SECTION 07 5556

FLUID-APPLIED MEMBRANE ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes reinforced fluid-applied protected membrane roofing.

B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following:

1. General provisions of the Contract, including General and Supplementary Conditions, and Division 01 General Requirements Specification Sections.
2. Section 03 3000 - CAST-IN-PLACE CONCRETE.
3. Section 07 2100 - THERMAL INSULATION
4. Section 07 6200 - SHEET METAL FLASHING AND TRIM.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's printed descriptions of materials and systems, performance criteria, use limitations, recommendations and installation information.

B. Shop Drawings: Shop drawings for all membrane types shall be prepared by the roofing contractor on sheets containing his name and job number. Shop drawings shall also bear the roofing manufacturer’s stamp of approval. Details of terminations, penetrations, etc. shall be specifically prepared for this Project. Submission of cuts of manufacturer's standard details will not be acceptable substitutes for shop drawings

1. Details of Installation, showing conditions at terminations, transitions, drains, penetrations or build-up if different from or supplemental to the Drawings provided.
2. Final/Field Layout of Irrigation lines (Supply Lines and Subsurface Drip Irrigation Lines). Use Drawings provided to illustrate any differences for future maintenance.
3. Submit shop drawings of methods for flashing internal and external corners, penetrations and terminations, details of roofing. Shop drawings shall be at least 1/4 full size.
4. Submit shop drawings of roofing as a package.
5. Submit an installation plan including but not limited to: roof quality control, system delivery, and maintenance plan until green roof acceptance.
6. Provide a water hook-up installation submittal if an irrigation system is required on the Drawings.

C. Samples: Submit the following:

1. Two full size samples of pedestals, including all accessories, shims, spacers, and the like.
2. Roof paver, full sized, in each color and texture required.

D. Waterproofing Certification: signed by Waterproofing Provider, certifying that proposed vegetated roof cover assembly is fully compatible with waterproofing assembly (if assembly differs from specifications provided herein); and complies with waterproofing warranty.

E. Maintenance Program: Clearly describing the procedures for maintaining the vegetated assembly including a maintenance schedule for the first 24 months of establishment.

1. Maintenance manual and staff training for proper care of plantings and roof cover assembly.

F. Certification from an approved independent testing laboratory experienced in testing this type material, that the material meets the CGSB-37.50-M89 standard for rubberized asphalt membranes, including applicable ASTM procedures. Testing shall be done by a nationally recognized testing laboratory acceptable to the engineer.

G. Certification showing full time quality control of production facilities and that each batch of material is tested to insure conformance with the manufacturer's published physical properties.

H. Certification showing that all roofing components are being supplied and warranted by a single-source manufacturer.

I. Evidence that the roof membrane assembly is currently Class A listed with Underwriters Laboratories.

J. Prior to starting work, furnish certificates from the roofing manufacturer stating that materials to be furnished will comply with the standards specified and that all materials in the system are physically and chemically compatible.

K. If the Contractor intends to deviate in any way from the Contract drawings, or the manufacturer takes exception to them, submit a separate letter stating the proposed deviation.

1.3 QUALITY ASSURANCE

A. The Roofing/Waterproofing Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:

1. Certification or license by the membrane manufacturer as a locally based, authorized applicator of the product the installer intends to use, for a minimum of five (5) years.
2. List of at least three (3) projects, satisfactorily completed within the past five (5) years, of similar scope and complexity to this project. Previous experience submittal shall correspond to specific membrane system proposed for use by applicator.

B. Green Roof:

1. Coordination with Waterproofing Provider: before commencement of the waterproofing installation, the Waterproofing Applicator and Vegetated Roof System Contractor shall meet with the Owner’s Representative and the Architect to discuss project sequence, procedures and methods for protecting the work, and review Drawings (and any submitted Shop Drawings) to establish compliance with the Specifications.
2. Prior to installing Green roof, the following procedures are to be conducted:
    a. The Engineer shall verify that the roof is properly designed and constructed to adequately support the load of the Green roof system.
    b. The roof is to be inspected and determined ready to accept the Green roof by a Technical Representative of the Installer.

C. The manufacturer shall provide a field advisor for a minimum of 40 working hours. He shall be certified in writing to be technically qualified in design, installation, and servicing of the required products. Personnel involved solely in sales do not qualify. The field advisor shall be present at the beginning of the actual membrane installation to render technical assistance to the Contractor regarding installation procedures of the system and answer questions that may arise.

