

ParaGREEN

Layered Vegetated Roof

Installer Guide



ParaGREEN™
Vegetated Roof Solutions

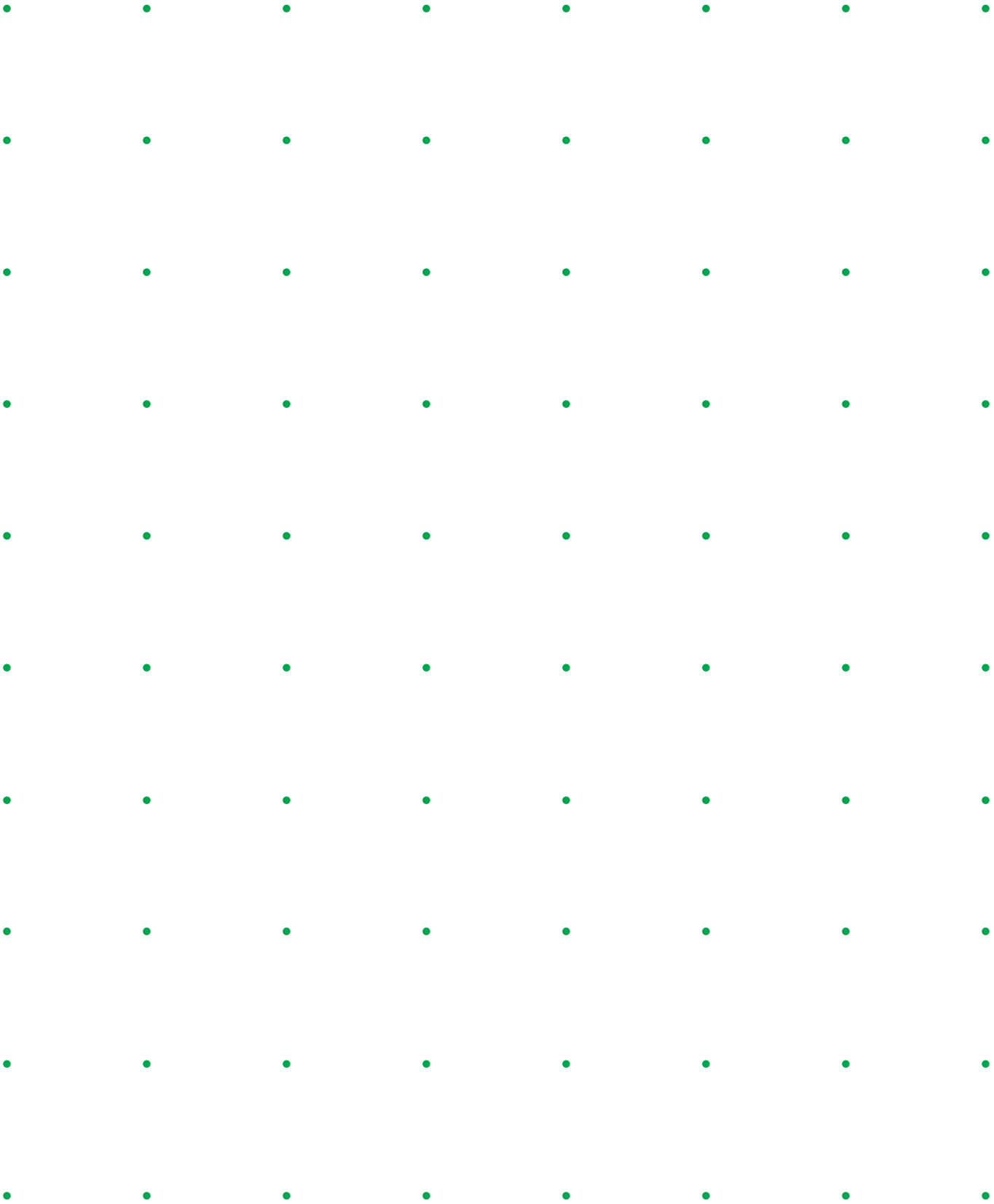


Table of Contents

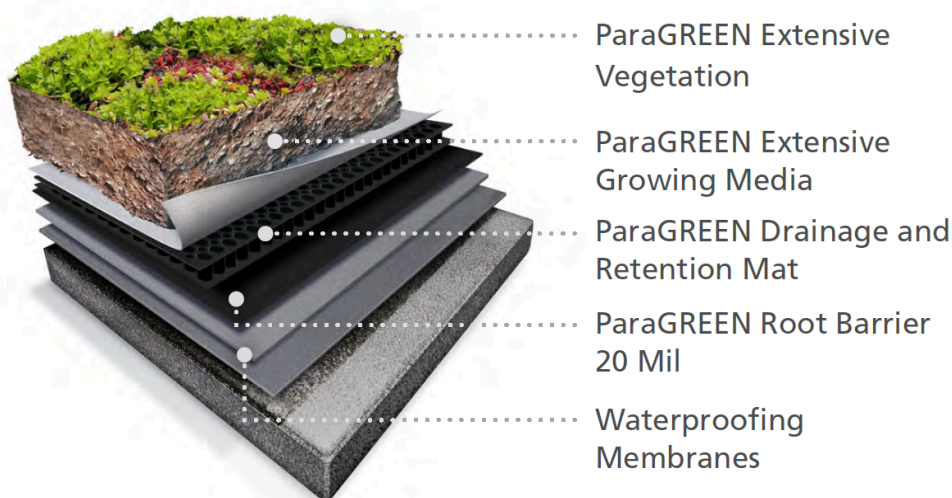
- I. [System Overview & Products](#)
- II. [Delivery, Storage, and Handling](#)
- III. [Membrane Protection, Inspection, and Preparation](#)
- IV. [Installation](#)
- V. [Notes](#)

I. System Overview & Products

ParaGREEN Layered Vegetated Roof Solutions provide integrated, single-source assemblies that offer the flexibility to meet your design and technical requirements. They can be tailored to fit within project thresholds and maximize performance. It is important to reference the project documents prior to beginning installation.

Extensive

ParaGREEN Extensive layered vegetated roof assemblies incorporate shallower media depths commonly ranging from 3"-8" and can be tailored to fit within project thresholds. ParaGREEN Extensive can be planted with ParaGREEN Vegetated Mats or containerized non-woody, herbaceous plants.



Extensive with Mineral Wool

ParaGREEN Extensive Mineral Wool layered vegetated roof assemblies incorporate shallower media depths commonly ranging from 3"-8" and can be tailored to fit within project thresholds. ParaGREEN Extensive can be planted with ParaGREEN Vegetated Mats or containerized non-woody, herbaceous plants.



Semi-Intensive

ParaGREEN Semi-Intensive is most commonly vegetated with turf grasses or meadow-style plantings, with media depths between 8"-12" and is designed to withstand the traffic from active spaces and meet the horticultural demands of turf grass and deeper rooting, prairie style plantings.



Intensive

ParaGREEN Intensive layered vegetated roof assemblies incorporate deeper media depths, typically greater than 12", supporting a wide range of plant material. ParaGREEN Intensive solutions are used in applications from amenity decks to immersive landscapes on podium.



II. Delivery, Storage, and Handling

Inorganic Roll Goods

All Siplast ParaGREEN™ products should be stored on a clean, flat surface. All roofing products should be stored in a dry place out of direct exposure to the elements and should not be double-stacked. Material should be handled in such a manner as to ensure that it remains dry prior to and during installation.

Growing Media

Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and Federal laws if applicable. Store material away from sources of ignition and extremely high temperatures. Avoid exposure to heat, sparks, and open flames.

Bulk Materials: Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways. Store growing medium in a dry area, free of contaminants which may adversely affect the engineered blend, including weed seeds. Accompany each delivery of bulk materials with product certificates.

Plant Material

Deliver pre-cultivated plant material in such a manner as to preserve the quality of the plants, protecting the vegetation mats from excessive high/low temperature or wind damage. Maintain the health of plants as recommended by nursery guidelines prior to installation. Store vegetated planters and materials over plywood panels or protective sheeting on the membrane surface. Extensive plants should be unloaded and stored in a cool place out of direct sunlight.

