

## BIOROOF SYSTEMS INC. – ECO-LITE VEGETATED ROOF ASSEMBLY

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**SPEC NOTE:** This guide specification is intended for use when specifying a vegetated (or green) roof assembly. Make any required selections where options are given. Where selection is indicated with an [OR] statement, select the appropriate statement. Delete all SPEC NOTES and [OR] statements prior to final printing.

**DISCLAIMER:** The manufacturer has reviewed the product information contained in this guide specification. The information is organized and presented to assist the specification writer working on a construction project to select the appropriate products and save time in writing the project specification Section. The specification writer is responsible for product selection as well as the use and application of this information, and should contact the manufacturer to ensure all options are available and that the associated specification information is valid and correct.

## 1 General

### 1.1 SECTION INCLUDES

- .1 All conditions of the Contract and Division 1 apply to this Section.
- .2 Additional requirements may be specified in other sections.
- .3 All components above the roofing membrane are included in this description of a vegetated roof assembly.

**SPEC NOTE:** Edit to suit project requirements

### 1.2 PERFORMANCE REQUIREMENTS

- .1 All vegetation must be verified for compatibility by the growing medium manufacturer prior to acceptance.

**SPEC NOTE:** The top reasons cited for specifying a vegetated roof in North America are storm-water retention, cooling and storm-water pollution remediation. Therefore the vegetated assembly must adequately address those issues in order to address the present and future policies of government building permit requirements.

- .2 Plant materials must demonstrate the ability to achieve at least 35<sup>o</sup>F transpirative cooling 6" above the surface of the growing medium.
- .3 The entire vegetated assembly must demonstrate the ability to retain at least 0.9 gal./ft<sup>2</sup> of water.
- .4 The entire assembly must demonstrate the ability to remediate chlorinated and non-chlorinated hydrocarbons.
- .5 The entire assembly must demonstrate minimum populations of microorganisms necessary to sustain the vegetation naturally.
- .6 All materials involved in the making of the growing medium must be from recycled products and at least 90% must be obtained from sustainable sources. Mined products will not be accepted, i.e. agricultural peat moss, expanded shale, pumice, lava rock, and other similar sourced materials.
- .7 All media must be locally sourced from within a 500 mile radius of the project site.

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## 1.3 RELATED SECTIONS

- .1 Section 03 XX XX – Structural Concrete
- .2 Section 07 XX XX - Air Vapour Barriers
- .3 Section 07 XX XX - Roofing
- .4 Section 16 XX XX - Plumbing
- .5 Section 11 XX XX - Fall Arrest Systems

## 1.4 SUBMITTALS

- .1 Provide documentation from the Vegetated Roof System provider that the Contractor/Subcontractor is a certified installer of their systems.
- .2 Submit testing data to verify the remediation ability of the growing medium as per Section 1.2.4.
- .3 Submit testing data to verify the minimum microbial populations as per a SoilFoodweb certified laboratory as per Section 1.2.5.

## 1.5 CERTIFICATES

- .1 Manufacturer Certificates: Signed by the Vegetated Roofing System Manufacturer verifying that the installer is approved, authorized or licensed by the manufacturer to install specified products.
- .2 Installer Certificates: Signed by the installer verifying they have the specified qualifications described.

## 1.6 INSPECTION AND TESTING

- .1 Product Test Reports: based on the evaluation of comprehensive tests conducted by an independent testing agency of the specified products.
- .2 Manufacturer Field Inspection Reports: manufacturer's written acceptance of vegetated roofing installation based on regular inspections.

**SPEC NOTE:** Electronic testing is an option. It may not be compatible with all conventional roofing products. If retaining, revise to include Project-specific requirements. Insert additional requirements to suit Project.

- .3 Electronic Testing: Perform leak testing by an electronic detection process administered by a qualified testing agency. Flood Testing will not be accepted.

## 1.7 QUALITY CONTROL

- .1 The Contractor/Subcontractor must have proven experience installing vegetated assemblies of a similar nature.
- .2 The Contractor/Subcontractor must have at least 2 years of proven experience in the application of growing mediums on elevated roof decks with a blower truck.
- .3 The Contractor/Subcontractor must have trained staff to facilitate the maintenance of the vegetated roof system.

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- .4 The Contractor/Subcontractor must be certified by the manufacturer of the vegetated roof system.
- .5 All employees of the Contractor/Subcontractor must have Fall Arrest Certificates on their person at all times while working on the roof top.