D. Technical representatives of the membrane manufacturer shall have reviewed the Contract drawings and specifications. He shall instruct the applicator on mixing and application and

witnessed the first full day of application and accepted the completed surface prior to water testing to ensure acceptability.

E. Unsatisfactory conditions disclosed by the manufacturer's visits to the site shall be promptly and satisfactorily repaired and the areas re-inspected by him before work starts or resumes in affected areas.

F. Pre-Installation Conference

1. Prior to but not less than 30 days before beginning work, and not less than 5 days following approval of all shop drawings representatives of the Architect, Contractor and Owner will meet with the Contractor, his Superintendent or Foreman who will be engaged full time on the Project, and the manufacturer’s representative to review the earlier submitted and acceptable materials and submittals and procedures to be followed in performing the work. At this time, submit samples and progress schedule. The Contractor shall keep the minutes of the meeting and distribute same as noted.
2. Prior to, but not more than seven days before beginning work, a second meeting of the same parties will be held at the job site to review storage locations, operating procedures and inspect the roof deck. At this time, the Roofing Contractor shall note, in writing, all items and conditions that are unacceptable and which would preclude proper application of his materials. Failure to do so will be construed as acceptance of the surface as suitable for roofing installation.

G. Preconstruction Conferences. The manufacturer will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the roofing assembly.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened containers of packaging clearly labeled with manufacturer's name, brand name, instruction for use, all identifying numbers, and U.L. labels.

B. Materials shall be stored in a neat, safe manner, not to exceed the allowable structural capacity of the storage area.

C. Store materials in a clean, dry area protected from water and direct sunlight.

D. Store all adhesives at temperatures between 60 degrees F and 80 degrees F. If exposed to lower temperatures, restore materials to 60 degrees F minimum temperature before using.

E. Plants shall be delivered in labeled flats and pots and conform to existing specifications in the American Standards For Nursery Stock. Delivery of Plants shall be such that they are not stored on site for any long period of time to minimize any potential of shock.

F. Synthetic components shall have identifying labels and stored out of direct sunlight where required.

G. Handling of Materials:

1. Primer contains solvent and is flammable. Do not use near open flame.
2. Melting equipment shall consist of an indirect fired kettle with a double shell containing a high flash point heat transfer oil and mechanical agitator.
3. Avoid overheating of hot rubberized asphalt; refer to manufacturer's instructions.
4. Pallets shall be shrink wrapped and secured prior to being lifted onto roof.

1.5 PROJECT CONDITIONS

A. Application of the membrane shall not commence nor proceed during inclement weather. All surfaces to receive the membrane shall be free of water, dew, frost, snow and ice.

B. Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer.

C. Preparation and application of membrane must be conducted in well ventilated areas.

D. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, etc.) to come in contact with the roof membrane. Any exposure to foreign materials or chemical discharges must be presented to membrane manufacturer for evaluation to determine any impact on the roof membrane assembly performance.

E. Restrict traffic from work areas until green roofs and pavers are installed. Erect signs and barriers as required.

F. Provide hoses, etc. for temporary irrigation as needed for plant maintenance until roof system acceptance.

1.6 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 all components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of roofing system such as base flashing, insulation, protection board, drainage board, filter fabric, primer, membrane, and other components of the following warranty period:

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 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.
3. Liquid Adhesive applied at the rate of two gallons per square (100 sq. ft.) yields the following test results:
    a. ASTM D-529-82, Weathering Daily Cycle B. No cracking or crazing. No slump. Turns a slight gray color.
    b. Hardness: Attains a Shore Hardness of 60 max.
    c. Ductility; ASTM D-113-79;at 1 cm per minute (39.2oF=4oC) 125% elongation min.
    d. Wind up-lift pull=150 lbs. using test apparatus.

e. Water permeability; ASTM E-96-80; 0.005 perms/hr/sq.ft.
f. Dry Film Thickness: 9 mils per gallon per 100 sq.ft. min.

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. Roof assembly shall be designed in accordance with Miami-Dade approved systems.
2. System assembly shall comply with UL testing data showing that the system meets the local wind uplift requirements and provides a Class A fire-rated roof assembly.

2.2 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following products:

1. American Hydrotech, Inc.; Monolithic Membrane 6125, Fabric Reinforced Assembly.
2. Carlisle CCW-500R.
3. Henry, 790-11, Fabric Reinforced System.
4. CETCO, Strataseal
5. Acceptable equivalent.

