SECTION 07 50 00 (07000) – MEMBRANE ROOFING

PART 1 – GENERAL

PART 2 – PRODUCTS

1.1 Questions pertaining to this Standard may be directed to the assigned Project Manager. Variance from the prescribed criteria must be justified by circumstances or conditions which conflict with the intent of the Standard.

- This Standard shall apply to all new roof construction or roof replacements for Washington University School of Medicine properties.

3.1 The preferred roofing membrane assembly shall be a modified bitumen membrane assembly. A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, applied over a prepared substrate. Both reinforcement mats shall be impregnated/saturated and coated each side with an SBS modified bitumen blend and coated one side with a torch grade SBS bitumen blend adhesive layer. The adhesive layer shall be manufactured using a process that embosses the surface with a grooved pattern to provide optimum burn-off of the plastic film and to maximize application rates. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14 degrees F (-10 degrees C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.

3.2 Manufacturers

A. Modified Bitumen
   1. Siplast “Paradiene 20 TG/30 FR TG” torchable roof system.
   2. Soprema torchable roof system.

B. PVC
   1. Sarnfil Type II feltback fiberglass reinforced.

3.3 Roofing System Assembly Products

   Modified Bitumen Base and Stripping Ply
   a. Thickness (avg): 114 mils (2.9 mm) (ASTM D 5147)
   b. Thickness (min): 110 mils (2.8 mm) (ASTM D 5147)
   c. Weight (min per 100 ft² of coverage): 76 lb (3.7 kg/m²)
   d. Maximum filler content in elastomeric blend: 35% by weight
   e. Low temperature flexibility @ -13º F (-25º C) - PASS (ASTM D 5147)
   f. Maximum Load (avg) @ 73ºF (23ºC): 30 lbf/inch (5.3 kN/m) (ASTM D 5147)
   g. Maximum Load (avg) @ 0ºF (-18ºC): 75 lbf/inch (13.2 kN/m) (ASTM D 5147)
   h. Elongation @ 5% Maximum Load (avg.) @ 73ºF (23ºC): 50% (ASTM D 5147)
   i. Dimensional Stability (max): 0.1% (ASTM D 5147)
   j. High Temperature Stability (min): 250ºF (121ºC)
   k. Approvals: UL Class listed, FM Approved (products shall bear seals of approval)
   l. Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria.
Modified Bitumen Finish Ply
a. Thickness (avg): 140 mils (ASTM D 5147)
b. Thickness at selvage (coating thickness) (avg): 118 mils (3.0 mm) (ASTM D 5147)
c. Thickness at selvage (coating thickness) (min): 114 mils (2.9 mm) (ASTM D 5147)
d. Weight (min per 100 ft² of coverage): 101 lb.
e. Maximum filler content in elastomeric blend: 35% by weight
f. Low temperature flexibility @ -13º F (-25º C): PASS (ASTM D 5147)
g. Maximum Load (avg) @ 73ºF (23ºC): 30 lbf/inch (5.3 kN/m) (ASTM D 5147)
h. Maximum Load (avg) @ 0ºF (-18ºC): 75 lbf/inch (13.2 kN/m) (ASTM D 5147)
i. Elongation @ 5% Maximum Load (avg) @ 73ºF (23ºC): 55% (ASTM D 5147)
j. Dimensional Stability (max): 0.1% (ASTM D 5147)
k. High Temperature Stability (min): 250ºF (121º C) (ASTM D 5147)
l. Granule Embedment (max loss): 2.0 grams per sample (ASTM D 5147)
m. Approvals: UL Class listed, FM Approved (products shall bear seals of approval)

Flashing Membrane Assembly: A flashing membrane assembly consisting of a prefabricated, reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane with a continuous, channel-embossed metal-foil surfacing. The finish ply shall conform to ASTM D 6298 and the following physical and mechanical property requirements.