## 1.8 PRE-INSTALLATION MEETINGS

**.1 Conduct pre-installation meeting as specified in Section XXXX**

- .1 Meeting: prior to commencement of roof installation, review and document methods and procedures related to roof deck and roofing system construction, including:
  - .1 Participants: authorized representatives of the Contractor, [Construction Manager], [Owner], Consultant, Roofing Sub-Contractor, Roofing Manufacturer, Vegetated System Manufacturer, vegetated system installer.
  - .2 Review methods and procedures relating to vegetated roofing assembly, including manufacturer's written installation instructions.
  - .3 Review construction schedule and confirm availability of products, Sub-Contractor personnel, equipment and facilities.
  - .4 Review roofing membrane type and system for conformance with vegetated assembly criteria.
  - .5 Review structural loading limitations of roof deck and identify temporary loading areas for storage.
  - .6 Review flashing details, roofing details, drains, penetrations, equipment curbs, and other conditions affecting vegetated system assembly.
  - .7 Review governing regulations, insurance and/or certificates where required.
  - .8 Review safety requirements, including fall arrest measures.
  - .9 Review field quality control procedures and review no-smoking policy.
  - .10 Prior to commencement of work obtain from the [owner] [consultant][roofing contractor] a report certifying the roof is watertight.
  - .11 Prior to commencement of work obtain a structural report from the consultant certifying the dead load weight restrictions for the entire assembly.
  - .12 Prior to commencement of work, ensure coordination with related work specified in other Sections.
  - .13 The [owner] [consultant]
  - .14 Minutes of each meeting must be taken by a representative of the consultant and distributed to all the parties within 24 hours of the meeting date.
  - .15 Review limits of traffic by other trades on vegetated assembly and outline procedures for compensation due to damage.
  - .16 Review procedure for manufacturer's inspection visit to assess compatibility with warranty requirements.
  - .17 Contractor must complete a photographic record of site prior to commencement.

## 1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store Products in original packaging with manufacturer's labels and materials list intact and signed off.
- .2 Store Products in designated areas elevated from the ground and protected from environmental damage.

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- .3 Do not store growing medium on site to prevent contamination. Growing medium should be installed immediately upon delivery to site.

## 1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Vegetation must be installed according to optimal conditions, conducive to plant establishment and survival.
- .2 Seed may be installed during a dormant period provided the Contractor/Subcontractor is willing to warrant at least 80% germination by the end of one complete growing season.
- .3 All other components and growing medium may be installed at any time provided adequate protection is provided to prevent damage and erosion.
- .4 Traffic is prohibited on the vegetated assembly during the establishment period.

## 1.11 WARRANTY

- .1 Warranty commences at substantial completion of this project.
- .2 Installer's Warranty: standard two year warranty for all components of the vegetated assembly as specified in this Section.
- .3 Manufacturer's Extended Warranty: a written warranty that the manufacturer will replace, at no cost to the Owner, any portion of the green roof which does not perform adequately.
  - .1 The installer must make application and obtain from the manufacturer the extended warranty.
  - .2 The manufacturer's warranty will include a maintenance program for the extent of the warranty period.
  - .3 The manufacturer's warranty will run concurrently with all other warranties.

## 1.12 MAINTENANCE

- .1 Maintenance shall be conducted annually as per this specification for the entire warranty period.
- .2 Initial Maintenance shall include a weekly inspection of entire green roof for the first 8 weeks, providing irrigation as required to ensure survival of new plantings. Bi-weekly inspection shall continue for further 8 visits, including irrigation, re-planting and weeding out of non-intended plantings as required.
- .3 Regular Maintenance shall commence following the Initial Maintenance period and shall include visiting the site monthly during each growing season. Included in this schedule shall be: removal of unintended species, replacement of dead plantings, plant appropriate pruning, cleaning of drains and maintenance free areas, programming and opening/closing of irrigation system, watering, repairing of components due to normal wear and tear, as required.
- .4 The following products are to be used, as required, in order to maintain the performance parameters of the vegetated system:
  - 1. aerobic compost tea by a supplier certified by the growing medium manufacturer.
  - 2. kelp meal
  - 3. pelletized compost or alfalfa
  - 4. fish emulsion
  - 5. Microblend™

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All products must be certified organic and approved by the growing medium manufacturer. The use of chemical fertilizers or pesticides is strictly prohibited.

