

VEGETATIVE ROOF ASSEMBLIES (GARDEN GUIDE SPECIFICATION)

PART I GENERAL

1.01 Summary

- A. This is meant to be a guide specification for overburden placed over a waterproofing assembly from the section ~~XXXXXX~~ or Roofing portion of this specification
- B. Furnish all labor, materials, tools, and equipment to furnish and install garden roof system, drainage materials, growth media and plants on a low-sloped roof.

1.02 PERFORMANCE REQUIREMENTS

- A. Maintain a vegetated green roof for the life of the purposed warranty.
- B. Install all components of green roof in accordance with manufactures guidelines and in a manor that will not damage the waterproofing membrane.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau (FLL) guidelines

1.04 DEFINITIONS

- A. Garden Roof -- An area of planting/landscaping, built up on a waterproofed substrate at any level that is separated from the natural ground by a man-made structure.
- B. Extensive Garden Roof -- Low maintenance landscaping consisting of shallow soil depths (3 to 6 inches) with plant varieties to be chosen by a certified Landscape Architect.
- C. Semi-Intensive Garden Roof – Medium maintenance landscaping consisting of medium soil depth (6 to 8 inches) with plant varieties to be chosen by a certified Landscape Architect.
- D. Intensive Garden Roof – Higher maintenance landscaping consisting of high soil depths (8+ inches) with plant varieties to be chosen by certified Landscape Architect.
- E. Garden Roof Contractor – A contractor certified by the Garden Roof System Manufacturer to install all components of a comprehensive green roof system including, but not limited to protection layer, thermal insulation, drainage layer, filter fabric, edging, growing medium (soil), and vegetation.

1.05 SYSTEM DESCRIPTION

- A. Furnish and install a completed Garden Roof System including geotextile leveling layer, protection layer/root barrier, rigid thermal tapered insulation, drainage layer, filter fabric, river gravel maintenance strip / ballast or pavers, lightweight engineered growing medium (soil), and vegetation.

1.06 SUBMITTALS

- A. Product Data: For each type of roofing material indicated.
 - 1. Provide product data on all components of the garden roof assembly.
 - 2. Submit list of materials and data sheets describing physical characteristics and performance

- criteria for materials proposed for use
3. Include sample of warranty customized for this project.
- B. Shop Drawings: Include plans, sections, details, and attachments to other Work, flashing sheets, roof penetrations, vertical intersections, roof slope, expansion joints, membrane terminations, soil depth, planting schedule and drainage.
- C. Samples for Verification: For each of the following products:
1. Submit sample of ballast.
 2. Manufacturer's standard sample of tapered board insulation.
 3. Manufacturer's standard sample of drainage/water storage board, protection layer and moisture relocation mat.
 4. Submit a sample bag of soil media.
 5. Nursery's listing of available plants complying with listed specifications.
 6. 12" section of perforated metal edging.
- D. Installer Certificates: Signed by manufacturer's certifying that installers comply with requirements.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- F. Maintenance: Provide scope for yearly maintenance of Garden Roofing.
- G. Warranties: Provide documentation either with roof warranty or stand alone for Garden Roof components.
- H. Inspection Report for Information: Copy of roofing system manufacturer's inspection report of completed roofing membrane.

1.07 QUALITY ASSURANCE

- A. Refer to Section 1.06 SUBMITTALS.
- B. The Garden Roof Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:
1. Approved by the Garden Roof System Manufacturer as an authorized installer in good standing.
 2. List of at least three (3) projects, satisfactorily completed within the past three (3) years, of similar scope and complexity to this project. Previous experience submittal shall correspond to specific Green Roof System proposed for use by Green Roof/Waterproofing Contractor.
- C. Installation of leveling layer, separation layer, drainage layer and insulation shall be the responsibility of the Garden Roof Contractor to ensure undivided responsibility.
- C. Supplier Qualifications:
1. Green Plant supplier that specializes in the propagation of green roof plants.
 2. Green Roof plant supplier must have 5 years experience in the production and maintenance of green roof plants specifically chosen.
 3. Engineered planting media by a firm that specifically mixes rooftop media and is approved by Soprema.
- D. Drainage mat manufacture should have successfully produced drainage mat material for at least 15 years.

