

SPECIFICATION

1. GENERAL

1.1 SUMMARY

- .1 This section describes the green roof panel system designed to provide a vegetative cover on sloped (<20 degrees) and flat surfaces. Green Roof Panels can be delivered as a pre-grown system or non-vegetated. Green Roof Panels are also used as the base for any intensive or roof top garden applications.
- .2 Related Sections
 - .a Section [01.5] – [Waterproofing Membrane]
 - .b Section [02.8] – [Irrigation Systems]
 - .c Section [2.93] – [Paving Stones and Ballast]
 - .d Section [02.9] – [Edging]

1.2 SYSTEM DESCRIPTION

- .1 The green roof panel system is made up of modular sections 109.2 cm (43”) by 109.2 cm (43”) including overlap areas or 99.1cm (39”) by 99.1cm (39”) of vegetation area that are delivered as a preassembled product to the site for installation. The plants may be pre-grown into the modules and all components that make up the system are bonded together to maintain structural integrity. The ability to customize and accessorize the system with various options is possible provided the design has been approved by the manufacture’s Approved Agent or certified installer.
- .2 The system can be delivered pre-vegetated.
- .3 The system can be planted in place.
- .4 This assembly is compatible with pedestrian access and integration with patio and walkway elements
- .5

1.3 SUBMITTALS

- .1 Product Data:
 - .a Manufacturer’s Technical literature showing compliance of components
 - .b Certified lab report showing specified compliance of growing media
 - .c Product data on Green roof panel component
 - .d Product data sheets on all irrigation components
 - .e Product data sheets on Geo textile filter fabric
- .2 Shop Drawings
 - .a Panel layout with planting and paver plan
 - .b Irrigation layout indicating zones (if Used)
 - .c Section profile showing thickness of materials and install sequence
 - .d Details of fabricated components for Drain access, Transitions, edge details, scupper details, and penetration details
 - .e
- .3 Samples
 - .a Green roof panel assembly, 12” x 12”
 - .b Growing Media, 6 oz bag
 - .c Washed River gravel, 1 lb bag
 - .d Precast or stone pavers

- .4 Certification signed by system provider:
 - .a The submitted green roof assembly complies with the specified system requirements.
 - .b The waterproofing system is fully compatible with the green roof assembly.
 - .c The submitted green roof assembly is eligible for the specified warranty required by the Waterproofing Provider.
 - .d The proposed use is appropriate for each product.
 - .e The System Provider has reviewed and approved the shop drawings for the associated waterproofing system, including deck drains, flashings, penetrations, and copings.
 - .f The System Provider has reviewed and approved the shop drawings for the associated plumbing as they pertain to the roof drains and water supply for irrigation systems

- .5 Certification signed by waterproofing system provider:
 - .a The proposed green roof assembly is fully compatible with the waterproofing assembly.
 - .b The waterproofing membrane meets FFL standards for root penetration.
 - .c The finished waterproofing shall be tested under the direction of the Waterproofing Provider, as approved by System Provider, and shall be certified as watertight prior to installation of the green roof assembly.
 - .d The waterproofing assembly being supplied shall be warranted by the Waterproofing Provider, as part of the Single Source warranty offered by the Waterproofing Provider.

- .6 Maintenance Program: Shall clearly describe the procedures for maintaining the green roof assembly, including a maintenance schedule for the first 24 months. The schedule must include a minimum of eight documented maintenance visits and two Annual Check-Ups by the System Provider.

- .7 Detailed plant list: For approval by the Architect

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Green roof panels and other Synthetic components shall be accompanied by identifying labels in original packaging. They shall be stored out of direct sunlight.
- .2 Co-ordination of delivery time lines is the responsibility of the system provider Two (2) days advance notice of delivery to the producer is necessary to ensure there are no delays.
- .3 The pre-grown panels will be palletized and delivered to site for installation on the date of installation unless otherwise specified.
- .4 Pre-grown Sedum mats shall be delivered in rolls or flat trays. They shall be stored in a shaded area for no longer than 24 hours and lightly watered during this time period as needed.
- .5 If the outside temperature is above 25°C (77°F) the vegetated panels must be installed within two (2) days after being palletized to prevent damage to the vegetation. If the outside temperature is between 15°C (59°F) and 25°C (77°F) the modules must be installed four (4) days after being palletized to prevent damage to the vegetation. If the outside temperature is between 5°C (41°F) and