B. Provide complementary products, if suggested by the manufacturer, for use under the mortar setting bed at the precast concrete stairs.

2.3 MEMBRANE

A. Single-component; 100 percent solids; fabric reinforced hot fluid-applied, rubberized asphalt system formulated for a minimum 215 mil thick-coat application with the following properties measured per applicable test methods in CAN/CGSB-37.50:

1. Flash Point: Not less than 260 deg C or not less than 25 deg C above manufacturer's maximum recommended application temperature.
2. Cone Penetration: 110 maximum at 25 deg C, and 200 maximum at 50 deg C.
3. Flow: 3 mm maximum at 60 deg C.
4. Toughness: Not less than 5.5 J
5. Ratio of Toughness to Peak Load: Not less than 0.040.
6. Adhesion Rating: Pass.
7. Water-Vapor Permeance: 1.7 ng/Pa x s x sq. m.
8. Water Absorption: 0.35-g maximum mass gain, or 0.18-g maximum mass loss.
9. Pinholing: Not more than one pinhole.
10. Low-Temperature Flexibility: No cracking.
11. Crack Bridging Capability: No cracking, splitting, or loss of adhesion.
12. Heat Stability: Comply with requirements for penetration, flow, low-temperature flexibility, and viscosity when heated for five hours at manufacturer's recommended application temperature.
13. Viscosity Test: 2 to 15 seconds.

2.4 AUXILIARY MATERIALS

A. Primer: ASTM D 41, asphaltic primer.

B. Elastomeric Flashing Sheet: 60-mil minimum, nonstaining, uncured sheet neoprene with

manufacturer's recommended contact adhesives and predrilled metal termination bars and anchors, with the following physical properties as measured per standard test methods referenced:

1. Tensile Strength: 1400 psi minimum; ASTM D 412, Die C.
2. Elongation: 300 percent minimum; ASTM D 412.
3. Tear Resistance: 125 psi minimum; ASTM D 624, Die C.
4. Brittleness: Does not break at minus 30 deg F; ASTM D 2137.

C. Bonding Adhesive: Manufacturer’s one-component neoprene base contact adhesive specifically recommended for applying sheet flashing to vertical surfaces.

D. Splicing Cement: Manufacturer’s synthetic rubber-base polymer adhesive specifically recommended for securing vertical laps in sheet flashing.

E. Lap Seal: Manufacturer’s EPDM or synthetic rubber sealant specifically recommended for sealing lap joints in sheet flashing.

F. Water Block Mastic: Manufacturer’s recommended mastic for bedding flashing anchors.

G. Reinforcing Fabric: Manufacturer's recommended spun-bonded polyester fabric.

H. Protection Course: Semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/4 inch, nominal.
2. Facings: Provide polyethylene film facings for protection course sheets.

I. Sheet Metal Accessories:

1. Counterflashings and Reglets: Stainless steel; refer to Division 7 Section “Sheet Metal Flashing and Trim”.
2. Termination Bars: Type 302 or 304 stainless steel, 1/8 inch thick minimum, predrilled or punched 8 inches o.c. for mechanical fastener attachment to substrate.
3. Flashing Pipe Clamping Rings: Waterproofing membrane manufacturer approved, stainless steel adjustable wormgear pipe clamping rings; size appropriate to installation

PART 3 EXECUTION

3.1 EXAMINATION

A. Acceptable substrates are cast-in-place and precast concrete and plywood. Metal pan decks to which concrete is poured must be venting type. Lightweight concrete is not an acceptable substrate.

B. Verify that surfaces and conditions are ready to accept the work of this section. Commencement of the work or any parts thereof shall mean acceptance of the substrate.

3.2 PREPARATION

A. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar, frost or other contaminants. Fill spalled areas in substrate to provide an even plane and remove scaling or laitant concrete. Remove curing compounds or any foreign matter detrimental to the adhesion of the primary waterproofing membrane or membrane flashings.

B. New concrete should be cured for a minimum of fourteen days and must be dry before waterproofing membranes are applied. Concrete in vented metal pan decks must be cured a

minimum of sixty days.

C. Concrete shall have a wood float finish. Steel float finishes are too smooth and compromise the adhesion of the waterproofing system. Decks with a steel float finish must be sandblasted or equivalent prior to the application of the waterproofing system.

D. Prefabricated expansion joint assemblies should be in place prior to the application of the primary waterproofing assembly.