## 2 Products

## 2.1 MANUFACTURERS

- .1 Manufacturer of Vegetated Roof Assembly having systems approved for use:
- .1 Bioroof™ Eco-Lite System; [www.bioroof.com](http://www.bioroof.com), 1 866 377 5177
- .2 Substitution Procedures: Submit requests for alternates to this specification a minimum of fifteen (15) working days prior to tender closing for evaluation in accordance with Section XX XX XX .
- .1 Submit evidence that alternate materials meet or exceed performance characteristics as set out in this specification. Submit documentation from an approved independent testing laboratory certifying the performance of the vegetated roof system and its components as per the testing methods cited in Section 2.2.
- .2 Submit references clearly indicating that the Vegetated Roof Installer has successfully completed projects on an annual basis of similar scope and nature for a minimum of five years.
- .3 Submit manufacturers' complete set of standard details for the extensive vegetated roof system
- .4 Submit a list of 5 projects executed over the past twelve months and any related case studies.

## 2.2 MATERIALS

- .1 Root Barrier: Heavy duty re-inforced polymer film, 10mil thick, 3 ply laminate with high strength cord grid, fire-retardant.
- |                                     |          |
|-------------------------------------|----------|
| Flame Spread Index-Class A ASTM E84 | 5        |
| 1" Tensile Strength ASTM D7003      | 50 lb/ft |
| Elongation at break ASTM D7003      | 600%     |
| Grab Tensile Strength ASTM D7004    | 78 lb/ft |
| Trapezoid Tear ASTM D4533           | 52 lb/ft |
| Hydrostatic Resistance D751         | 74 psi   |
| Mullen Burst ASTM D751              | 169 psi  |
- .2 Horizontal & Vertical Protection Air Layer: Woven polypropylene mat, open weave.
- Mechanical Properties**
- |  |                         |
|--|-------------------------|
| Tensile Strength ASTM D5035 (modified)         | 145 lbs/ft              |
| Thickness ASTM D5199                           | 0.75 in                 |
| Mass/Unit Area ASTM D5261                      | 12.0 oz/yd <sup>2</sup> |
| UV Stability ASTM DG53 / ASTM D5035 (modified) | 80% strength retained   |
- Performance Properties**
- Permissible Velocity**
- |                                  |         |
|----------------------------------|---------|
| Product Only Flume test1         | 20 ft/s |
| 30 minute, vegetated Flume test1 | 19 ft/s |

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50 hour, vegetated Flume test1	14 ft/s
<b>Permissible Shear Stress</b>	
Product Only Flume test1	11.2 lbs/ft <sup>2</sup>
30 minute, vegetated Flume test1	10.0 lbs/ft <sup>2</sup>
50 hour, vegetated Flume test1	8.0 lbs/ft <sup>2</sup>

**SPEC NOTE: Remember to eliminate insulation from roofing section (Section 07 XX XX) if protected membrane assembly is used**

- .3 Horizontal Insulation: Use polystyrene extruded foam board conforming to ULC-S701-05 (ASTM C578), Type IV with shiplapped edges. Thickness as specified and/or as shown on drawings.
- |                                 |                     |
|---------------------------------|---------------------|
| Thermal Resistance ASTM C518    | 5 per inch at 75° F |
| Compressive Strength ASTM D1621 | 40 psi              |
| Water Absorption ASTM C272      | 0.1% average        |
- .4 Drainage/Water Retention Board: Shall be a made of 100% recycled HDPP, molded into a three dimensional panel which positively locks together to form an integrated Drainage/Water Retention system.
- |                 |   |
|-----------------|---|
| Water retention | 0.165 gal./ft <sup>2</sup>              |
| Dimensions      | 24" x 24" x 1.25"                       |
| Dry Weight      | 0.6 lbs/ft <sup>2</sup>                 |
| Weight          | 1.93 lbs./ ft <sup>2</sup> (with water) |
- .5 Filter Cloth:
- Mechanical Properties**
- |                                  |            |
|----------------------------------|------------|
| Grab Tensile Strength ASTM D4632 | 80 lbs/ft  |
| Elongation ASTM D4632            | 50%        |
| Trapezoid Tear ASTM D4533        | 35 lbs/ft  |
| Puncture ASTM D4833              | 45 lbs/ft  |
| CBR Puncture ASTM D6241          | 220 lbs/ft |
| Mullen Burst ASTM D3786          | 160 psi    |
- Endurance Properties**
- |                         |                |
|-------------------------|----------------|
| UV Stability ASTM D4355 | 70% @ 500 hrs. |
|-------------------------|----------------|
- Hydraulic Properties**
- |   |                          |
|---|--------------------------|
| Permittivity ASTM D4491                 | 2.2 sec                  |
| Water Flow Rate ASTM D4491              | 160 gpm/ft. <sup>2</sup> |
| Permeability ASTM D4491                 | 0.22 cm/sec              |
| Opening Size ASTM D4751 US Sieve Number | 70                       |
- Physical Properties**
- |                      |                        |
|----------------------|------------------------|
| Weight ASTM D5261    | 3.2 oz/yd <sup>2</sup> |
| Thickness ASTM D5199 | 45 mils                |
- .6 Growing Medium: A lightweight, biologically populated, soil-less mix of organic and inorganic material that will support a wide variety of plant growth, retain and remediate storm water run-off.