- 15°C (59°F) the modules must be installed eight (8) days after being palletized to prevent damage to vegetation.
- .6 Palletized vegetated material must be stored in a secure, cool shady environment out of direct sunlight prior to installation. Vegetated panels must be protected from rapid temperature changes of more than 15°C (59°F)/hour. All vegetation is to be installed within two (2) days of being delivered. If this is not possible contact the Manufacture's representative for further instructions.
 - .7 Growing Media material delivered in super sacks and covered with a tarp to minimize contamination, protect them from weed seed infiltration and maintain them in a dry condition.
 - .8 Pavers and masonry materials shall be palletized, shrink-wrapped, and stored in a safe and secure location.

1.5 QUALITY CONTROL

- .1 Warranty: A 20-year Single-Source Warranty shall be provided by the System Provider at the point of substantial completion. The terms of this warranty shall incorporate the following:
 - .a This warranty shall guaranty 80% foliage coverage after a period of 24 months so long as the green roof assembly is maintained according to the System Provider's requirements. Bare areas shall be planted as necessary.
 - .b This warranty shall guaranty 80% foliage coverage after a period of 24 months so long as the green roof assembly is maintained according to the System Provider's requirements. Bare areas shall be planted as necessary.
 - .c This warranty shall cover the cost of removing the green roof assembly, exposing and repairing the membrane, and restoring the green roof assembly, provided:
 - 1.5.1.c.1 The System Provider and Waterproofing approves the method and technician for leak location.
 - 1.5.1.c.2 A representative of the System Provider and Waterproofing Provider are present to observe the removal of the green roof assembly.
 - 1.5.1.c.3 The leak is attributable to physical damage caused by activities of the Green Roof Installer, Roofer or representatives of the System Provider or waterproofing provider.
 - .d This warranty also shall include provisions to repair or replace specified materials or Work that has failed within the warranty period. System failures covered by the warranty shall include, but are not limited to, the following:
 - 1.5.1.d.1 Failure of the green roof assembly to support a robust ground cover
 - 1.5.1.d.2 Loss of soil permeability
 - 1.5.1.d.3 Development of anaerobic conditions in the profile
 - 1.5.1.d.4 Loss of drainage capacity
 - 1.5.1.d.5 Development of soil pathogens
 - 1.5.1.d.6 Deleterious changes in pH
 - 1.5.1.d.7 Slope related instability of the green roof assembly
 - 1.5.1.d.8 Wind or water erosion of the green roof assembly
- .2 A copy of the standard system warranty shall be attached as an exhibit to the contract agreement. This warranty must guaranty the performance of the system for a duration not less than the accompanying waterproofing warranty, and must include removal of the cover system, as may be necessary, to expose the underlying waterproofing

- .3 Warranty on Components
 - .a The manufacturer warrants all non-living components of the system will perform as specified for 15 years provided certified maintenance program has been followed and any work performed on the system has been done the manufacture's certified approved agent.
 - .b The 15 year warranty for the root barrier, vegetation carrier/drainage board, water retention, root stabilizer, growing medium and edging details of the system states that these components will not degrade due to physical, chemical or biological processes that naturally occur in a green roofing system. The labor and material cost of any warranty work is covered in this warranty. An extended warranty is available for this portion of the system but must be used in conjunction with the maintenance program performed by an authorized agent.

- .4 Warranty on Vegetation:
 - .a A two (2) year warranty and maintenance contract for the approved vegetation shall be provided with the initial quotation for an extra cost. (*All vegetation warranties are voided unless an automatic low volume irrigation system is installed unless otherwise noted in the scope of work) This will cover all aspects of the vegetation and system performance.
 - .b An extended warranty (including vegetation) could be available as part of the maintenance program and can be extended for as long as a maintenance program is purchased through an authorized representative

- .5 OPTIONAL Extended warranty and maintenance program:
 - .a Provide a renewable extended warranty and maintenance program can be for the green roof panel system.
 - .b The plant warranty and maintenance program is available in the form of an annually renewable contract between Manufacture's approved agent and the client. The warranty will cover all system components including plant performance provided that all maintenance has been performed by a Manufacture's approved agent since the date of installation.
 - .c Copies of the Manufacture's maintenance program and check list must be on file at the project site, with the certified installer and an electronic copy filed with Manufacture's
 - .d The maintenance program will depict clear initials and signatures of the authorized maintenance technician, date of visit and all reporting information as per the Manufacture's maintenance contract.
 - .e If the client named declines the Manufacture's maintenance agreement, the Manufacture's will warranty the non-vegetative components
 - .f As long as there is a Manufacture's maintenance contract in place from the installation date after the 15 year warranty on the non vegetated materials, the Manufacture's will continue to warranty the non-vegetated materials every year after 15 years if the maintenance agreement continued.