- E. Garden Roof System Manufacturer shall have available an in-house technical staff to assist the Garden Contractor, when necessary, in application of the products and final inspection of the assembly.

- F. Pre-construction conference to be held with the Owner, Architect, Garden Roof Contractor's field superintendent, Garden Roof System Manufacturer's representative, and other involved trades to discuss waterproofing practices applicable to this project, including schedule for waterproofing, flood testing, installation or soil media and planting schedule. Pre-installation conference should include general contractor's plan for green roof protection, if necessary.
 - 1. Review structural load limitations of roof deck during and after roofing.
 - 2. Review flashing, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 - 3. Review regulations and requirements of authorities having jurisdiction for insurance certifications, inspection and testing, if applicable.
 - 4. Review temporary protection requirements for roofing system during and after installation.
 - 5. Review roof observation and repair procedures after roofing installation.

- G. Water testing of the completed waterproofing system (minimum of 24 hours) is required. Water testing shall be witnessed and confirmed in writing by the Owner's Representative, the Garden Roof Contractor, and the Garden Roof System Manufacturer's representative.

- H. All work shall be completed by trained and authorized personnel.

1.08 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. Membrane rolls shall be stored lying down on pallets and fully protected from moisture with canvas tarpaulins.
- E. Bonding adhesives shall be stored at temperatures above 40°F (5°C).
- F. Deliver roof media in bags on site and protect from contamination dumping on site is not accepted.

1.09 PROJECT CONDITIONS

- A. Proceed with Garden roof installation only after water test has been completed. Owner's Representative and/or Architect and Garden Roof Contractor must water test results before proceeding with membrane installation.
- B. Do not work in rain or snow or adverse weather conditions. Comply with applicable installation requirements for all components.
- C. All work shall be scheduled and executed without exposing the interior building areas to the affects of inclement weather. The building and its contents shall be protected against all risks.

- D. The Garden Roof Contractor shall take precautions that storage and/or application of materials and/or equipment does not overload the deck or building structure.
- E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner, at all times, as to preclude wind blow-off or damage.
- F. Arrange work sequence to avoid use of newly-constructed garden roof for storage, walking surface, and equipment movement. Where such access is absolutely required, the Roof/Waterproofing Contractor shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. Any damage which occurs to the garden roof system is to be brought to the attention of the Owner's Representative and/or Architect and the Garden Roof System Manufacturer's representative. All damage is to be repaired according to Garden Roof System Manufacturer recommendations.
- G. Prior to and during installation, all dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air, pressure washing and/or similar methods per manufacturer's written instructions.
- H. All materials shall be immediately taken off the site to a legal dumping or recycling area authorized to receive such materials.
- I. If any unusual or concealed condition is discovered, stop work and notify the Owner's Representative and/or Architect and Garden Roof System Manufacturer's representative immediately, in writing.
- J. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks and excessive heat. All products including solvents, compatible with and not detrimental to plant components and plant growth.
- K. Contaminants, such as grease, fats, oils, and solvents, shall not be allowed to come into direct contact with the waterproofing membrane. Any such contact shall be reported to Owner's Representative and/or Architect and the Garden Roof System Manufacturer's representative immediately.
- L. The Garden Roof Contractor shall verify that all drain lines are connected and un-blocked before starting work. Report any such blockages or non-connected drains to the Owner's Representative and/or Architect in writing.
- M. Site cleanup, including both interior and exterior building areas below or adjacent to, or in any way affected by the construction, shall be complete and to the Owner's satisfaction.
- N. All landscaped areas affected by the garden roof system installation shall be raked clean and restored to original conditions, if required.
- O. All paved areas shall be swept clean.
- P. All areas stained, dirtied, and discolored or otherwise damaged due to the garden roof system installation shall be cleaned, restored, and replaced as required.
- R. Garden Roof Contractor shall assure that adequate protection is provided after installation so other trades do not damage garden areas.