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Mix shall be aerobically composted, stable and mature green organic waste matter with an end organic content value of at least 25%.

Injected into the soil mix is a microbial stimulant and organic tackifier that temporarily binds the soilless mix on the roof surface and facilitates natural plant nutrition for superior establishment.

**SPEC NOTE:** It is understood that with an organically dominated mix, physical parameters may fluctuate as the product changes over time. The following should be viewed as a general guideline only:

- .1 Organic Matter: All organic products should be aerobically composted using CFR 503 Regulations, including time and temperature data indicating effective weed seed, pathogen and insect larva kill. The composted products shall have a minimum end organic content of 25% by weight and be free of any materials/concentrations toxic to plant growth. Test Methods should follow USCC TMECC guidelines. All laboratories must be STA certified.
- .2 Chemical Characteristics:
  - pH : 6.0 – 7.5
  - EC : under 1.75
- .3 Performance Characteristics
 

Maximum Bulk Density (at Saturation after free drainage)	3.75 lbs./ft <sup>2</sup> /inch
Moisture Retention L/m <sup>2</sup> /mm depth	0.45 gal./ ft <sup>2</sup> /inch
Dry Weight kgs./m <sup>2</sup> /mm depth	2.0 lbs./ ft <sup>2</sup> /inch
Aeration Porosity	Minimum 10%
Total Porosity	Minimum 35%
- .4 Biological Characteristics: The growing medium must demonstrate minimum populations of microorganisms as per a certified Soilfoodweb Laboratory as follows:
  - Active Bacterial Biomass – over 25 ug/g
  - Total Bacterial Biomass – over 3000 ug/g
  - Active Fungal Biomass – over 25 ug/g
  - Total Fungal Biomass – over 300 ug/g
  - Total Protozoa – over 100,000/g
  - Total Nematodes – present

Supplements must further enhance the growing medium by demonstrating the ability to remediate chlorinated and non-chlorinated hydrocarbons over 30 times that of basic green waste compost as per 2.2.10.1.
- .5 Depth: 4” compacted depth.
- .7 Vegetation:
  - .1 Seed: Seed must be a minimum of 90% purity, in dry form and without litter.

[OR]

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**SPEC NOTE:** Pre-established vegetation must be hardened off in the local hardiness zone of the project or a cooler hardiness zone to ensure vegetation is sufficiently prepared for the local climate. [Species per Consultant].

- .1 Potted plantings should be a minimum of 3.5” pot size with well-established rooting. Root bound plants will not be accepted.

[OR]

- .1 Vegetated mats should be grown without any underlay and have an established root system able to hold together within a polypropylene weave mat or fiberglass reinforcement netting for transportation. Vegetated mats shall be no older than one growing season.

[OR]

- .1 Plug plantings should be a minimum of 4” root depth. Root bound plants will not be accepted.

## 2.3 ACCESSORIES

- .1 Pre-manufactured Lightweight Composite Fire Rated Roof Pavers:

Modulus of Rupture ASTM D6109	2500 psi
Modulus of Elasticity ASTM D6109	500,000 psi
Compression Parallel ASTM D413	2516 psi
Water Absorption ASTM D1037	0.41%
Flame Spread Index - Class B ASTM E84	55
Flame Spread Index - Class A ASTM E84	25
Coefficient of Thermal Expansion ASTM D696	.0000107
Screw Withdrawal ASTM D6117	926 lbs./in.