- .6 Installation Contractor: The Green Living Roof Panels must be installed by a certified installer or local labor in addition to manufacturer's certified supervision for warranty to be valid. A two (2) year standard warranty on workmanship is to be provided by the certified installer.

- .7 Proof of Structural Load Bearing Capacity

.a An engineer's report confirming the load bearing capacity of the existing structure *must be provided by the client, general contractor or other legal entity*. The system provider will not be held responsible if this report is not furnished to the installer and a copy must be on file with the Manufacturer.

.8 Waterproofing Membrane

.a Coordination with Waterproofing Provider: Before commencement of the waterproofing installation, the Roofing Applicator and Green Roof Installer shall meet with the Owner's representative to discuss project sequence and methods for protecting and controlling access to the work (including ballasting of the completed waterproofing) and to review shop drawings to establish compliance with the specifications. At this time, the parties to this meeting shall specifically determine how the waterproofing will be protected between the time it is certified by the Waterproofing Provider as watertight and the time that installation of the green roof assembly can begin.

.b There must be an approved high quality waterproofing membrane installed under the green roof systems prior to installation of the green roof that is capable of resisting to root penetration.

.c The waterproofing manufacturer must provide written approval of the green roof system for use on their waterproofing membrane.

.d A flood test, or other approved leak detection method, is to be performed prior to installation of the green roof system to ensure the membrane is performing as per manufacturer's specifications. A leak test report confirming the water tightness is acceptable and *must be provided by the client*.

.e The waterproofing membrane will be covered by a separate warranty issued by the waterproofing provider and will not be incorporated into the green roof system warranty as a single source warranty.

.9 Lead Time

.a It can take as long as 6 months of growing season to produce a custom pre-grown system depending on plant species and propagation method. The decision to purchase a custom pre-grown system must be made 8 - 12 months prior to the installation date to allow sufficient time for this production by a local approved grower.

.b Stock sedum mats of pre grown product can be prepared for delivery with only 6 weeks' notice. Up to 15 common sedum genus combined as a standard extensive blend.

2. PRODUCTS

2.1 Vegetation Carrier/Drainage Board

.1 The vegetation carrier must be provided by GLTi (Green Living Technologies International) Contact Angela DiPrima-Bucci system provider 215-928-8900

.a No substitutions allowed.

.2 The vegetation carrier must meet or exceed the following:

.a Made of high density polyethylene that contains at least 50% post industrial recycled materials.

.b Class "B" fire rating

.c Compressive strength of 3200 lbs f^2 (150 Kn/ m^2)

.d Flow rate of 6.868gpm/10.76 f^2 (3.28' x 3.28') or (26Lpm/ m^2)

.e UV resistant

.f Temperature range -40°F to 176° F (-40°C to 80°C).

- .g Water holding capacity = 16 oz per square foot (1.34 gallons per m²)
- .h Weight dry 4 ounces per square foot (2.68 lbs per meter²)
- .i Weight saturated 1lb – 4 oz per square foot (11.20 lbs per meter²)
- .3 There are drainage holes present on the flat surface area between the pockets to allow the overflow from the pockets to drain from the system to the roof drains.
- .4 Water Retention and Root Stabilizer Blanket
 - .a The Water Retention and Root Stabilizer is provided and attached to the vegetation carrier.
 - .b The Water Retention and Root Stabilizer must have a minimum depth of 7 mm (0.27”).
 - .c The Water Retention and Root Stabilizer must be made to cover the entire module except for the 2 rows around the exterior of two sides, which are left exposed for the fastening one module to the next.
 - 2.1.4.c.1 Water holding capacity = 16 oz per square foot (2.64 gallons per m²)
 - 2.1.4.c.2 Weight dry 4 ounces per square foot (2.68 lbs per meter²)
 - 2.1.4.c.3 Weight saturated 1.97 lbs – 4 oz per square foot (21.12 lbs per meter²)
 - 2.1.4.c.4 **COMBINED SATURATED WEIGHT WITHOUT GROWING MEDIA / PLANT MATERIAL** 2.10 lbs/f² = .25 - .30 gal/f²