1. Metal-Clad Modified Bitumen Flashing Sheet
   a. Thickness (avg): 142 mils (3.6 mm) (ASTM D 5147)
   b. Thickness (min): 120 mils (ASTM D 5147)
   c. Weight (min per 100 ft² of coverage): 77 lb.
   d. Coating Thickness - back surface (min): 40 mils (1 mm) (ASTM D 5147)
   e. Maximum filler content in elastomeric blend: 35% by weight
   f. Low temperature flexibility @ -22F: PASS (ASTM D 5147)
   g. Maximum Load (avg) @ 73ºF (23ºC): 85 lbf/inch (15 kN/m) (ASTM D 5147)
   h. Maximum Load (avg) @ 0ºF (-18ºC): 180 lbf/inch (31.7 kN/m) (ASTM D 5147)
   i. Elongation @ 5% Maximum Load (avg) @ 73ºF (23ºC): 45% (ASTM D 5147)
   j. Tear-Strength (avg): 120 lbf (0.54 kN) (ASTM D 5147)
   k. Dimensional Stability (max): 0.2% (ASTM D 5147)
   l. High Temperature Stability (min): 225ºF (107ºC) (ASTM D 5147)
   m. Cyclic Thermal Shock Stability (maximum): 0.2% (ASTM D 6298)
   n. Approvals: UL Approved, FM Approved (products shall bear seals of approval)
   o. Approvals: UL Approved, FM Approved (products shall bear seals of approval)
   p. Cyclic Thermal Shock Stability (maximum): 0.2% (ASTM D 6298)
   q. Approvals: UL Approved, FM Approved (products shall bear seals of approval)
   r. Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria
   s. Surfacing: aluminum metal foil

2. Provide roofing manufacturer standard material meeting this product criteria.

Flashing Reinforcing Ply - (Same as roof system base ply)

3.4 Alternate roof membrane, in situations/circumstances, which the preferred modified bitumen membrane assembly is not appropriate, the following single ply system may be employed after obtaining approval from the authority specified in Section 1.3 of this document.
Sarnafil Type II feltback fiberglass reinforced.

PVC Roofing membrane

a. Thickness (min) 48 mils (ASTM D4434)
b. Exposed face color to be determined
c. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing
d. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane
e. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings
f. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors
g. Overlayment: ½” “Dens-beck” overlayment and recover board
h. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, slip sheet, and other accessories

4.1 When appropriate/feasible, the preferred method of creating an insulated substrate shall be the installation of insulated lightweight concrete deck fill. All other insulation shall be a closed cell product and/or meeting the following criteria.

4.2 Maximum water absorption shall be less than or equal to 1.5%.

4.3 Minimum thermal resistance equal to or greater than 2.9 per inch.

4.4 Insulation shall have a minimal bearing capacity in order to avoid impressions.

4.5 The insulation dimensional stability must be compatible with the selected roofing membrane system and acceptable to the roof membrane manufacturer.

4.6 The insulation product selection and fastening method shall be compatible with the roofing membrane manufacturer specification.

5.1 Anodized Aluminum is the preferred material for architecturally visible/exposed applications. Kynar prefinished galvanized may be considered with the approval of the Authority specified in Section 1.3.

5.2 Stainless Steel material shall only be used when aluminum cannot be used when environmental corrosive circumstances are expected.

5.3 Gauges shall be selected appropriate to the application and fastening detail. Cap flashings with maximum dimension of less than 12 inches shall be a minimum 24-gauge. Cap/Coping flashings greater than 12 inches shall be a minimum 22-gauge.

5.4 Roof membrane termination detail must meet the manufacturer's typical detail to maintain warranty.

6.1 Roofing membrane system shall include a 20-year manufacturers material and a 2-year labor warranty. Prefinished metal shall have a 20-year guarantee which states finish will not chalk in excess of an eight rating or fade in excess of a five rating when tested in accordance with ASTM D 4214.

6.2 Inspection participants for the initial completion inspections shall include; Washington University assigned project manager, specifying design representative, installing
Contractor representative and membrane system manufacturer representative.

6.3 When the roof is complete an inspection shall occur to identify any issues and to establish specified warranty. If the roof is a component of a larger construction project, then a final inspection will take place after completion of larger project. Signed documentation of the inspection and warranty establishment shall be submitted to the Washington University assigned project manager.