[OR]

- .1 Pre-cast Concrete Pavers: [as specified in Section [07 76 00][\_\_\_\_\_].]  
[610 x 610] [\_\_\_ x \_\_\_] mm size, [50][ ] mm thick; [smooth][diamond][\_\_\_\_\_] pattern; [\_\_\_\_\_] colour [as selected by consultant].
  - .1 Paver Pedestals: [as specified in Section [07 76 00][\_\_\_\_\_].] [pre-fabricated, adjustable plastic paver pads][site fabricated, approximately 100mm x 100mm size rigid polystyrene pads, 25mm thick; having a minimum compressive strength of 210 KPA.]
- .2 Vegetated Inspection Chambers (VIC): SST 304 Stainless Steel, 20 Gauge, form bent from solid sheet steel. Box-shaped with flange and locking lid, 3/4” drain holes at the base on 4” centers. The height should be 1” higher than the finished growing medium height. The inspection chamber should be sized to fit wider than the entire flange of the drain.

**SPEC NOTE:** If vertical insulation with cementitious board is used, be sure to eliminate vertical flashing along parapet walls from roofing section (Section 7).

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- .3 Vertical Insulation/Protection Panels: applications along parapet wall use 3/8" latex modified concrete panel is laminated to Styrofoam closed-cell extruded polystyrene insulation board, ASTM C578, Type VI, 2"
- |                                  |                     |
|----------------------------------|---------------------|
| Color grey                       |                     |
| Weight ASTM D5261                | 4.5 psf             |
| Thermal Resistance ASTM C518     | 5 per inch at 75° F |
| Compressive Strength ASTM D1621: | 40 psi              |
| Water Absorption ASTM C272       | 0.1% average.       |

SPEC NOTE: Different options exist for straight or curved applications relating to the top cap and flange. Make note of such.

- .4 Edging: Pre-manufactured Lightweight Composite Fire Rated T-shaped edging.
- |   |              |
|---|--------------|
| .1 Fasteners: Truss Socket Type A, #6 x 3/4", Stainless Steel |              |
| .2 Modulus of Rupture ASTM D6109                              | 2500 psi     |
| Modulus of Elasticity ASTM D6109                              | 500,000 psi  |
| Compression Parallel ASTM D413                                | 2516 psi     |
| Water Absorption ASTM D1037                                   | 0.41%        |
| Flame Spread Index - Class B ASTM E84                         | 55           |
| Flame Spread Index - Class A ASTM E84                         | 25           |
| Coefficient of Thermal Expansion ASTM D696                    | .0000107     |
| Screw Withdrawal ASTM D6117                                   | 926 lbs./in. |
| .3 Fastening Strip: PVC angle 1.5" x 1.5" x 8'                |              |

SPEC NOTE: The decision to use erosion netting is dependent on a number of variables, including, but not limited to, building's location, orientation, design, height, parapet wall height, vegetation selection, in areas of exceptional wind uplift or where plant establishment could be slow. Consult with Manufacturer.

- .5 Erosion netting:
- |   |  |
|---|--|
| .1 Polymer Netting shall be 5 mil fused grid with 1" holes.   |  |
| To be used in applications where more than 1 year and less than 3 years of erosion control is required. |  |

SPEC NOTE: The installation of an irrigation system is dependent on the design of the entire vegetative assembly. Consult with manufacturer.

- .6 Drip Irrigation  
[insert irrigation specification here]

SPEC NOTE: The installation of a leak detection system is recommended for all vegetated roofs. Some roofing systems may not be compatible. Consult with manufacturer.

- .7 Leak Detection System: Electrical conduction method EFVM (Electric Field Vector Mapping).

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- .8 No-Smoking Signs: Warning signs must contain a prominent NO SMOKING message and contact details for information/inquiries.

### 3 Execution

#### 3.1 EXAMINATION

- .1 Examine surfaces and report any adverse conditions which may negatively impact the appearance or performance of the vegetated roof system. Do not proceed until unacceptable conditions are corrected.
- .2 Ensure adequate provisions have been made for loading, unloading, storage, parking and access to roof site.
- .3 Execute work in accordance with the Specifications, Drawings and Details.
- .4 Report any imbedded objects or obvious damage to the Consultant.
- .5 Ensure all equipment is in good working order. Protect all equipment which comes into contact with the roofing membrane, flashings and related work.
- .6 Ensure adequate safety equipment has been obtained for all operations.

