do not apply roofing to a damp or wet substrate or when temperature is below zero deg F (minus 18 deg C).
 - 1. Do not apply roofing in snow, rain, fog, or mist.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Warranty also includes base flashings, insulation, roof pavers, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as base flashing, board insulation, roof pavers for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roofing materials sheet flashings, protection course, insulation and pavers from single source from single manufacturer.

2.2 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. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
1. Corner Uplift Pressure: -107.7 lbf/sq. ft.
 2. Perimeter Uplift Pressure: -71.5 lbf/sq. ft.
 3. Field-of-Roof Uplift Pressure: -42.6 lbf/sq. ft.
- 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's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-120.
 2. Hail Resistance: SH.
- E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- F. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

2.3 ROOFING MEMBRANE

- A. Hot Fluid-Applied, Rubberized-Asphalt Roofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
1. Basis-of-Design Product: Subject to compliance with requirements, provide American Hydrotech, Inc; Monolithic Membrane 6125 or comparable product by one of the following:
 - a. Barrett Company; Ram-Tough 250.
 - b. Carlisle Coatings & Waterproofing Inc; CCW-500R.
 - c. Henry Company; 790-11.
 - d. Tremco Incorporated; Tremproof 150.

2.4 BASE FLASHING SHEET MATERIALS

- A. Surface Conditioner:
1. A surface conditioner for concrete surfaces - American Hydrotech, Inc., Surface Conditioner.

- B. Elastomeric Flashing Sheet and reinforcing:
 - 1. 60-mil (1.5 mm) thick, uncured neoprene flashing/(heavy duty) reinforcing sheet - American Hydrotech, Inc., Flex Flash UN.
 - 2. Spunbonded polyester fabric reinforcing sheet - American Hydrotech, Inc., Flex Flash F.

- C. Adhesives/Sealant:
 - 1. Contact adhesive to bond elastomeric flashing together - American Hydrotech, Inc., Splicing Cement.
 - 2. Contact adhesive to bond elastomeric flashing to an approved substrate - American Hydrotech, Inc., Bonding Adhesive.
 - 3. Sealant to seal elastomeric flashing seam edge - American Hydrotech, Inc., Lap Sealant.

- D. Protection Course:
 - 1. A fiberglass reinforced rubberized asphalt sheet - American Hydrotech, Inc., Hydroflex 30.

- E. Prefabricated Drainage Course:
 - 1. A composite drainage system consisting of a three-dimensional, crush-proof, drainage core and a filter fabric meeting the following physical properties - American Hydrotech, Inc., Hydrodrain 400 series.
 - a. Compressive Strength: 15,000 psf
 - b. Thickness: .40 in
 - c. Flow, Q @ 3600 psf & hydraulic gradient of 1: 15 gpm/ft width

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approved roof insulation.

- B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VII, 2.2 lb/cu. ft. (35 kg/cu. m), with rabbeted edges and with one side having ribbed drainage channels.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Dow Chemical Company (The). or comparable product by one of the following:
 - a. DiversiFoam Products.
 - b. Owens Corning.
 - c. Pactiv Corporation.

2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

2.7 BALLAST

- A. Roof Pavers: Heavyweight, hydraulically pressed, concrete units, with top edges beveled 3/16 inch (5 mm), factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hanover Architectural Products, Inc.
 - b. Hastings Pavement Company, LLC.
 - c. Roofblok Limited.
 - d. Sunny Brook Pressed Concrete Co.
 - e. Wausau Tile Inc.
 - f. Westile Roofing Products.
 2. Size: 24 by 24 inches (600 by 600 mm). Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch (1.6 mm) in length, height, and thickness.
 3. Weight: 18 lb/sq. ft. (90 kg/sq. m).
 4. Compressive Strength: 7500 psi (52 MPa), minimum; ASTM C 140.
 5. Colors and Textures: As selected by Architect from manufacturer's full range.

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 cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations.
 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. 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 installation according to roofing system manufacturer's written instructions.

- B. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.
- C. Mask off adjoining surfaces not receiving roofing to prevent spillage from affecting other construction.
- D. 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.

3.3 JOINTS, CRACKS, AND TERMINATIONS

- A. Prepare and treat substrates to receive roofing, including joints and cracks, roof drains, and penetrations, according roofing system manufacturer's written instructions.
 - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
 - 2. Adhere strip of elastomeric sheet to substrate in a layer of hot fluid-applied, rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches (150 mm) on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch (3 mm) thick, and beyond roof drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
 - 3. Embed strip of reinforcing fabric into a layer of hot fluid-applied, rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches (150 mm) on each side of nonmoving joints and cracks not exceeding 1/8 inch (3 mm) thick, and beyond roof drains and penetrations.

3.4 BASE FLASHING INSTALLATION

- A. Install base flashing at terminations of roofing according to manufacturer's written instructions.
- B. Prime substrate with asphalt primer if required by manufacturer.
- C. Bond elastomeric flashing sheet in contact adhesive against wall substrate to within 3 inches (75 mm) of deck. Adhere remaining vertical leg and horizontal leg of flashing sheet in a layer of hot fluid-applied, rubberized asphalt.
- D. Extend flashing sheet up walls or parapets a minimum of 8 inches (200 mm) above insulation and 6 inches (150 mm) onto roof deck.
- E. Install termination bars and mechanically fasten to top of flashing sheet at terminations and perimeter of roofing.

3.5 ROOFING MEMBRANE APPLICATION

- A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
- B. Heat and apply rubberized asphalt according to manufacturer's written instructions.
 - 1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.
- C. Start application with manufacturer's authorized representative present.
- D. Reinforced Membrane: Apply hot fluid-applied, rubberized asphalt to area to receive roofing. Spread a 90-mil- (2.3-mm-) thick layer of hot fluid-applied, rubberized asphalt; embed reinforcing fabric, overlapping sheets 2 inches (50 mm); spread another 125-mil- (3.2-mm-) thick layer of hot fluid-applied, rubberized asphalt to form a uniform, reinforced, seamless membrane, 215 mils (5.5 mm) thick.
- E. Apply hot fluid-applied, rubberized asphalt over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
- F. Cover membrane with protection course with overlapped joints before membrane is subject to construction traffic.

3.6 INSULATION INSTALLATION

- A. Loosely lay board insulation units over roofing membrane, with long joints of insulation in continuous straight lines and with end joints staggered between rows. Abut edges and ends between units.
- B. Install one or more layers of insulation to achieve required thickness over roofing membrane. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.
 - 1. Where overall insulation thickness is 2 inches (50 mm) or more, install required thickness in two or more layers with joints of each succeeding layer staggered over joints of previous layer a minimum of 6 inches (150 mm) in each direction.

3.7 ROOF-PAVER INSTALLATION

- A. Install roof pavers over roofed area according to insulation manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by roofing manufacturer to inspect substrate conditions; surface preparation; and application of membrane, base flashings, protection, insulation, and ballast; furnish daily reports.
- B. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
 - 1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks using EFVM.
- C. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - 1. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of base flashing.
 - 2. Flood each area for 48 hours.
 - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installation are watertight.
- D. 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.

3.9 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 spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 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. 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 <Insert mph (m/sec)>;
 - 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.

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

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

END OF SECTION 075556