Plants shall be unpacked within 12 hours of delivery. Rolled sedum mats and stacked sedum tiles must be stored in a cool location, below 75 deg F (20 deg C), for a maximum of twenty-four hours. Do not leave plants in hot storage areas. Provide water source for irrigating plants per the supplier's recommendations until permanent irrigation system is in place.

Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be replaced at the contractors expense.

Protection Requirements:

Install vegetated roof overburden components in such a manner as to not damage or disturb any previously installed waterproofing membrane or accessory components. Handle and store materials, and place equipment in a manner to avoid overloading the roof structure or damaging roofing membrane.

Metal Components

Deliver materials in the manufacturer's original packaging. Store materials out of direct exposure to the elements. Do not remove the strippable film masking on the metal component until immediately following installation. Do not allow extended UV or heat exposure to metal components covered with strippable film masking.

Damaged Material: Any materials that are found to be damaged will be automatically rejected, removed and replaced at the Contractor's expense.

III. Membrane Protection, Inspection, & Preparation

Final Inspection of Membrane

Prior to the application of any overburden, a final inspection of the Waterproofing System must be completed by a Siplast representative. The punch list will indicate any deficiencies in the waterproofing membrane and flashing membrane system that require remediation before the installation is accepted. Remove any debris, excess waterproofing materials, equipment, and other related items before overburden application.



Completed Teranap SBS membrane assembly prior to installation of the overburden.

Membrane Integrity Testing

Integrity testing of the finished waterproofing membrane system is recommended and may also be required by the project specifications. Testing is typically conducted using one or more of the following methods. Fully document all tests, regardless of method(s) used. Complete reports with a description of the techniques employed, summary of findings, and CAD scaled roof plans and applicable photographs of the tested areas with the locations of all defects accurately mapped on the plans. Please forward all copies of test reports to the Siplast Technical Department.

Water Flood Test

ASTM D5957: Standard Guide for Flood Testing Horizontal Waterproofing Installations. This practice describes testing the water-tightness of waterproofing installations applied to horizontal surfaces having a slope of no greater than 1/4 inch per foot (2% slope). Prior to the application of the overburden, plug the drains and scuppers and flood the waterproofing surface with water a minimum of 1 to 2 inches deep. Leave the water for a minimum of 24 hours to ensure the system is leak free. Take necessary precautions to determine/verify if the structure can sustain the weight of the water for the duration of the test.

Electronic Leak Detection

This practice allows for using a low and/or high voltage electronic detection system to verify that the membrane is free of any holes, open seams or capillary defects that will allow water to pass. Each of the following methods allows for using a low voltage electronic scanning system to locate membrane breaches on both horizontal and vertical surfaces to identify potential leaks in exposed roofing and waterproofing membranes. ASTM D7877-14, Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes. Four separate test methods are referenced below. 1. Low-voltage membrane EFVM 2. Low-voltage horizontal membrane scanning platform 3. Low-voltage vertical membrane surface scanning 4. High-voltage membrane testing

Membrane Protection

It is the waterproofing contractor/general contractor's responsibility to ensure that the overburden installer takes all necessary precautions to protect the waterproofing membrane during installation. Care shall be taken not to exceed the UV exposure limit of the membrane. It is the overburden installer's responsibility to report any damage to the membrane during installation.

Root Barrier

Siplast requires the installation of ParaGREEN Root Barrier when installing ParaGREEN Vegetated Roof Modules over asphaltic membranes, including SBS Modified Bitumen and PA 750 Hot Fluid Applied Rubberized Asphalt. ParaGREEN Root Barrier seams may be heat welded OR taped with an 18" overlap using ParaGREEN Root Barrier Tape. ParaGREEN Root Barrier is available in 20, 40, and 60-mil thicknesses. A hot air gun is recommended when welding the 20-mil root barrier, as traditional roof membrane welders can create excessive heat resulting in damage to the root barrier. Contact Siplast for specific thickness recommendations based on application.

Drain Mat (If Applicable)

Install the specified drain mat (if applicable) with the filter fabric side up. Lap the selvage edge over the adjacent drain mat. Extend the drain mat to walls, curbs, and other penetrations/junctures.