1.10 WARRANTY

- A. Please refer to the roofing portion of this specification to see what the warranty will cover. The following are some components that may or may not be covered: protection layer/root barrier,

rigid thermal tapered insulation, drainage layer, filter fabric, river gravel maintenance strip / ballast, lightweight engineered growing medium (soil), vegetation, and automatic irrigation system. All components must be warranted by the Roofing Manufacture as a single-source warranty for all components.

Some warranties includes comprehensive coverage of plant survivability at a rate of 80% after two years, as well as possibly the removal and replacement of overburden to access the waterproofing membrane.

1. Duration of Membrane/Flashing: See Roofing Section
2. Duration of Insulation: See Roofing section
3. Material Integrity of Green Roof Components: 20-years
4. Extensive Vegetation: 2-year thrive coverage (min. 50% coverage after 1st year; 80% after 2nd)

PART II PRODUCTS

2.01 MATERIALS

- A. General: Provide products required by manufacturers to be fully compatible with each other and with indicated substrates, or provide separation materials as required to eliminate contact between Incompatible materials.

1. See Roofing section of specification

- B. Root barrier (choose one of the following)

1. **MicroFab Root Barrier** – Is a 18 mil thick, coated woven, micro-perforated polyethylene fabric. Used above the drainage layer/moisture retention layers.

Properties

- a. Roll lengths: 300'x11' or 300'x3'
- b. Roll weight: 105 lbs or 30 lbs
- c. Thickness: 18 mils
- d. Tensile Strength: 45 lb/ft
- e. Elongation at Break: 15%
- f. Tear strength: 6.7 lb/ft
- g. Mullen Burst Strength: 70 psi

2. **Sopranature RB20/30** – Available in 20 mil or 30 mil thicknesses. Virgin-blended linear polyethylene. Used below the drainage layer. Double-sided and single sided BUTYL tape available to tape seams.

RB20 Properties

- a. Roll lengths: 508 sq ft or 762 sq ft
- b. Tensile Strength: 75 lbs.
- c. Elongation at Break: 800%
- d. Tear resistance: 11 lbs/ft
- e. Hydrostatic resistance: 100 psi
- f. Puncture resistance: 30 lbs/ft
- g. Perm rating: .041perms

RB30 Properties

- a. Roll length: 508 sq ft or 762 sq ft
- b. Tensile Strength: 142 lbs
- c. Elongation at Break: 800%
- d. Tear Strength: 16 lbs/ft
- e. Hydrostatic resistance: 170 psi
- f. Puncture Resistance: 45 lbs/ft
- g. Perm rating: .031 perms

- C. Soprema Drainage and/or water retention layer (choose one of the following)

1. **Sopradrain Eco-Vent** – Drainage composite consisting of a post-industrial recycled polypropylene drainage core of fused, entangled filaments and a geocomposite fabric heat fused to one side.

Properties Core

- a. Compressive Strength: 30,000 psf
- b. Thickness: 0.45 in
- c. Flow rate: 9.2 gal/min/ft

Fabric Properties

- a. Flow: 120.0 gal/min/sf
- b. Puncture Strength: 70 lbs.
- c. Apparent Opening Size (AOS): 70 US sieve
- d. Grab Strength: 120.0 lbs.

2. **Sopradrain Eco-2** – Drainage composite consisting of a post-industrial recycled polypropylene drainage core of fused, entangled filaments and a geocomposite fabric heat fused to one side and bonded to the other. This second fabric eliminates the need for a protection fabric.

Properties Core

- a. Compressive Strength: 30,000 psf
- b. Thickness: 0.45 in
- c. Flow rate: 7.7 gal/min/ft

Fabric Properties (Black)

- a. Flow: 120.0 gal/min/sf
- b. Puncture Strength: 70 lbs.
- c. Apparent Opening Size (AOS): 70 US sieve
- d. Grab Strength: 120.0 lbs.

Fabric Properties (grey)

- a. Flow: 185.0 gal/min/sf
- b. Puncture Strength: 35.0 lbs
- c. Apparent Opening Size (AOS): .357 mm
- d. Grab Strength: 125.0 lbs.