**SPEC NOTE:** Some conventional roof membranes may require protection or an air layer immediately above the surface of the membrane. All protected membrane assemblies should have the root barrier placed immediately upon the roofing membrane. Consult roofing membrane manufacturer for details.

#### 3.2 ROOT BARRIER

- .1 Install root barrier continually over the finished membrane surface, including all vertical surfaces and projections. Overlap and seal with adhesive all side and end laps a minimum of 4" and allow for root barrier to reach up all verticals 1" above the intended soil line and secure.

#### 3.3 HORIZONTAL INSULATION

- .1 Lay insulation in parallel courses, staggering end laps and side laps. Do not force into place.
- .2 Cut insulation to fit neatly at projections and terminations with less than 1" tolerance.

#### 3.4 VERTICAL PARAPET INSULATION/PROTECTION PANELS

- .1 Cut vertical panels to fit directly on horizontal insulation and up to top of parapet wall prior to cap flashing being installed.
- .2 Apply a continuous bead of adhesive along grooved end and ensure tongue and groove fit when using more than one panel high.
- .3 Apply adhesive in a serpentine pattern to back of panel and adhere to the parapet wall. Allow to cure.

#### 3.5 EDGING

- .1 Install edging along perimeter border between vegetation free area and vegetated area.

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- .2 Corner Details: Cut out 3.5 inches of horizontal flange from end to fit precisely for 90 degree corners. Butt end vertical edge to vertical edge and screw together using stainless steel screws provided. Cut top cap at a 45 degree angle and fit onto top of corner. Screw in place.
- .3 Fasten 3' wide strip of filter cloth to edging by wrapping over top of vertical portion and installing lock-down cap over the top for a tight fit. Fasten cap with stainless steel screws from the top, through the cap and into the vertical edging. Trim excess filter cloth and dispose.

## 3.6 RETENTION/DRAINAGE BOARDS AND VERTICAL DRAINS

- .1 Lay Water Retention/Drainage Board panels over insulation up to vertical edging, cutting tightly around any projections, drains, etc... working top to bottom and left to right while securing panel edges together.
- .2 Lay fastening strip tightly on top of Water Retention/Drainage Board panels and against the inside of edging. Fasten with stainless steel screws through strip, into edging as well as through strip, into Water Retention/Drainage Board panels.
- .3 Install Vertical Drains around all roof projections from the top of the Water Retention/Drainage Board to the top of the intended soil line. Join all seams with tie wrap fasteners.

## 3.7 INSPECTION CHAMBERS

- .1 Install inspection chamber centered over the drains directly on the Water Retention/Drainage Board, ensure the bottom inner edge of the chamber is outside of the outer edge of the drain flange.
- .2 Install Vertical Drains around outside of inspection chamber.
- .3 Install filter fabric over the vertical drains and over the lip of the inspection chamber. Cut slits in fabric to fit around locking pins and glue to top inside edge.

## 3.8 AIR LAYER/FILTER CLOTH

- .1 Lay Horizontal Air Layer, pointed surface down, over the Water Retention/Drainage Board panels, cutting around all projections and edging for a tight fit. Do not overlap. Join separate sheets together with tie wrap fasteners every 12'.
- .2 Lay filter cloth over the Air Layer, overlapping seams by 1', and taping to all verticals 1" above the intended soil line.

## 3.9 ROOF PAVERS

- .1 Place roof pavers over filter cloth, ensuring one side is resting on the edging flange. Ensure there is a tight fit between the parapet wall and the edging.
- .2 Fasten edging to flange with stainless steel screws.

[OR]

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- .1 Place concrete pavers on pedestals [spacers] directly over the filter cloth, ensuring one side is resting on the edging flange.
- .2 Ensure pedestals [spacers] are supporting all four corners and create a tight fit between the edging and the parapet wall.

