07 00 00 THERMAL AND MOISTURE PROTECTION

07 05 00 COMMON WORK RESULTS FOR THERMAL AND MOISTURE PROTECTION

1. Any sloping roof shall have the underside of deck, on which membrane rests, ventilated to outside. Insulation to be below ventilated space.
2. Built up roofing shall use fiberglass felts.
3. Include vapor barrier, if required by roof design and roof material selection.
4. For sloped roofs, provide a minimum 40-mil thickness ice shield under roofing shingles. For roof slopes of 4:12 or greater extend ice shield, using standard widths as required, to overlap interior side of exterior wall by 24 inches minimum and for roof slopes less than 4:12, 36 inches minimum.
5. On sloped metal roofs use snow fence style design to control slide-off. Use of individual "snow jacks" or clips is prohibited. Avoid roof designs at building entrances that allow snow and ice to slide-off or drop onto entry walks below.
6. All "flat roofs" shall be designed so as to provide positive drainage and prevent ponding of water. Ponding of water is defined as water that remains on roof surface after 48 hours. Roof surfaces should try to provide a minimum of 1/4" per foot of slope to roof drain locations. This is particularly critical at saddles and valleys.
7. New "flat roof" installations shall require a one (1) week flood testing period with report to the University upon completion of the test. If any leaks are discovered the report shall identify the locations of the leaks and apparent cause, remedies taken to resolve, or when remedies will be performed, and when retest is scheduled to be conducted. When leaks are discovered a retest shall be performed and this procedure shall be repeated until the one week test period passes with no leaks. The cost of the first flood test shall be included in the roofing contractors bid. The costs of any and all retests shall be borne solely by the roofing contractor.
8. For LEED approved roofs, membrane roofs shall be any LEED acceptable color other than white. Review with Owner during design development.

07 10 00 DAMPPROOFING AND WATERPROOFING

07 13 00 SHEET WATERPROOFING

1. For below grade application, preferred product is Carlisle CCW MiraDRI 860/861 with CCW protection board. If foundation drains are used, use CCW MiraDRAIN 6000/6200 drainage board in lieu of CCW Protection Board.
2. Bituthene 3000, with compatible protection and/or drainage boards, is an approved alternative product.

07 20 00 THERMAL PROTECTION

07 21 00 THERMAL INSULATION

07 21 13 BOARD INSULATION

1. Roofing insulation to conform to Michigan Energy Code. The University prefers installation in 2 layers - for example; two 1" layers rather than one 2" layer.
2. Roofing and roof insulation to conform to FM wind resistance requirements for this area.

07 21 26 BLOWN INSULATION

1. Provide minimum R-50 for blown-in attic insulation.
2. Provide adequate attic insulation to prevent excessive ice dams at roof eaves.

07 30 00 STEEP SLOPE ROOFING

07 31 00 SHINGLES and SHAKES

07 31 13 ASPHALT SHINGLES

1. Roofing shingles shall be nailed with minimum .080 shank diameter; 1-1/4" long galvanized roofing nails. STAPLING IS STRICTLY PROHIBITED.
07 40 00 ROOFING AND SIDING PANELS

07 41 00 ROOF PANELS

07 41 13 METAL ROOF PANELS

1. On all sloped metal roof panel applications provide continuous snow fencing to prohibit snow slide-off. Style and location of snow fencing is to be reviewed and approved by the University. Individual clips of "snow jacks" are prohibited. Roof design shall not allow roof slopes coming down toward or over paths of building entry or exit.

07 50 00 MEMBRANE ROOFING

07 53 00 ELASTOMERIC MEMBRANE ROOFING

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

1. Single ply membrane roofing to be 60 mil EPDM, ballasted or fully adhered.
2. Roofing and roof insulation to conform to FM wind resistance requirements for this area.
3. Warranty for EPDM systems shall be:
   a. By the roofing contractor, a two (2) year material and labor workmanship warranty,
   b. Manufacturer's ten (10) year full system warranty,
   c. Manufacturer's twenty (20) year for the membrane material
   d. "Full system" means membrane, flashings, counter flashings, adhesives and sealants, insulation, recovery board, fasteners, fastener plates, fastening bars, metal edging, metal termination bars and any other products utilized in the installation.
   e. The warranty period shall commence starting from the date of substantial completion for the entire principal project.
   f. Shall include all parts, labor and material required for the replacement and installation of failing system components.