3. **Sopradrain Eco-Vent WR** – This is a multi-function composite consisting of 50% post-industrial recycled polypropylene drainage core of fused, entangled filaments and a specially formulated water retention fabric bonded to one side. The absorbent mat is designed to hold 10 to 12 times its units weight of water.

Drainage Core Properties

- a. Thickness: 0.60 in
- b. Flow rate: 6.9 gal/min/ft
- c. Compression Strength: 30,000 PSF

Water Retention Fabric Properties

- a. Weight: 20 oz/sq yd
- b. Puncture Strength: 70 lbs
- c. Grab Strength: 135.0 lbs

4. **Sopradrain Eco-2 WR** – This is a multi-function composite consisting of 40% post-industrial recycled polypropylene drainage core of fused, entangled filaments and a specially formulated water retention fabric bonded to one side and a protection fabric bonded to the other. The absorbent mat is designed to hold 10 to 12 times its units weight of water. The fabric eliminates the need for a separate protection layer.

Drain Core Properties

- a. Thickness: 0.60 in
- b. Flow rate: 6.9 gal/min/ft
- c. Compression Strength – 30,000 PSF

Water Retention Fabric Properties

- a. Weight: 20 oz/sq yd
- b. Puncture Strength: 70 lbs.
- c. Grab Strength: 135.0 lbs

5. **Soprema LT Aggreddrain** – Is made of rotary-Kiln expandable clay aggregate or expandable shale. The Aggreddrain closely emulates PH and drainage tendencies of natural soils and complies with the ASTM D-0330 and FLL standards.

Properties

- a. Specific gravity: 1.35
- b. Dry unit weight: 35-38 pcf
- c. Saturated surface weight: 46-48 pcf
- d. Absorption: 25-30%

D. Water Retention/Capillary Water Management System (choose one if necessary)

1. **Soprema Mositure Retention Mat** – Made from 100% recycled materials 35% polypropylene and 65% polyester. Contains no organic material and will not decompose. Designed to hold moisture in the garden roof assembly.

MRM14 (6'x150') Properties

- a. Water retention: .123 gal/sf
- b. Roll weight: 84 lbs
- c. Thickness: .087 in
- d. Bursting Strength: 261 lbs
- e. Puncture resistance: 101 lbs
- f. Elongation: Warp 122%; Fill 96%
- g. Breaking strength: Warp 186 lbs; Fill 219 lbs

MRM30 (6'x75') Properties

- a. Water retention: .201 gal/sf
- b. Roll weight: 110 lbs.
- c. Thickness: .397 in
- d. Bursting strength: 776 lbs
- e. Puncture resistance: 275 lbs
- f. Elongation: Warp: 153%; Fill 131%
- g. Breaking strength: 282 lbs; Fill 435 lbs

2. **Aquamat Jardin** – a capillary mat specifically designed for green roof irrigation and water retention. It is a lamination of four materials that perform specific functions. The top surface root barrier prevents roof penetration and permits the passage of water into the growing medium through capillary absorption. The integrated system provides watering with lines spaced at 2'. The non-woven geotextile acts as a reservoir that retains and distributes moisture constantly and evenly throughout the entire area. The bottom layer is a watertight 6 mil black, UV treated polyethylene film, which forms a capillary break at every 10'.

Properties

- a. Roll dimensions: 11'x100' or 7'x100'
- b. Roll weight: 170 lbs. or 108 lbs
- c. Capillary rise: 5 inch
- d. Water Retention: 2.5 gal/sq yd
- e. Transmissivity: 4.14 in/min

D. Extruded Polystyrene Insulation (if necessary)

1. **Dow Styrofoam**
- a. Insulation shall meet ASTM C-578, Type VI or VII.
 - b. Minimum compressive strength, ASTM D-1621, 60 psi (variance by type of product). Provide 60 psi insulation under garden system.
 - c. Maximum water absorption by volume per ASTM C-272, 0.1%
 - d. Water vapor permeance for 1" product per ASTM E-96, 1.0 perm (max.) (63 ng/Pa/s/m²)

- e. Insulation shall have an R value of 5.0°F ft² h/Btu/in. (0.88 K m²/W) of thickness when tested at 75°F (23.9°C) mean temperature in accordance with ASTM C-518
- f. Product shall be free of CFC's

E. Filter Fabric

- 1. **Soprema Filter Fabric** – is a virgin non-recycled polypropelene, staple fiber, needle-punched and non-woven geotextile. Additionally, the fibers in the fabric are needed to filter fabric for a stable network that retains dimensional stability relative to one another. Soprema Filter Fabric offers resistance to UV degredation and to biological and chemical environments typically found in soil. System Filter is to be used as a separation between drainage layers and medias with green roof systems.