## 3.10 GROWING MEDIA

- .1 Growing Media must be installed using a truck-mounted, integrated, pneumatic blower unit. In order to ensure accuracy, the unit should be powered by its' own separate diesel power unit, not PTO driven, and equipped with at least one computer-controlled, supplemental granular injection system. The Injection system must calculate according to RPM's of the internal airlock feeder and not percentages, in order to ensure accuracy of injection rates. The unit must be capable of uniformly applying materials and injected products at a rate greater than 15 yd.<sup>3</sup> per hour at least to a vertical limit of 150' and must also be equipped with an application hose capable of extending 300' from the blower truck.
- .2 Supplements must be injected simultaneously into the growing medium at a rate of 0.2 lbs./yd.<sup>3</sup>
- .3 Growing Medium must be lightly watered and rolled with a 50 lbs. hand roller to achieve the desired thickness after compaction.

## 3.11 VEGETATION

**SPEC NOTE:** Installation of erosion netting is optional and based on site conditions. Erosion Netting should be installed after seeding applications but before planting applications.

- .1 The erosion netting to be installed as indicated on drawings and details.
  - .1 After growing medium is installed stretch netting over growing medium and fasten to edging at 2' intervals. Fasten all seams with tie wrap fasteners at 8' intervals.
- .2 In the event of a seeding application, the seed mix should be calibrated with the supplement injection at the recommended seeding rate and applied in the top 1" of growing medium.

[OR]

- .3 Where potted or plug plants are used, dig a hole in excess of the size of the root ball after extracting it from the pot. Lightly cover the root ball, ensure plants are planted to their full root depth and gently tamp in place. If netting is used, cut holes sufficient in size to plant through.

[OR]

- .4 Where vegetated mats are used, cut rolls or mats to fit over entire roof area up to edging and around all projections. Ensure the root zones are in contact with each other. Lightly roll over vegetation (50 lbs. hand roller) for positive contact with the growing medium.

**SPEC NOTE:** Installation of Electronic Leak Detection is optional and may not apply in all conditions.

## 3.12 ELECTRONIC LEAK DETECTION

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- .1 After installing membrane and before placing overburden, verify installed membrane is watertight. Provide testing to verify membrane is free of any holes, open seams and capillary defects that will allow water to pass.
- .2 Utilize electrical conduction method as follows:
  - .1 Installation of EFVM impulse conductor wire around perimeter of area to be tested. The testing agency will determine size and shape of area. The conductor wire will consist of braided polyethylene .006” diameter interwoven with a minimum of nine (9) strands of stainless steel wire. The conductor wire will have a tensile strength of not less than 180 lbs.
  - .2 Installation of EFVM isolation conductors around all metal items contacting the membrane to isolate the current flow.
  - .3 Wet the test area with potable water sufficiently to create a continuous conducting “plate” above the membrane.
  - .4 Attach EFVM impulse generator to conductor wire with removable connectors and to ground or building structure creating a potential circuit.
  - .5 Utilizing an EFVM potentiometer and two test probes placed on the membrane surface to detect the presence of an electrical flow across the surface of the membrane.
  - .6 If there is no flow detected after a systematic search then the certified technician will report the installed membrane in that area tested free of holes, seam and capillary defects and is therefore deemed to be watertight at that time.
  - .7 If there flow is detected during the search then the certified technician will triangulate the test probes to identify the source of electricity and therefore the breach in the membrane. The technician will mark on the waterproofing membrane or surface the exact location of the defect and assign an identification number to each location.
  - .8 Any defect(s) located are to be repaired and a retest is to be performed to confirm the integrity of the repair(s)
  - .9 The certified technician will provide a report of each day’s test results containing a written description and photograph of all defect(s) located and a schematic CAD drawing indicating location of the EFVM conductor wire and of any defect(s) located in the testing field to within 1” of accuracy. This report will be made available in hard copy.

## 3.13 CLEANING/SIGNAGE

- .1 Upon completion of the Work, gather and dispose all debris.

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- .2 Clean all surfaces and inspect final assembly for approval.
- .3 Affix permanent warning signs at each entry to the green roof area.

## 3.14 REPORTS

- .1 Maintenance reports must be submitted quarterly to the owner and the System Manufacturer (to maintain warranty).
- .2 Maintenance Reports must be signed by an approved representative of the Contractor/Subcontractor.
- .3 Maintenance Reports must outline the actions carried out as per the maintenance requirements of this specification, as well as dates, personnel at each visit, and notes on growing conditions.
- .4 Subcontractor not conforming to the above maintenance requirements will be replaced, however, will still be held responsible for the results and costs of the replacement Subcontractor.

- END OF SECTION 07 55 XX -