ParaGREEN Vegetated Roof Module Specification

This specification is provided as a general guide for use of Siplast products based on typical building conditions and standard waterproofing practices. Siplast is strictly a manufacturer/supplier of roofing, waterproofing, and vegetated roof assemblies and does not assume responsibilities of the architect or engineer. Siplast recommends that the Owner's representative independently verify the accuracy and appropriateness of a specification provided for a specific project.

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 healthy root structure. Permanent Irrigation is strongly recommended for the health of the plant material.

SECTION 32 95 00 - VEGETATED ROOF ASSEMBLIES

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section Includes ***(Note to Specifier: Edit to Project Requirements)****:*

Root Barrier

Drainage Layer

Insulation

Lightweight Fill

Vegetated Roof Module

Metal Edging and Accessories

Modular Pavers Supported by Pedestals

* + - * 1. Related Requirements:

Insert Section or Sections in first subparagraph below to suit Project.

Section 12 93 00 "Site Furnishings" for exterior unit planters.

Section [-----] Thermal and Moisture Protection

Section 32 84 00 "Planting Irrigation" for irrigation system.

Section 32 93 00 "Plants" for trees, shrubs, and groundcovers.

* + - 1. DEFINITIONS
				1. Green Roof: An area of planting on an elevated surface, commonly over occupied space.
				2. Vegetated Roof Module – A plastic tray including growing media and extensive vegetation.
				3. ParaGREEN – A single source vegetated roof assembly comprised of root barrier, drainage and water retention layers, engineered growing media, and plants provided by Siplast.
				4. Water Retention: Water that is retained in the drainage layer of a vegetated roof assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.
				5. Water Detention: Water that is held within the vegetated roof assembly and released over an established amount of time.
				6. Finish Elevation: Elevation of finished growing-media surface of planting area.
				7. Engineered Growing Media: A manufactured, lightweight soil mixture comprised of small to mid-range aggregates and an organic component designed for use on-structure.
				8. FLL Greenroof Guidelines - German Guidelines for Planning, Execution, and Upkeep of Green Roof Sites, Current Release: A worldwide acknowledged state-of-the-art technological and scientific foundation for successful and thriving green roofs.
			2. System Description ***(Note to Specifier: Edit to Project Requirements)****:*
				1. Furnish and Install a single source ParaGREEN Vegetated Roof Module assembly including Root Barrier, Drain Mat, XPS Insulation, Lightweight Fill, Filter Fabric, Vegetated Roof Module, Metal Edging, Extensive Plant Material, and pedestal set Unit Pavers, and Accessories.

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - 1. SUBMITTALS
				1. Product Data: For each vegetated roof component provide the following:

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

Include performance specifications for each growing media.

Include list of plant species.

* + - * 1. Sustainable Design Submittals:

Insert recycled content or materials transparency goals to meet project sustainability requirements. Go to www.columbia-green.com/systems/ for more information.

Product Data: For recycled content, indicating recycled content and manufacturing locations for each system.

* + - * 1. Stormwater performance of the specific vegetated roof assembly for the project shall be provided by the vegetated roof manufacturer.

Total Stormwater Retention volume shall be provided in CF

* + - 1. INFORMATIONAL SUBMITTALS

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

* + - * 1. Product Test Reports: For complete analysis of each type of growing media.
				2. Sample Warranty: For special warranties.
			1. CLOSEOUT SUBMITTALS
				1. Maintenance Data: Include a recommended maintenance plan with procedures for inspection and care. Submit before start of required warranty and maintenance periods.

Retain "Continuing Maintenance Proposal" Paragraph below if required. Continuing maintenance may be required for a plant-growth warranty. Revise starting date if required. Paragraph provides a service contract beyond initial maintenance service. If continuing maintenance proposal is submitted at time of bid, include that information in the Instructions to Bidders.

* + - * 1. Continuing Maintenance Proposal: From the vegetated roof assembly Installer to Owner, in the form of a standard **[----]** year maintenance agreement, starting on the date installation is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
			1. QUALITY ASSURANCE
				1. Pre Installation Conference: Conduct a conference at the Project Site prior to roofing/waterproofing installation.

Arrange, in accordance with Section 01 31 00.

Attendance: All involved parties including but not limited to the Owner, General Contractor, Roofing/Waterproofing Sub-Contractor, Vegetated Roof Installer, Architect, Landscape Architect, Membrane Manufacturer, and others related to the scope of work.

* + - * 1. The vegetated roof installing contractor shall be approved, authorized, or licensed by the vegetated roofing assembly provider and maintain an experienced full-time supervisor on the Project site when vegetated roof assembly work is in progress. The vegetated roof installing contractor shall demonstrate qualifications to perform the work of this section by submitting the following documentation.