Insulation (If Applicable)

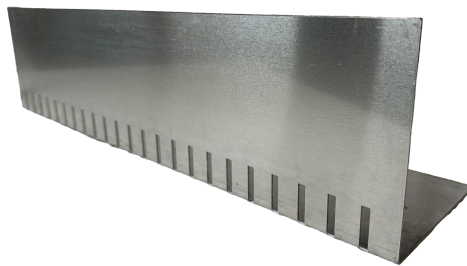
Place the specified insulation unadhered directly over the membrane protection layer or drainage mat, if utilized. If insulation includes channeled edges, place the panels with the channeled edges down. Install the panels to fit tightly, leaving a maximum opening between panels of 3/8 inch. Closely abut walls, penetrations, and projections, leaving a maximum opening between panels and projections of 3/4 inch.

Conform to the following requirements where insulation is installed in multiple-layer configurations.

- A. The bottom layer must be the thickest layer in the insulation configuration, and have a minimum thickness of 2 inches.
- B. Stagger the panel joints between insulation layers.
- C. Loose lay all layers unless otherwise noted.

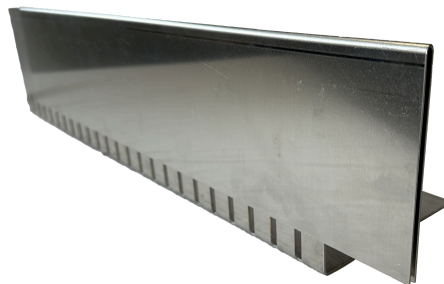
IV. ParaGREEN Layered Installation

- 1. Irrigation
 - a. Proper irrigation can be a critical component to a successful vegetated roof. Irrigation (by others) may most easily be incorporated above drainage layers, at the bottom of the media profile, or in surrounding vegetation-free zones.
- 2. Metal Edge Restraint



ParaGREEN Metal Edge Restraint

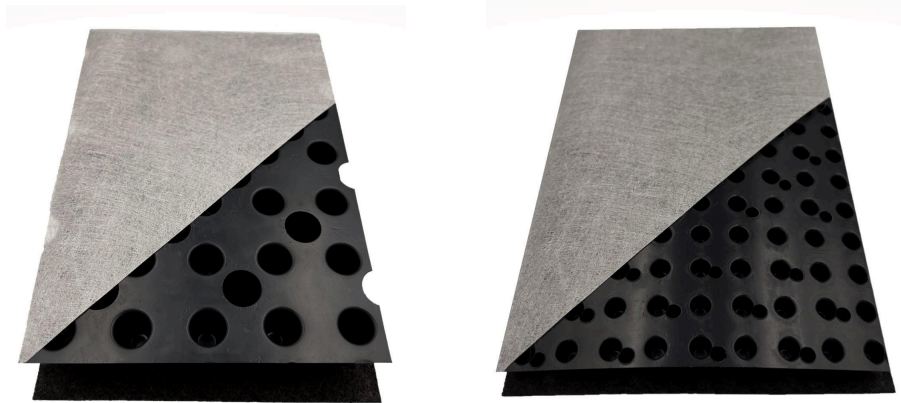
- a. Metal Edge restraint can be placed either on top of or below drainage and water retention layers. The horizontal leg may extend under the vegetated roof area or beneath surrounding ballast.
- b. Metal edge restraint should extend 0.5-1" above finished elevation of growing media.
- c. Aluminum metal edge restraint materials must be kept dry and out moist conditions to avoid "white rust". Siplast is not responsible for white rust on edging due to improper storage.
- d. Leveling caps are available to accommodate variable height edging in sloped deck assemblies. Leveling caps are pinned to the metal edge restraint, leveled, and then bolted directly to the metal edging.