Fabric Properties

- a. Flow: 150 gal/min/sq ft.
- b. Tensile: 90 lbs.
- c. Elongation: 50%
- d. Mullen Burst: 185 psi
- e. Puncture Strenght: 55 lbs
- f. Trapezoidal Tear: 40 lb (130 N)
- g. Apparent Opening Size (AOS): 70 US Sieve#

E. Soil

- 1. **Soprema Soil Mixtures** - Custom growing media mix capable of supporting vigorous growth of the specified vegetation, complying with the following specification.
- 2. Extensive soil mix shall be used when soil depth is < 6” with plant varieties to be selected by Landscape architect
- 3. Semi-Intensive soil mix shall be used when soil depth is > 6” with plant varieties to be selected by landscape architect
- 4. Intensive soil mix shall be used in Shallow Intensive/Lawn Green Roof applications in which soil depth would typically be < 8”.

F. Wind Erosion Control Mat (if necessary)

- 1. **Soprema Wind Erosion System** – designed to control the erosion of a new green roof system until the planting have grown in enough to prevent erosion
 - a. Erosion blanket is made of naturally biodegradeable coconut coir material and will biodegrade in 1 to 2 years. The blankets are 120 ft x 6 ft.
 - b. Erosion blanket anchors are made of recycled polyethelene or biodegradeable cornstarch, which allows them to biodedegrade with the blanket.
 - c. Erosion control Disk is a 30 mil steel disk which holds the blanket in place

G. Sedum mats (if necessary)

- 1. **Soprema Vegetatative mats** – consist of different varieties of sedum grown into holding mat at a nursery then delivered to the jobsite and installed like sod giving a look of instant green. Please contact local Soprema representative for sedum species available.
 - a. Nylon entanglement vegetative mat is a textile base of lightweight fleece sewn to PA/PP entanglements bound of geotextile fabric filled with a planting substrate

and pre-cultivated with an even layer of low-profile, drought-tolerant vegetation.
Available in both lightweight and heavy duty matting

- b. Coconut Coir vegetative mat is a coconut fiber blanket with a layer of planting substrate and filled with a layer of low-profile, drought-tolerant vegetation. Rolls are 4 ft x 6 ft

H. Plugs and Cuttings (if necessary)

1. **Plugs and Sedum Cuttings** - shall be planted and maintained in accordance with Architects written specifications by an approved installer.
2. Cutting and plugs vary by region please contact your local area rep for specific blends that are available.

2.02 Accessories (choose all that apply)

- A. **Soprema Edge Restraints** – Designed to meet or exceed drainage capacity of all manufactured green roof drainage panels. Made from .100 thick Aluminum 5052 sheet (stainless steel also available). These edge restraints are available in either straight or flexible edging. The Flexible edging has a V-shaped notches cut into it to allow for shaping to arcs and circles.

Edges come with 12 slots per foot, effective slot mean diameter .375 in. area per slot .11 sq in. Factory Flow = .0119 CFS/5.4 GPM. This equates to 1.7 GPM per linear foot (assuming 1” head to match the drainage course)

Edge restraints come in a various sizes from 3.5” to 8.5” heights with the return leg varying by height of edge restraint. Standard color is Aluminum unfinished, color options are available please consult your local Soprema Representative.

Edge Restraints come with clips and bolts for attachment. Corner pieces are also available.

- C. **Soprema Inspection Chambers:** Designed to fit over most standard drains and to keep out large debris and contaminants; to promote positive drainage in the garden roof system. 304 BB 18 gauge stainless steel. They have a removable top for easy inspection of the drain after installation.