6.4 Contractor shall clearly identify the annual inspection schedule to maintain the warranty (minimum frequency once per year).

7.1 At all roof penetrations, a sheet metal umbrella shall be installed to direct the water away from the penetration in addition to the typically specified flashing detail.

7.2 Whenever possible Davits / Fall Protection shall be built into the structure and coordinated with the roof system installation.

7.3 Future penetrations that fall within the two-year labor warranty shall be performed by the original roofing contractor. All penetrations occurring after that time period must be installed by a certified vendor of the existing roofing system.

7.4 All roof accessories must be selected to accommodate the roof manufacturer’s flashing method/ability. Pitch pockets are not permitted.

7.5 Slope/Pitches shall be incorporated into the roof deck structure and/or the roofing system to achieve positive drainage and eliminate ponding.

a. New Roofs
   1. How: When appropriate/feasible, overall roof slope/pitch shall be incorporated into the roof deck structure design and supplemented with insulated lightweight concrete or tapered insulation crickets where necessary or required.
   2. Minimum slope shall be ¼ inch per lineal foot.
   3. All new building structures shall be considered for future vertical expansion before sloping the structure.

b. Existing Roofs
   1. How: Tapered insulation shall be incorporated into the roof system design to achieve overall roof slope supplemented with crickets as required.
   2. Minimum slope shall be 1/8 inch per lineal foot. When existing conditions dictate the use of tapered insulation, the maximum height shall be limited to 10”. Minimum 8” flashing heights shall not be sacrificed.

7.6 Traffic protection shall be included in the project from all primary access points to and around all roof top equipment requiring service. Traffic protection material and installation shall be as per manufacturers recommendation. Concrete pavers are not preferred.

7.7 Perimeter flashing details shall be as per roofing system manufacturer recommendations with a minimum height of 8”.

7.8 Penetration flashing details shall be as per roofing system manufacturer recommendations with a minimum height of 8” as well as the inclusion of a sheet metal
umbrella collar.

7.9 Cap Flashings and Copings must be sloped to drain surface moisture.

7.10 All drawings and specifications must be copied to the owners current insurance company for review/approval. Transmittal copies of all such submittals shall be provided to the Washington University assigned project manager.

Included but not limited to the following shall be provided, considered and reviewed during the design process:

8.1 The design and specification for roof related assemblies shall meet or exceed the standards prescribed by the following; Factory Mutual Research Corporation, NRCA Roofing and Waterproofing Manual, UL Building Material Directory, UL Fire Resistance Directory, SMACNA Architectural Sheet Metal Manual and the applicable building code to the facility’s location.

8.2 Construction documents shall include but not be limited to; roof plan at a minimum scale of 1/16"=1'-0", details at a minimum scale of 1½"=1'-0" of any change of roof edge condition, flashings at walls/curbs/penetrations, details at sills/louvers, roof drains, copings, expansion joints and scuppers, appropriate cross sections and applicable written specifications.

8.3 Mechanical units or penetrations shall not be located in valleys, drain areas or restrict the flow of water. Adequate space shall be provided between mechanical units, penetrations and walls so that roofing materials can be property installed.

8.4 Mechanical units and accessories mounted on pipe standards shall be mounted to a height above the roof in direct correlation to equipment size in accordance with NRCA recommendations to allow for future roof repair/replacement access.

8.5 Existing equipment must be identified with supports and flashings detailed per the manufacturers specification/recommendations. The condition of the weather tight enclosures of equipment shall be reviewed/considered for appropriateness or repair.

8.6 Existing piping must be identified with supports and flashings detailed per the manufacturers specification/recommendations.

8.7 Anytime two roofs are adjacent but only one roof is being installed, the joint must be specified and approved by the roofing system manufacturer.

8.8 Expansion Joints shall be provided where; structural system expansion joints exist, structural decking/framing changes direction, roof structures change direction, type of decking changes, and/or where movement is anticipated. Roof pitch shall be away from expansion joints.

8.9 Infrared Moisture Meter Test must be provided in all applications where existing roofing and/or insulation is proposed to be retained.

8.10 Slopes and Pitches shall exceed the minimum BOCA code and achieve positive drainage and eliminate ponding (see Section 8.4).