4. When vegetated roofing is utilized, in conjunction with elastomeric membrane roofing, a single warranty for the complete system installation shall be provided. See Section 07 55 63 (4.0) for warranty requirements.

07 55 00 PROTECTED MEMBRANE ROOFING

07 55 63 VEGETATED ROOFING

The following is an outline guide to describe the desired outcome the University expects for a vegetated roofing installation and is not intended to represent all technical information that would otherwise be required for a complete specification and therefore is NOT to be copied by the Architect and used as the entire specification for this application.

PART 1: GENERAL

1. SCOPE
   A. Provide equipment, materials, tools, and labor necessary to deliver, hoist and install vegetated roofing modules.
   Modules shall include growth media and plants. This work shall also include edge treatments, custom shaping of modules, and installing paver stones or ballast, slip sheet/root barrier and irrigation system.
   B. The vegetated roof shall be part of a total roofing installation, contracted and warranted as such.

1. SUBMITTALS
   A. Product data for vegetated roofing systems.
   B. Planting mix design indicating species.
   C. Shop Drawings: Indicating layout of modules, pavers, irrigation, and square footage.
   D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   E. Maintenance instructions for inclusion into owner's manuals.

1. QUALITY ASSURANCE
   A. Installation shall be per the manufacturer's requirements and no deviation should be made from the manufacturer's specifications.
   D. Once the installation is completed, an inspection is to be conducted by a Technical Representative of the installer to verify that the vegetated roof system is installed properly to standards.
1.5 DELIVERY, STORAGE, HANDLING, PROTECTION

A. Vegetated roof system is to be delivered in good condition free from shipping damage.
B. Vegetated roof system is to be kept out of the sun if plastic wrapped to prevent overheating.
C. Vegetated roof system is to be installed on the roof top within 4 hours of delivery.
D. On the job site, Vegetated roof system is to be handled to prevent damage to the system and all roofing components.
E. System shall not exceed the load capacity of the roof deck when placing vegetated roof system on the roof.
F. During installation, protect the roof deck and membranes with appropriate material such as plywood sheeting. Never scrape or puncture slip sheet or membranes. Keep roof surfaces free of soil, grit, or debris at all times with broom.
G. Transport carts (if used) are to have pneumatic tires, to be wheeled about only upon protective plywood sheeting, and to be loaded so as not to exceed weight capacity of roof deck.

PART 2: PRODUCTS

2.1 PRODUCTS

A. Maximum 1.5 foot x 2 feet outside diameter, 4 inches tall finished product. May allow for growing soil above the container edge. Soil height from container bottom is approximately 4-inches.
B. Saturated weight with mature vegetation not to exceed 30 lb. per square ft.
D. Module color: Black
E. Pre-vegetated at a Nursery, the Nursery is to execute the following:
   1. Module is to be filled with soil and appropriately settled either by mechanical vibration or flooding with water. Any settled soil is to be replaced so that soil extends to top at time of planting and maintaining the full 4-inches of planting depth.

2.3 GROWING MEDIUM

A. Growing medium is an engineered blend of inorganic and organic components based upon German FLL granulometric guidelines, modified so as to contain ecologically sustainable levels of organic content.

2.4 PLANTS

A. Per specifications and consisting of highly drought resistant ground covers; selected according to their USDA hardiness zone classification and shall include, but not necessarily limited to, grasses, perennials and ground covers.
B. Module is to be filled with plants as specified. Plants are to be grown to maturity with coverage of no less than 95% soil coverage when delivered to the project site. When modules are installed, coverage is adequate to diminish the visual appearance of a grid.