2.2 Growing Medium

- .1 For Pre-Grown systems an approved growing medium (minimum depth of 52 mm (2”) (Pre-Grown System Only); (10-15 lbs per sf saturated @ 2” or 52 mm or 15 lbs per sf saturated @ 3” or 78 mm) *As the depth of the substrate increases so will the weight. *ON AVERAGE THE SYSTEM WILL MAINTAIN BETWEEN 10 AND 15 POUNDS PER SQUARE FOOT SATURATED WITH 2.5 - 3 INCHES OF GROWTH MEDIA UNLESS SPECIFIED.*
 - .a *Geographic independent testing may be required to insure quality control and roof load safety. Each region may require a varied blend of the GLTi Extensive Green Roof Media with bioSoil.*
 - .b 90% established sedum mat vegetation with root growth. (Pre vegetated only)
 - .c OPTIONAL: Sedum cuttings dispersed at a rate of ¼ lb per sf
 - .d For other assemblies, Planted in place or hybrid planted in place semi-intensive vegetation, the saturated maximum weight is 6 lbs per sf per 1” of soil depth plus 2 lbs per sf saturated weight for the Drainage board and Root stabilizer blanket.
- .2 Growing Media with biosoil, A locally produced substrate must be applied to the system on top of the Water Retention and Root Stabilizer for the purpose of plant sustainability.
- .3 When weight is a concern lightweight growing medium components may be used to reduce the load on the roof structure.
- .4 Any growing medium required must be approved or provided by the manufacture’s authorized agent to ensure viability and performance of the system as per the specifications.

2.3 Vegetation

- .1 The plant list must be approved or provided by Manufacture’s authorized agent to ensure viability and performance of the system as per the specifications

- .2 Pre-Grown Sedum Mats shall contain Sedum varieties as specified by the System Provider and approved by the Architect. The mats shall be 90% covered when delivered to the project, satisfying the following specifications:
 - .a Thickness ½"
 - .b Size 12" x 24" mats Or 3' x 6' rolls
 - .c Foundation fabric
 - .3 OPTIONAL: Sedum cuttings. Harvested from sedum not flowering
 - .a Ship so that cuttings are enclosed for no more than 30 hours
 - .4 OPTIONAL: Sedum plugs
 - .a 3 inch deep, 72-cell plugs, propagated in sterile nursery medium, according to the plant provider's recommendations.
 - .b "Harden off" plugs prior to planting by gradually eliminating irrigation over a period of one week.
 - .5
- 2.4 Optional Components
- .1 Additional approved growing media with GLTi bioSoil; for semi intensive areas
 - .2 GLTI edging details and irrigation accessories.
 - .3 Custom Plants (planted on site in additional substrate areas)
- 2.5 Protection Fabric
- .1 Protection Fabric that is a 16-ounce per square yard polypropylene or polyester non- woven needled fabric.
 - .2
- 2.6 PAVING SYSTEM
- .1 Concrete Pavers shall be Pavestone, Hanover Architectural Products, Inc. Concrete Patio Pavers, or approved equivalent. Color shall be selected from manufacture's standards, and pavers shall satisfy the following specifications:
 - .a Size: 12" x 12" x 2" nominal
 - .b Compressive strength: 8500 PSI
 - .c Weight: 25lb per sf or less
 - .d Absorption (ASTM C-140): less than 5%
 - .e Color as approved by Architect
 - .2 Pavers shall be set in fine sand setting bed over Green roof Drainage board with bonded water retention blanket
- 2.7 Drain access chambers
- .1 Drain Access Chamber is a square unit fabricated from 1/8" thick perforated Aluminum, with removable press fit cover to allow easy access for inspection. The width is 12" x 12"-inches nominal. The chambers have vents but no bottom panels Chambers shall be installed over all drains. Install:
 - .a In vegetated roof areas and surrounded by an 12-inch stone margin.
 - .b In paver areas fit flush to top of pavers and cut pavers to fit tight.
- 2.8 Irrigation
- .1 Various irrigation solutions are available depending on the situation. All irrigation designs must be approved or designed by the manufacture's authorized agent.
 - .2 An irrigation water source must be provided at the roof level with a shut-off valve installed by certified plumber.
 - .3 Grey water or rainwater irrigation water is encouraged for use with the green roof system System. Water quality must be approved by the manufacture's authorized agent prior to installation.
 - .4 All plant warranty's are subject to irrigation being present.