Written approval from the vegetated roof manufacturer to install the specified assembly.

A list of a minimum of 3 similar vegetated roof projects completed over the last 5 years field supervision.

* + - * 1. Acceptable Products: The vegetated roof overburden products shall be supplied by Siplast, Inc.
				2. Local Regulations: Confirm to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.
			1. DELIVERY, STORAGE, AND HANDLING
				1. 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.
				2. 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.

* + - * 1. Plant Materials:

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 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.

* + - * 1. Protection Requirements:

General: 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.

* + - 1. FIELD CONDITIONS
				1. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when optimum results may be obtained. Apply products according to manufacturer's written instructions and warranty requirements.
			2. GUARANTEE/WARRANTY
				1. Upon completion of work the contractor shall supply the owner with a single source warranty direct from the roofing/waterproofing manufacturer.
				2. Available Warranties ***(Note to Specifier: Edit to Project Requirements)****:*

Material Warranty

Material Warranties on all inorganic vegetated roof components including the integrity of the root barrier, drainage and water retention layers, and filter fabrics.

Warranty Period: **[10, 15, 20]** years.

Extensive Vegetation Establishment Warranty:

Warranty Period: 2 years

2” plugs or 4” pots

ParaGREEN Vegetated Mats

Paver Warranties against cracking splitting, or delaminating due to freeze thaw.

Warranty Period: 10 years

ParaGREEN Removal/Replacement Guarantee Addendum. Membrane manufacturer to provide removal and replacement of all overburden supplied by the manufacturer in the event of a leak that is covered under the terms of the leak-free membrane guarantee. The addendum shall include the full vegetated roof system, planter areas, insulation, geofoam, and pavers.

Warranty Period: The duration of the membrane manufacturer's leak-free guarantee.

1. PRODUCTS
	* + 1. MANUFACTURERS
				1. Source Limitations: Obtain vegetated roof modules, pavers, pedestals, insulation and accessories.

Basis of Design Manufacturer: Siplast Inc. Dallas, TX

* + - 1. VEGETATED ROOF ASSEMBLY COMPONENTS
				1. Root Barrier: A low density polyethylene sheet for use over roofing or waterproofing membrane

ParaGREEN Extensive Root Barrier 20 by Siplast Inc., Dallas TX

* + - * 1. Root Barrier Tape: Single-Sided 4 inch wide polyethylene tape used to secure the laps of adjacent root barrier sheets where they meet.

ParaGREEN Root Barrier by Siplast Inc.; Dallas, TX

* + - * 1. Drainage Layer: Composite Drainage Layer with a three dimensional dimple style drainage core fabricated from polypropylene and a non-woven, not rotting polypropylene fiber geotextile.

Paradrain Drainage Mat by Siplast, Inc.; Dallas, TX

* + - * 1. Insulation: Extruded polystyrene (XPS) rigid insulation having a density of **[40 psi, 60 psi, 100 psi]** for use above membrane ***(Note to Specifier: XPS insulation is only required in an inverted membrane roof application to achieve required R-Value, and is not integral to the vegetated roof assembly.)***

Extruded Polystyrene Insulation as marketed by Siplast.

* + - * 1. Geofoam Fill: Install geofoam-fill blocks in as few layers as possible with abutting edges and ends and with the long dimension of each block placed at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.

Install geofoam connectors as recommended by geofoam manufacturer

Insert requirements for installing additional anchorage to restrain geofoam fill from displacement due to wind loading on roof if required.

Cover geofoam fill with filter fabric on slopes or faces greater than 2:12, or drain mat on slopes less than 2:12 before installing drain mat or growing media.

* + - * 1. Filter Fabric: Non-woven, chemical resistant geotextile fabric comprised of polypropylene fibers.

Basis of Design Product: ParaGREEN Filter Fabric/ParaGREEN Filter Fabric 20

* + - * 1. Vegetated Roof Module

Plastic vegetated roof module comprised of 100% recycled plastic, filled with engineered growing media, and planted with a mix of 6-8 sedum species. ***(Note to Specifier: Edit to Project Requirements)***

Basis of Design Product:

ParaGREEN Vegetated Roof Module 4”

ParaGREEN Vegetated Roof Module 6”

ParaGREEN Vegetated Roof Module 8”

* + - 1. ACCESSORIES
				1. Metal Edging

Slotted metal edging for transition between vegetated and non-vegetated areas allowing for continuous drainage. Size and finish as called out on plans.

Basis of Design – ParaGREEN Metal Edge Restraint provided by Siplast, Inc., Dallas, TX

* + - * 1. Drain Inspection Boxes:

Manufacturer’s slotted metal edging for transition between vegetated and non-vegetated areas allowing for continuous drainage. Size and finish as called out on plans.