2.5 ACCESSORIES

A. Pavers/Ballast
   1. To be of compatible size, design and appropriate weight.
B. Edging: L-shaped, 4.5-inch x 3.5-inch, minimum 0.025 with black painted aluminum with perforations for drainage. Painted finish shall be Duraflex electrostatically applied and baked on paint, meeting requirements of AAMA 2603. Acceptable product: “Geoedge” by Permaloc Corporation or approved equal.
   1. If edging is attached to modules, use 10-16 x l-inch wafer head self-tapping screws in gray spex finish.
C. Provided minimum of one (1) wall hydrant for watering.
D. Irrigation System (when required and dependent on area of vegetated roof)
   1. System to be used only to keep vegetation in optimal condition during prolonged periods of heat and drought and to optimize the evaporative cooling effect of vegetation during such weather events.
      a. Function: fully automatic.
      b. Controls:
         (1) Automatic rain sensor.
         (2) Irrigation controller shall be outdoor-type.
         (3) All sprinklers will have matched precipitation on the same zone.
      c. Piping:
         (1) Subterranean irrigation
      d. Valves:
         (1) A master valve shall be installed on the mainline after the backflow device.
         (2) All valves to be covered by a 6” valve box.
         (3) All wire connections to be waterproof, UL approved.
         (4) To be a manual drain type. Install automatic freeze protection drain valves on all main and lateral piping.
2. Irrigation System Maintenance
   a. System to be blown out with compressed air no greater than 60 psi annually in fall prior to reaching freezing temperatures.

PART 3: EXECUTION

3.1 PREPARATION OF ROOF SURFACE
   A. Slip sheet/root barrier, specified by architect and approved by manufacturer, of 40-60 mil. thickness with overlapped and effectively bonded seams to ward against root penetration and to keep waterproofing layer safe and clean from soil during installation.
   B. Install slip sheet/root barrier in accordance with manufacturer’s recommendations.
   C. All surfaces to be smooth, free of debris, soil, and grit prior to placing modules.
   D. All materials to be tested water tight and free draining prior to module placement. The required roof flood test is to have been successfully completed prior to installation of the vegetated roof system.
   E. All surfaces to be maintained clean and free of debris, soil, and grit during installation process via use of broom. Never walk upon such materials as they may damage membranes.

3.2 INSTALLATION SEASON
   A. Module Installation to be conducted when plants are:
      1. Properly adapted and acclimatized to local weather conditions.
      2. When weather is above 35° F and there is no ice on the roof and soil is unfrozen.

3.3 LAYING (PLACING) MODULES
   A. Vegetated roof system installation to follow behind installation of slip sheet/root barrier, irrigation system, pavers, ballast, and edging.
   B. Vegetated roof system installation to be conducted in strict accordance with installation guidelines.
   C. Vegetated roof system installation to be conducted in accordance with green roof design.
   D. Vegetated roof system to be placed directly on top of appropriate slip sheet/root barrier.
   E. It is recommended that any custom cutting/fitting be oriented on the high side (top), or sides of the roof. It is recommended that the cut side of the module be set tight against the edging or toward the side of an intact module so as to prevent soil spillage. If custom cutting must be done on the low, draining, side of the roof, it is imperative that no filter cloth be inserted as it could impede drainage. It is best to orient the cut side against another module, facing upstream.
   F. After installing modules, they should be immediately watered so as to thoroughly moisten the media from top to bottom. Water shall be of suitable quality for plant growth and irrigation system or hoses and sprinklers may be used for such purpose. Note: it takes approximately 1 inch of water, or 1 gallons per module to moisten each module thoroughly.
   G. Walkway pavers shall not be installed along roof edge. Pavers, forming walkways or runways that can be used by personnel, shall be a minimum of 6-feet from roof edge as measured from the paver’s closest edge.