Slot dimensions are 3/16-inch x 3-15/16-inch, with a flow rate of 110 gallons per minute. They are available in 11”x11”x5/8” or 18”x18”x5/8”

- D. **Soprema Extensions for Edge Restraints and Inspection Chambers:** Extension pieces to be used when the garden roof area is higher than the standard heights. Made of the same materials as the edge restraints and inspection chambers.

- D. **Pavers:** Wausau Concrete Pavers, varies by design please contact your local Soprema representative for options.

- F. **Stone Ballast:** As shown on the plans, or if not indicated on the plans use well screened and washed stone gravel meeting ASTM D-448-80, gradations #57, 2, 4 or 5

PART III EXECUTION

3.01 INSPECTION

- A. The Green Roof/Waterproofing Contractor shall examine all surfaces to receive the garden roof system to verify it is acceptable and proper for the installation of the garden roof.
- B. The Roof/Waterproofing Contractor shall not proceed with the installation of the garden roof system until all roof defects have been corrected. A water test may be required before placement of any overburden.

3.02 PREPARATION

- A. Substrate cleaning
 - 1. Thoroughly sweep the substrate which is to receive the extensive green roof system.

3.03 INSTALLATION

- A. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- B. Water Test
 - 1. All roof areas or portions thereof shall be water tested by means of flood testing water at a minimum depth of 2" for a period of 48 hours to check the integrity of the membrane installation.
 - 2. Verify that the structure can support the dead load weight of a water test before testing.
 - a. If leaks should occur the water must be drained completely and the membrane installation replaced and the roof system area dried out, seal membrane and retest.

3.03 EXTRUDED INSULATION INSTALLATION (if required)

- A. Insulation Placement
 - 1. Install one or more layers of rigid insulation to required thickness and/or R-value. Stagger all joints, cut and fit to within 3/4 inch (19 mm) of all projections, perimeter walls and penetrations. Insulation is to be loose laid and tightly butted with joints not greater than 3/8 inch (9.5 mm).

2. Multi-layer insulation applications require the bottom layer of insulation to be the thickest layer and shall be a minimum of 2" thick (50.8 mm). All layers shall be loose laid with the joints of the second layer staggered and offset from all joints of the preceding layer. Each successive layer shall be offset from the underlying layer(s).

Vertical insulation applications shall be spot adhered to the protection layer with appropriate adhesive or additional hot rubberized asphalt membrane.

3.04 GARDEN ROOF COMPONENTS INSTALLATION

A. Root Barrier Installation (RB20/RB30)

1. Unroll the specified root barrier over the entire surface, around all edges and upstands (vertical surfaces); overlapping all seams a minimum 4" (four inches). Seal all side and end laps with specified adhesive in a continuous and unbroken ¾" (three-quarter inch) ribbon strip.
2. Install Drainage layer RB20 or RB30 below the drainage layer always.

B. Air layer/Drainage / Water Retention Installation (Eco-Vent, Eco-2, Eco-vent WR or Eco-2 WR)

1. Install the specified drainage / water retention course over waterproofing or insulation layers with the black filter fabric or water retention mat facing up (product dependent).
2. Properly position drainage course, carefully cutting and fitting panels to fit the surface. Typically drainage mats will be run over the full length of the roofing system and turned up walls to provide protection for flashing sheets. Cut and snugly fit the drainage course at all perimeters, curbs and penetrations, following the membrane manufacturer's installation procedures. Cut holes to expose all drain areas
3. Drainage mat must be positioned so the 3" overlap, laps over the next sheet. It is recommend to adhere this overlap with adhesive to hold it in place for the install of the soil. This can be accomplished with a one part urethane adhesive or a butyl tape.
4. Drainage mats should be covered with soil as soon as possible to avoid any deterioration to the filter fabric or retention mats.

C. Root Barrier Installation (Micro-fab)

1. Unroll the specified root barrier over the entire surface, around all edges and upstands (vertical surfaces); overlapping all seams a minimum 4" (four inches). Seal all side and end laps with specified adhesive in a continuous and unbroken ¾" (three-quarter inch) ribbon strip.
2. Micro-fab root barrier can be installed above the Drainage layer.