Basis of Design – ParaGREEN Drain Inspection Chambers provided by Siplast, Inc., Dallas TX

* + - * 1. Gravel Ballast: Washed River Rock used as ballast shall meet the ASTM D 448 #57 requirements. Diameter of the rock particles shall maintain a nominal ¾ inch to maximum 1 – 1/2 inch range.
			1. PEDESTAL SET PAVER ASSEMBLY
				1. Concrete Slab Unit Pavers

Hydraulically Pressed Concrete Pavers as marketed by Siplast, Inc.

Compressive strength 8,500 psi, as tested per ASTM C140

Minimal flexural strength 1,100 psi, as tested per ASTM C293

Water absorption shall not exceed 5%, as tested per ASTM C140

Freeze thaw shall not exceed 1% loss of dry weight, as tested per ASTM C67

Dimensions and finish as noted on plans

Pedestal Supports: Adjustable Height Pedestals as recommended by Siplast

Typical height range 0-24 inches (bracing required above 24 inches)

* + - * 1. Wood Tile Pavers

Prefabricated Wood Tile Pavers for pedestal set applications as marketed by Siplast ***(Note to Specifier: Edit to Project Requirements)***

Ipe Wood Tile, Smooth (23.875” x 23.875” x 1.69”) Nominal

Ipe Wood Tile, Ribbed (23.875” x 23.875” x 1.69”) Nominal

Ipe Wood Tile, Smooth (29.875” x 29.875” x 1.69”) Nominal

Ipe Wood Tile, Smooth (47.9375” x 23.875” x 1.69”) Nominal

Ipe Wood Tile, Ribbed (47.9375” x 23.875” x 1.69”) Nominal

Ipe Wood Tile, FSC, 8 Plank, Smooth (23.875” x 23.875” x 1.69”) Nominal

Cumaru Wood Tile, 8 Plank (23.875” x 23.875” x 1.69”) Nominal

Cumaru Wood Tile, 8 Plank (47.9375” x 23.875” x 1.69”) Nominal

Cumaru Wood Tile, FSC, 8 Plank, Smooth (23.875” x 23.875” x 1.69”) Nominal

Cumaru Wood Tile, FSC, 8 Plank, Smooth (47.9375” x 23.875” x 1.69”) Nominal

Garapa Wood Tile, FSC, Smooth (23.875” x 23.875” x 1.69”) Nominal

Bamboo Wood Tile, 5 Plank, Smooth (23.88” x 23.88” x 1.69”) Nominal

Itauba Wood Tile, 8 Plank, Smooth (23.875” x 23.875” x 1.69”) Nominal

Tigerwood Wood Tile, Smooth (23.875” x 23.875” x 1.69”) Nominal

Pedestal Supports: Adjustable Height Pedestals as recommended by Siplast

Typical Height Range 0-24 inches (bracing required above 24 inches)

Fastening Kit

Manufacturer’s recommended securement accessories to secure tiles to pedestals.

* + - * 1. Porcelain Pavers

Porcelain Pavers as marketed by Siplast

Break Strength >\_ 3000lbs (24”x24”) as tested per ASTM C648

Water Absorption <\_ 0.1% as tested per ASTM C373

Thermal Shock Resistance as tested per ISO 10545-9 (Resistant)

Dimension and finish as called out on plans

Support Tray

Manufacturer’s recommended support tray to provide wind uplift resistance and support the porcelain paver in the event of cracking. (The support tray is not designed to prevent cracking of the paver itself.)

1. EXECUTION
	* + 1. EXAMINATION
				1. Membrane Inspection

Roofing/Waterproofing Membrane to be visually inspected to ensure membrane is installed per manufacturer’s instructions.

Membrane to be integrity tested to ensure it is water tight prior to placement of the vegetated and/or paver overburden by one of the following methods.

Electronic Leak Detection (ELD)

Flood Test (Ponding water at minimum 2” depth for a period of 48 hours.)

Confirm with the design authority that the structure can support dead load weight of flood test prior to testing.

* + - * 1. Vegetated Roof Installer to confirm that the membrane has been inspected and approved by the design authority for compliance with requirements prior to installation of overburden installation.

Verify protection course over membrane roofing is in place and conforming to roofing manufacturer instructions, as inspected and accepted by roofing manufacturer's technical representative.

Verify that roof insulation over roofing membrane is in place, secure, and flush along all seams (if applicable).

Verify that perimeter and other flashings are in place and secure along entire lengths where they will be covered by vegetated roof assembly.