E. Before application of hot rubberized asphalt, the substrate shall be clean and dry, free from surface water, ice, snow or frost, dust, dirt, oil, grease, of any other foreign matter detrimental to the adhesion of the hot rubberized asphalt.

F. The contractor shall review all surfaces to receive the membrane and report any discrepancies prior to installing the waterproofing system.

3.3 INSTALLATION – SUBSTRATE BOARD

A. Substrate Boards:

1. Install in locations indicated in compliance with manufacturer’s recommendations for each substrate.
2. Carry substrate board minimum 18 inches up stud parapets before transitioning to gypsum sheathing.

B. Surface conditioner application (to concrete)

1. Apply the surface conditioner to the concrete using a hand held sprayer evenly at a rate of 300 to 600 SF/gallon depending on surface texture. Surface conditioner should "tan" the surface, not blacken it.
2. Allow sufficient time for the surface conditioner to thoroughly dry prior to the membrane application.

C. Seal joints and fasteners in substrate board with product mutually acceptable to manufacturers of substrate board and roof system.

3.4 INSTALLATION OF WATERPROOFING MEMBRANE

A. Primer:

1. Apply primer as recommended by manufacturer and allow to dry prior to the application of the primary waterproofing membrane or membrane flashings.

B. Deck to Vertical Junctures:

1. Apply hot rubberized asphalt membrane to provide a thickness of approximately 1/8 inch to the vertical faces and a minimum of 4 inches out onto the horizontal surface.
2. Embed flashing sheet in the hot rubberized asphalt membrane, avoiding any wrinkles or fishmouths, extending a minimum of 3 inches out onto the horizontal surface.
3. Mechanically attach the flashing sheet to vertical surfaces with metal securement bar where height of flashing exceeds 12 inches. Lap flashing sheet minimum 3 inches on ends.
4. At monolithic pour, use fabric reinforcement as option to flashing sheet.

C. Expansion Joints (Neoprene):

1. Expansion joint membrane can be applied in a bed of primary waterproofing membrane or adhered to substrate with expansion joint adhesive. Place expansion joint membrane into expansion joint adhesive as recommended by manufacturers' written instructions.
2. Loop expansion joint membrane down into expansion joint, embedded into a 1/8 inch thick layer of hot rubberized asphalt membrane. Ensure that the depth of loop is a minimum 1-1/2 inch.
3. Extend expansion joint membrane minimum of 3 inches on each side of joint. Seal end joints a minimum of 6 inches and seal with a 1/8 inch coat of membrane. Fill loop with membrane as required.
4. Secure top of expansion joint membrane with continuous fixing bar at vertical wall locations.

D. Crack Treatment:

1. Seal cracks and joints 1/16 inch to 1/8 inch in width with a 12 inch wide, 1/8 inch thick coat of hot rubberized asphalt membrane and a 6 inch wide strip of fabric reinforcement, centered over joint.
2. Seal cracks and joints 1/8 inch to 1/4 inch in width with a 12 inch wide, 1/8 inch thick coat of hot rubberized asphalt membrane and a 6 inch wide strip of crack treatment or expansion joint membrane, centered over joint.

E. Membrane Flashing At Drains:

1. Coat areas around the drains with hot rubberized asphalt membrane at a thickness of 1/8 inch.
2. Place flashing sheet over the coated drain flange and extending a minimum 6 inches around the flange.
3. Apply a second coat of hot rubberized asphalt membrane over the flashing sheet at a thickness of 1/8 inch.
4. Apply clamping ring exerting sufficient pressure to affect a seal between clamping ring and membrane. Temporarily block all drains during the application of ballast, or other materials that might block the drains. Remove blocking when work is not in progress and upon completion.
5. Furnish drain access chambers where indicated. Install so that top of access chamber finishes flush to the surface of the system in which it is installed (Insulation or Vegetated roof alternate).

F. Membrane Flashing At Protrusions:

1. At mechanical vent, protrusions and pipe penetrations provide flashing sheet set into 1/8 inch layer of hot rubberized asphalt membrane. Overcoat and seal with membrane. Install clamps as required.
2. At pitch pockets, place pan on top of a 1/8 inch layer of membrane and attach into roof deck. Set flashing sheet into 1/8 inch hot rubberized asphalt membrane over top of flange. Fill pitch pocket with rubberized asphalt or rubber asphalt sealer in order to shed water.