D. Edge Restraints and Extensions

1. Installed on top of Drainage, water retention or root barrier course, so the perforated edge is vertical with a horizontal leg positioned in area that is to receive the soil and vegetation.
2. Metal edge restraints shall be fastened together using clips and corner pieces. These will be secured with bolts and washers.
3. Edge restraints may need to be cut to size depending on design.
4. Extension pieces are secured using bolts and washers and will need to have holes drilled on site hold the two pieces in place

E. Inspection Chambers and Extensions

1. Inspection chambers are fit over existing drains
 2. Extensions can be used to extend the Inspection Chamber up to the soil level, these are secured with bolts and washers and must have holes drilled on site for securement.
- F. Water Retention layer (Soprema Mositure Retention Mat, if necessary)
1. Loose laid in areas to receive soil, above the drainage or root barrier layer.
- G. Aggregate Drainage System (Aggredrain LT, if chosen instead of drain mat)
1. Installation of Aggredrain LT will be installed to the desired depth called out in the specification. Aggredrain LT must be covered with filter fabric if installed in planting areas.
 2. Bags are opened and spread over air layer to specified height
- H. Capillary Water Management system (Aquamat Jardin, if necessary)
1. Please call manufacture for written installation instruction for this capillary water management system.
- I. Filter Fabric
1. Filter Fabric shall be laid over the drainage layer, lapping adjacent rolls a minimum of 6 inches (150 mm). Enough material shall be left to be drawn up above the anticipated soil level. Any excess shall be trimmed down to the level of the soil..
- J. Garden roof soil (extensive, semi-intensive and intensive)
1. Soil shall be placed carefully to avoid damage or displacement of other materials such as walls, paving, drainage components, filter fabric, and roofing membrane.
 2. Garden roof soil shall be placed to within 1 inch greater than final grade or to a depth of no greater than 4 inches and compacted as described in below. For final grades less than 4 inches only one round of compaction shall be performed and remaining soil loosely placed such that top of soil exceeds final grade by 1 inch (see 3.08.D. below). For final grades greater than 4 inches, place soil at no greater than 4 inches and repeat procedure until soil has been compacted within 1 inch of final grade.
 3. Compaction shall be performed with a 75 lb. landscape roller to achieve a 50 – 60 % compaction as determined by ASTM D1557.
 4. After compaction remaining soil shall be placed at 1 inch greater than final grade and thoroughly watered or jetted over entire area. Low settled areas shall be filled with additional soil and re-wet to achieve uniform prescribed final grade.
- K. Stone ballast or pavers
1. Installed at all roof perimeters, building walls, penetrations, and access hatches and as required for flashing vegetation barriers, proper wind design, fire breaks, and as walkway/maintenance paths.
 2. Ballast design shall be in accordance with Dow Chemical Company TechNote 508 Ballast Design Guide for IRMA Roofs, and other applicable codes or wind design guides.
- L. Wind Erosion System (if necessary)

1. Once soil is installed bury anchors bottom of the anchors 3' OC in the field and 2' OC near the edges.
2. Install Bio-degradable mat, so that it is secured through the shaft of the anchor pieces
3. Once mat is completely installed, place metal disc over the anchors to secure the mat in place

M. VEGETATION INSTALLATION

1. Install the vegetation by Vegetate Mat, Plugs or Cuttings in accordance with design drawings.
2. Sowing seed for grass or meadow flower plantings must be done so as to achieve the maximum uniformity possible over the entire surface of the medium at the density specified by the seed provider. Once sown, the surface of the medium is gently raked (as with the backside of a leaf rake) to lightly bury the seed; the surface is then gently rolled with a garden roller.
3. Rolls of sod or vegetative mat are laid out in a staggered pattern, snugly butted side-to-side and end-to-end; do not stretch the rolls. The surface is then gently rolled with a garden roller.
4. In all instances, all plantings must be thoroughly watered to the point of saturation immediately after planting.

3.05 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from extensive green roof installation operation.
- B. Repair or replace garden roof system that is vandalized until final acceptance is granted.

END OF SECTION