* + - 1. VEGETATED ROOF INSTALLATION
				1. Install layered system according to manufacturer's written instructions and details.
				2. Root Barrier:

Taped seams: Loose-lay the specified root barrier over the entire area to be planted with excess to extend into ballasted areas. Lap sides a minimum of 12 inches (457 mm) and seal the seams of the sides and ends using the specified polyethylene tape. Stagger end laps a minimum of 36 inches. Extend root barrier up to roof drains and vertical penetrations. Seal the root barrier around penetrations using the specified polyethylene tape.

Welded seams: Loose-lay the specified root barrier over entire area to be planted, overlapping seems 4” minimum.

Heat weld the seams of the root barrier using a hand-held hot air gun.

* + - * 1. Drainage Layer: Unroll and place drainage layer oriented with the length of the component running parallel to the slope. Abut the edges of the drainage layer core. Overlap selvage edge of the attached filter fabric onto adjacent courses of the drainage layer.
				2. Extruded Polystyrene Rigid Insulation: Place the specified insulation un-adhered directly over the root barrier with the channeled edges down, if applicable. Install the panels to fit tightly. Extend the insulation beneath the drain mat to terminate flush with the vertical face of flashing conditions and penetrations. In multiple-layer configurations install the thickest layer of insulation as the base layer. Stagger the panel joints between insulation layers. Install per manufacturers recommendations.
				3. Geofoam Fill: Install geofoam-fill blocks in as few layers as possible with abutting edges and ends and with the long dimension of each block placed at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.

Install geofoam connectors as recommended by geofoam manufacturer

Insert requirements for installing additional anchorage to restrain geofoam fill from displacement due to wind loading on roof if required.

Cover geofoam fill with filter fabric on slopes or faces greater than 2:12, or drain mat on slopes less than 2:12 before installing drain mat or growing media.

* + - * 1. Filter Fabric Installation: Filter Fabric shall be installed at vertical to horizontal transitions and at penetrations to contain growing media.

Filter Fabric shall be installed at the finished elevation of the growing media, OR 12” up onto the vertical surface beneath drain mat (if applicable), and 8” minimum onto the drainage and water retention layer.

Retain "Small Plant Stabilization" Paragraph below if required for small plug-type planting with exposed media. Coordinate with products specified in "Vegetated Roof Assembly Components" Article.

* + - * 1. Access Boxes: Install access box at locations shown on Drawings. Install top of boxes level withthe finish elevation of growing medium.
			1. VEGETATED ROOF MODULE INSTALLATION
				1. Align ParaGREEN Modules in rows directly abutting one another, long sides together.
				2. For corners or radial areas, the ParaGREEN vegetated roof module may be cut to size using an electric saw, as required.
			2. HARDSCAPE INSTALLATION
				1. Gravel Ballast: Distribute the river-washed stone ballast evenly over the drainage mat or filter fabric in accordance with project details and to meet local code requirements.
				2. Install pedestal-set pavers per the Manufacturer’s installation instructions and as indicated on perimeter details, and in accordance with ballast requirements, including any perimeter securement and incorporation of metal fabricated restraints at the perimeter.
			3. CLEANING
				1. Leave the rooftop clean, as well as the surrounding premises free from debris and residue resulting from the work of this Section.
				2. Remove stains from adjacent surfaces according to the waterproofing membrane manufacturer's recommended cleaning agents.
			4. PROTECTION
				1. Protect vegetated roof assemblies from damage, including growing-medium contamination, due to operations of other contractors and trades. Repair or replace damaged vegetation as necessary.
			5. MAINTENANCE SERVICE

Verify with Owner that maintenance service is required for Project. Generally, a maintenance period should be long enough to ascertain establishment of healthy plants.

* + - * 1. Maintenance Service: Provide maintenance by a qualified party familiar with manufacturer’s vegetated roof assembly. Begin maintenance immediately after plants are installed and continue for a period as defined below.

Assembly and Plant Maintenance: During maintenance period, maintain plantings by pruning, cultivating, watering, weeding, fertilizing if necessary, mulching, restoring planting saucers, adjusting and repairing devices, resetting plants to proper elevations or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

Replace growing medium that becomes displaced or eroded because of settling or other processes.

Apply treatments as required to keep plant materials, planted areas, and growing medium free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

Use only products and methods acceptable to roofing-membrane manufacturer.

Following the maintenance period, instruct the Owner and furnish written maintenance instructions as necessary for planting materials to develop and maintain healthy root structure.

Coordinate "Maintenance Period" Subparagraph with warranty requirements; revise to suit Project. At minimum Columbia Green Technologies recommends a period of 90 days following installation through substantial completion and occupancy by Owner. A 24 month maintenance period as offered by installer is recommended.

Maintenance Period: [**24**] <**Insert number**> months from date of [**Substantial Completion**] [**Planting Completion]**.

END OF SECTION 32 95 00