G. Membrane Flashing At Vertical Junctures (Self-Adhering Membrane):

1. Apply self-adhering waterproofing membrane to prepared substrate in lengths of 6 feet or less.
2. Horizontal to vertical inside corner transition areas are to be pre-treated with a fillet bead of termination sealant extending ¾ inch vertically and horizontally from the corner. Apply a minimum 10 inch wide strip of waterproofing membrane centered at the joint.

3. All outside corners are to be pre-treated with a minimum 10 inch strip of waterproofing membrane centered at the joint.
4. Where three or more planes come into contact reinforce with cut sections of waterproofing membrane reinforcing sheet as per manufacturer's instructions.
5. Provide 2-1/2 inch laps at both sides and ends. Position for alignment and remove protective film. Press firmly into place. Promptly roll all laps with a counter top roller to effect seal. If more than one length is required on a vertical surface, apply in a shingle fashion.
6. Terminate membrane using termination sealant and counter flashing as indicated.
7. All laps within 12 inches of a 90 degree change in plane are to be sealed with termination sealant.

H. Application of Hot Rubberized Asphalt Membrane:

1. Ensure deck is ready to receive hot applied rubberized asphalt membrane. Where torch applied flashing membranes have been used, ensure top polyfilm has been scorched away prior to application of the membrane.
2. Apply membrane smooth, free from air pockets, wrinkles, or tears and to manufacturer's Instructions. Ensure full bond of membrane to substrate.
3. Apply first layer of hot rubberized asphalt membrane evenly to a minimum thickness of 90 mils to form a continuous monolithic coating over horizontal and vertical surfaces including previously reinforced areas.
4. Apply fabric reinforcing sheet and firmly press into first layer of hot membrane. Overlap fabric approximately ¼ inch ensuring that a layer of membrane is present between overlaps. Apply second layer of membrane over the fabric to a minimum thickness of 1/8 inches (125 mils) providing a total thickness of 215 mils.

I. Installation of Protection Course/Separation Sheet

1. Protection course shall be rolled onto hot applied rubberized asphalt membrane while still warm and tacky.
2. Lap protection course 2 inches on side laps and 6 inches on end laps.
3. Starting at the low points or drains lay the protection course membrane in full continuous sheets in a shingle pattern. Stager all end laps.

J. Required Leak Test

1. Upon the completion of the Primary Waterproofing Membrane, Protection Course and all associated terminations the contractor shall leak test the system.
2. Valleys:
   a. Provide temporary stops and plugs for the roof drains within the test area.
   b. Flood test with minimum 2 inches of water for no less than 24 hours.
3. All other roof areas:
   a. Perform 48 hour sprinkler test.
4. Repair and retest the system for no less than 24 hours, report all deficiencies to the Consultant.
5. Remove temporary stops and plugs.
6. No other Work is to proceed without prior direction from the Consultant.

3.5 INSTALLATION OF PROTECTION BOARD

A. Protection board shall be placed directly into hot membrane.

B. Apply protection board sheet beginning at the low point of the deck, align membrane along center line of floor drain and lay out.

C. The protection membrane sheets shall be end and side lapped 1 inch - 2 inch.

D. Stagger or offset joints of protection membrane sheets.

E. Place all subsequent sheets in an overlapping single fashion.

3.6 CLEAN-UP

A. Promptly as the work proceeds and on completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.

B. Clean to the consultant's approval, soiled surfaces, spatters, and damage caused by work of this Section.

C. Check area drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from the site.

3.7 INSULATION PLACEMENT

A. General

1. Contractor shall examine the roof area to be covered with subsequent topping materials in order to insure that all roof areas have received the membrane, the membrane is free of damage, it is properly protected, and all flashing has been properly installed, before placing the insulation.
2. It is recommended that the drainage course (if required), insulation, fabric and ballast be installed as each section is completed.

B. Insulation Placement

1. Loose lay in a staggered manner and tightly butt together all insulation boards. The maximum acceptable opening between insulation boards is 3/8 inch. Insulation must be installed within 3/4" of all projections, penetrations, etc.
2. When multi-layer insulation applications are involved the bottom layer of insulation must be the thickest layer and must be a minimum of 2 inches thick. All layers shall be installed unadhered to each other and all joints in relation to underlying layers staggered.

3.8 FIELD QUALITY CONTROL

A. Final Inspection and Approval:

B. Final inspection of completed work shall be carried out by the owner's representative, the contractor and Henry.

END OF SECTION