ParaGREEN Metal Edge Restraint with Leveling Cap

3. Drainage and Retention Components

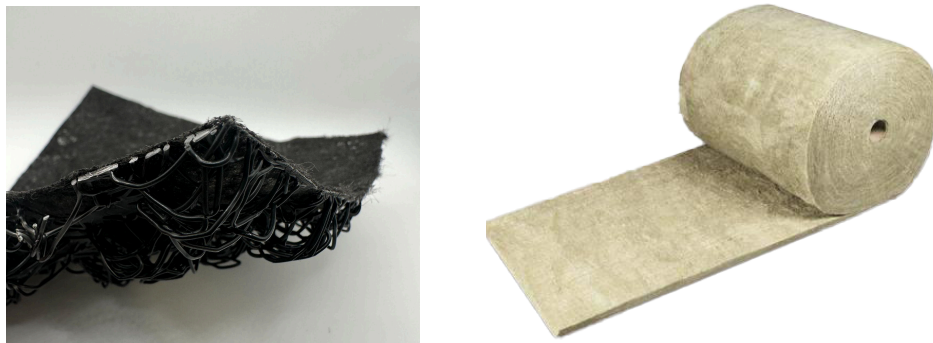
a. ParaGREEN Drainage and Retention Mat and Drainage and Retention Mat LT



ParaGREEN Drainage and Retention Layer/Drainage and Retention Layer LT

- i. Loose-laid with white fabric side up. Selvage edge overlaps onto adjacent panel.
- ii. Trim mat around drains and other penetrations. Neither product should turn up at vertical surfaces.

b. ParaGREEN Mineral Wool and Entangled Drain Mat



ParaGREEN Entangled Drain Mat and Mineral Wool

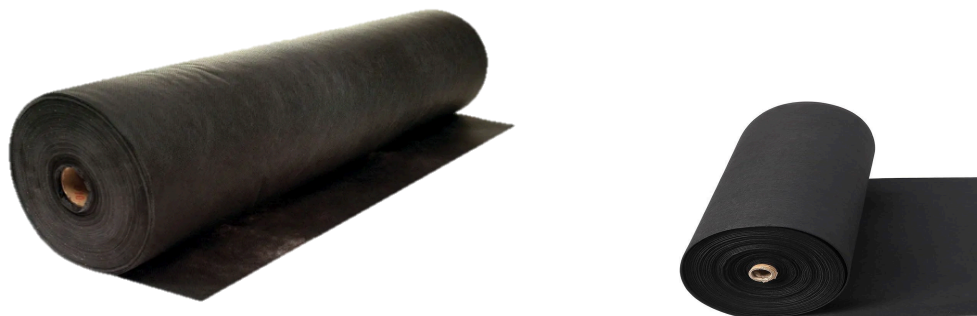
- i. Entangled Drain mat is rolled out, loose-laid with the selvage edge overlapping the adjacent row of Drain Mat. Trim mat around drains and other penetrations.
- ii. Mineral Wool is rolled out onto the prepared Entangled Drain Mat. Rows shall be installed crosswise to underlying Entangled Drain Mat and tightly butted together but not overlapped.
- iii. Mineral Wool may be installed in multiple layers depending on the specified depth.

c. ParaGREEN High Retention Drainage Panel

- i. Drainage panels are loose-laid and joints are fitted tightly together. Avoid overlapping the panels. Joints between panels should be staggered.
- ii. Panels may be filled with LW Aggregate at a rate of 2CY/1,000 SF.

4. Filter Fabric

- a. Filter fabric should be overlapped 12" minimum between rolls and when using additional pieces at details. Filter fabric should extend up over the metal edge restraint to at least 6" above the proposed final height of the growing media and the excess fabric trimmed after growing media has been installed.



ParaGREEN Filter Fabric and ParaGREEN Filter Fabric 20 (20" Width)

- b. NOTE: When used with ParaGREEN Drainage and Retention Mats and ParaGREEN Mineral Wool assemblies, filter fabric is only required at the horizontal to vertical transitions.
 - i. Fabric should be overlapped a minimum of 8" onto the ParaGREEN Drainage and Retention Mat or Mineral Wool onto the vertical surface beyond the finished elevation of the growing media. Filter Fabric may be temporarily held in place by spot adhering with adhesive or tape, until it can be ballasted by growing media. Excess filter fabric may be cut after growing media is installed.