3.7 MAINTENANCE
   A. The Contractor shall provide annual maintenance for the vegetated roof for a period of two (2) years commencing from the date of substantial completion for the entire principal project.
   B. The Contractor shall replace all dead and/or dying plants during the maintenance period. (see also: 4.0 Warranty).
   C. All maintenance to be performed per manufacturer’s instructions.
   D. Documentation
      1. Record all green roof maintenance events. Include name of person, date and activity.
      2. If fertilizer, record type and amount applied per 1000sf
      3. If soil test, record lab
      4. If irrigation, record duration and quantity
   E. Annual Maintenance
      1. Soil Testing and Fertilization: Annually, between the dates of April 1st & 15th of each year, administer a soil test for PH and fertility levels.
         a. Maintain pH in the range of 6.5 to 8.0. When indicated, apply a single springtime application of Nutricote 14-14-14, Type 180 (180 day release period), at 20lbs per 1000sf. Follow the Nutricote labeled directions for application rate. All applications of fertilizer are the sole responsibility of the applicator.
F. Irrigation
   1. Watering
      a. when needed as a "temporary" management tool under the following conditions:
         1) Periods of 75 degree weather, with less than 1" of rainfall persisting for 4 weeks or longer.
         2) In areas of reflected light, such as next to south facing walls, more frequent irrigation should be applied to keep the soil from becoming excessively dry.
         3) Limit fall season watering to only periods of prolonged wind and drought.

G. Inspections and Plant Care Protocol: Conduct the following twice per month during the entire growing season
   1. Conduct hand weeding during the twice monthly inspection. Pull all weeds, never allow any weed to flower, set seed and complete its life cycle.
   2. Any displaced soil should be immediately replaced.
   3. Roof drains should be cleared of any debris, pebbles, leaves, etc.
   4. Immediately remove debris or trash.

3.8 ACCEPTANCE
   A. Conduct post-installation inspection to determine acceptance of vegetated roof system. Inspection to be made by General Contractor’s Representative or by Owner’s Representative upon General Contractor’s request; five working days’ notice required.
   B. Upon acceptance, Owner assumes responsibility for module/plant maintenance after the initial two (2) year warranty and maintenance period.

3.9 CLEANUP
   A. During installation, keep all work surfaces clean and free of grit, dirt, or debris. Use broom not blower, do not sweep soil under modules or slip sheet. Following installation, remove all excess materials and tools from job site. Ensure that any damage that occurs as a result of installation is appropriately and immediately repaired.

4.0 WARRANTY
   A. Warranty for EPDM-Vegetated roofing systems shall be:
      1. By the prime roofing contractor, a two (2) year material and labor workmanship warranty,
      2. Membrane manufacturers ten (10) year full system warranty,
      3. Membrane manufacturers twenty (20) year for the membrane material,
      4. Vegetated roofing “module” shall be warranted for twenty (20) years with no exceptions or conditions in regard to how modules are placed with or without edging, parapets, ballast or similar conditions of installation
      5. All plantings shall be warranted for a period of two (2) years
      6. Membrane manufacturers “Full system” means membrane, flashings, counter flashings, adhesives and sealants, insulation, recovery board, fasteners, fastener plates, fastening bars, metal edging, metal termination bars and any other products utilized in the installation.
      7. In the case of a membrane roofing workmanship or system failure the warranty shall include material and labor costs for the removal and replacement of the vegetated roofing as necessary to facilitate the membrane roof repair and shall include replacement of modules and/or plant material damaged as a result of the repair work.
   B. The warranty period shall commence starting from the date of substantial completion for the entire principal project.
   C. Shall include all parts, labor and material required for the replacement and installation of failing system components.

07 70 00 ROOF AND WALL SPECIALTIES AND ACCESSORIES

07 72 00 ROOF ACCESSORIES

07 72 33 ROOF HATCHES
   1. Provide roof hatch access door, manufactured by SafePro, L.P. or equal.
   2. Provide hold-open arm with vinyl grip.
   3. For safety and added security, provide interior lock provision for Owner supplied padlock.
   4. Provide roof hatch fall protection safety rail system and ladder extension by SafePro L.P., or equal. Include wrap around self-closing gate mounted on heavy duty non-pinching hinges acting as ladder extension.

END OF SECTION