8.11 The existing deck shall be checked for its condition and life expectancy.

8.12 Roof drains shall be verified for appropriateness as to quantity, size, proper location and code compliance.
8.13 The designer shall assume the building has a life expectancy of 20 years or more unless otherwise directed by the Washington University assigned project manager.

8.14 Corrosive or any other special exhaust shall be identified and accommodated in the design and the specification of materials.

8.15 Roof access for maintenance shall be designed for future safety.

8.16 Prior to the design of a roof replacement, the team including a representative from Washington University School of Medicine must agree on the recommendation of the existing roof in regards to the need for tear-off or retention.

8.17 Procedure for ACM will be defined in the Standards Document under ACM.

8.18 The designer shall schedule a site visit with the owner to discuss existing conditions.

8.19 Rooftop equipment and curbs shall be reviewed for proper pitch, slope, size and location.

8.20 Accommodations for window washing access shall be designed into the building structure.

8.21 Specifications must require that contractors must follow The Roofers Union Safety Program and all applicable OSHA Standards. (The contractor shall submit a copy of the company Safety Program prior to the start of work.)

9.1 Coordination meeting to discuss the following:

9.2 Take care to not overload roof structure during stockpiling of materials.

9.3 A copy of all MSDS sheets must be kept onsite for the owner’s reference.

9.4 All large deliveries and hoisting must be before 8:00 a.m.

9.5 Contractor shall take precaution with vibration in regards to fireproofing on the steel structure below. Any excessive damage to the fireproofing below will be the contractor’s responsibility to patch/replace.

9.6 Dumpster locations must be approved by WUSM Project Representative and all dumpsters must be covered after hours.

9.7 Any necessary street closures must be coordinated with WUSM Project Representative.

9.8 Prior to the job starting, a mandatory site walk through will occur to evaluate valuable equipment located below the roofs to identify necessary protective measures.

9.9 The contractor must supply emergency call back phone numbers.

9.10 The contractor shall not park any trucks near building air intakes.

9.11 The owner will identify any hazardous building exhaust that the contractor needs to be aware of.

9.12 Daily communication will occur to discuss potential inclement weather that could stop work.

9.13 Contractor must clearly identify how they intend to access the roof during construction.

9.14 Odor control requirements and action plan.
9.15 Contractor and owner must review working hours.

9.16 Contractor must follow The Roofers Union Safety Program and all applicable OSHA Standards (The contractor shall submit a copy of the company Safety Program prior to the start of the work).

9.17 Site Logistics shall be reviewed with the owner prior to the start of the job.

9.18 Preconstruction submittals shall include but not be limited to; list of all proposed subcontractors and material suppliers, product submittals and shop drawings required by the specifications, and certificates of insurance.

10.1 Daily communication will occur to discuss potential inclement weather that could stop work.

10.2 A reoccurring meeting schedule shall be established to discuss construction issues and tenant potential problems.

11.1 When the roof is complete, an inspection shall occur to identify any issues and to establish specified warranty. If the roof is a component of a larger construction project, then a final inspection will take place after completion of the larger project. Signed documentation of the inspection and warranty establishment shall be submitted to the Washington University assigned project manager.

11.2 The contractor shall clearly identify the roof limitations for future use of the maintenance and any other contractor.

11.3 At the completion of the project the contractor shall submit a manual including certificates of warranty, final inspection report signed by the installing contractor and manufacturer, a list of all materials used (identified by manufacturers name, size, thickness, type, etc.), and as-built drawings showing expansion joints, tapered insulation, seam locations and any deviations from original plans.

11.4 At the completion of the project, the contractor must submit a signed off punchlist. The punchlist should include signatures from the owner, owner’s representative, engineer, and architect. The punchlist shall include a flood test of the entire area.

11.5 Contractor shall supply the recommended maintenance and inspection schedule at the completion of the project to maintain warranty.

11.6 Lien waivers from the previous pay application must accompany each current pay application. At the completion of the project final lien waivers must be submitted to the owner prior to release of retention.

PART 3 – EXECUTION

END OF SECTION