5. Growing Media

- a. Growing media may be supplied in Bulk, Super Sacks, or in some cases, small bags. Bulk media may be pumped or conveyed to the rooftop. Super sacks may be craned or hoisted to the roof. Note: Super sacks should not be stored on site for an extended period of time as it may result in deterioration of the super sack, rendering it unsuitable for use.



ParaGREEN Growing Media in Super Sacks



ParaGREEN Growing Media installed utilizing a conveyor

- b. Protect all growing media from contamination with weed seeds. Dump bulk growing media onto clean surface that will not contribute to contamination.
- c. Rough grade growing media with a shovel and fine grade/distribute with a rake.



Fine grading of ParaGREEN Growing Media with rake

- d. Compact growing media with a 300-400 lb. water-filled lawn roller or by thoroughly watering. For deeper media depths in excess of 6 inches, install media d in lifts, and either compact or water in after each 6 inch lift. Note mechanical compactors are not allowed and can cause damage to rooftop elements and structures.
6. Erosion Control Mats, Wind Mats, and Wind Anchors
- a. Roll out and stake into place all Erosion Control and Wind Mat products using Wind Anchors.
 - i. Install wind anchors with the base at the bottom of the media profile. This may be done before or after the growing media has been installed. If after installation, the growing media will need to be excavated so the base of the anchor can rest directly on the drainage and retention layer.

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- ii. Install Wind Mats atop Sedum Mats and Tiles.
 - iii. Install Erosion Control and Wind Mats atop Growing Media.
 - iv. Firmly install wind disk onto anchor stem once erosion control or wind mat has been installed.

7. Extensive Plant Installation

- a. Immediate access to water is the most critical element during the installation of plant material. It is the contractor's responsibility to ensure that sufficient water is available for installation and establishment of extensive plants provided by Siplast prior to the shipping of those plants to the job site.
 - i. Sufficient water is defined as either one of the following:
 - 1. Having a permanent functional irrigation system installed.
 - 2. Temporary irrigation sprinklers must be able to operate properly and cover the planted surface.
- b. Thoroughly saturate growing media must be thoroughly saturated with water prior to installation of plant material and compact immediately prior to plant installation. Special care must be taken on sunny or warm days to keep the growing media wet and cool prior to installation of the plants. Hot media surfaces can burn or damage the roots of the plants.
- c. Containerized Extensive Plant Material
 - i. 2" Plugs or 4" Pots should be planted in either late spring (2 weeks after last frost) or early fall and 2 weeks before first frost).
 - ii. Any Erosion Control or Wind Mat components shall be installed prior to installation of plant plugs.
 - iii. Remove plugs from trays with care by gently pushing plugs from bottom of cells to remove from trays or pots.
- d. Sedum Mats or Tiles



ParaGREEN Sedum Mats

- i. Carefully transfer rolls of carpet or tiles to the surface of the growing media, taking care not to

dislodge the plants in the carpet. Unroll the carpet or place tiles over the premoistened growing media. Butt edges together tightly with no overlap or gaps. Stagger joints to the greatest extent possible. Make sure the mat is in full contact with the surface of the growing media below.

- ii. Cut mats or tiles to fit around edging, drains and other penetrations. Make sure the carpet is in full contact with the surface of the growing media.
- iii. Immediately after installation, thoroughly saturate vegetation with water using manual watering or temporary overhead spray irrigation.



Completed ParaGREEN Sedum Mat installation.

- iv. Program and engage the irrigation system.
9. Install restraint edging around the vegetation perimeter per manufacturer's instructions and as required by project documents.
10. Thoroughly water vegetation when installation is complete. Plants should be watered thoroughly 2-3 times per week during the first few weeks of establishment depending on time of year and natural precipitation volumes, tapering down to less frequent watering as the plants establish. Contact Siplast at ParaGREEN@siplast.com for further information regarding irrigation.

Maintenance

It is important to note that a means of supplying water to the roof-top with sufficient pressure is required for irrigation purposes to establish a vegetated roof assembly. Spray or manual overhead irrigation must be employed during the first few months of the establishment period to allow the vegetation to establish a healthy root structure. Permanent Irrigation is strongly recommended for the health of the plant material.

Reference Siplast ParaGREEN Care and Maintenance Guidelines for more information.

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