2.9 Edging Details

- .1 Aluminum edging details that fasten to the system are available. This edging detail is designed to be non penetrating under and over the vegetative carrier. Edge details also have the option of being powder coated or wrapped with a decorative metal such as copper, contact the system provider or approved agent for more information.
- .2 Any detail requiring mechanical edging fastening that threatens the waterproofing warranty will not be the responsibility of system provider Concrete pavers and gravel ballast edging details are available that hold the system down and provide additional weight around the perimeter to help combat any wind uplift and/or to provide access for foot traffic.
- .3 All edging must be approved by system provider for use with the system.

2.10 OPTIONAL Root Barrier

- .1 The system may require a root-blocking sheet to be laid under the polyethylene vegetation carrier. The root barrier must be made of an approved material and be thick enough to resist root penetration. Usually recommended by waterproofing manufacturer.
- .2 Root barrier / protection fabric sheets must be overlapped by at least 60 cm (2') or seamed using approved methods to ensure root blockage
- .3 Some high quality single-ply membranes may provide ample root barrier qualities and may not require the addition of a second root barrier membrane (subject to approval by waterproofing manufacturer).

3. EXECUTION

- 3.1 The roof membrane is to be protected from damage by first sweeping off all debris and then laying protective paneling in work and traffic areas. Any damage to the roof membrane during construction is the responsibility of or Manufacture's authorized agent.
- 3.2 Heavy materials are only to be placed in designated areas on roof which have been approved by a structural engineer to be suitable to carry the specified load. If there are no areas that can support additional weight then all loads must be "floated" above the roof surface by lift, never to set the load down on the roof, protected by 4 tires or 8" of polystyrene.
- 3.3 Installation
 - .1 The roof area must be vacuumed, swept or other means free of minor debris or other material.*The project site must be free from major construction or other debris.
 - .2 The root barrier and/or protection sheet (if required) must be placed over the membrane in the area being greened.
 - .3 Geo textile fabric is laid down next, laped 6" minimum and turned up sides
 - .4 The modular panels can then placed in the proper area. The panels must cleaned and overlapped by two pockets.
 - .5 Place low flow drip irrigation tubing over green roof panels and attach as necessary with zip ties to the Drainage panel. Stub up to connection points and seal ends with duct tape to prevent debris from clogging the drip lines.
 - .6 The Growth Media shall be dispensed at the roof level in a manner that will not suddenly increase the load to the roof. It shall be immediately spread to the specified thickness, plus ten percent, after moderate compaction.

- .7 Unroll the Pre-grown Sedum Mats on the roof and layout on top of Growth Media, then soak
 - .8 OPTIONAL Cuttings
 - .a The planting mixture should include species that will generate a continuous ground cover. Maximum mature plant heights shall be less than 24 inches. Large drifts of single species should be avoided. All extensive planting schemes in temperate climates must incorporate non- deciduous or semi-deciduous Sedum species. These should be established from fresh Cuttings. The plant mixture should include a minimum of four species of sedum
 - .9 OPTIONAL Plugs
 - .a Plant installation may occur April-October.
 - .b Plants should be established from 72-cell 3-inch deep plugs (unless indicated in the drawings) propagated in sterile nursery medium, according to the plant provider's recommendations. The recommended minimum planting rate is two plants per square foot.
 - .c Thoroughly soak the Surface Growth Media prior to commencing planting.
 - .d Cover with the Temporary Wind Blanket.
 - .e Secure Temporary Wind Blanket with Nylon Tie Anchors. As required, make cuts in Temporary Wind Blanket to insert the Plugs.
 - .f Install Plugs. Plugs should be set into the Surface Growth Media to their full depth and the Surface Growth Media pressed firmly around the installed Plug.
 - .g At the end of each day, soak those areas that have been newly planted.
4. 2-YEAR MAINTENANCE SERVICE
- 4.1 Maintenance must be provided by the Manufacturer's Certified Maintenance Technician.
 - 4.2 Hand weeding and/or chemical weeding and fertilization, as required to maintain the health and vigor of the plants
 - 4.3 Plant replacement as needed to achieve the required 80% coverage rate two years following substantial completion
 - 4.4 Contractor is responsible to check irrigation system every regularly to insure proper functionality

Description

This multi-function composite consists of a 50% post-industrial recycled polypropylene drainage core of fused, entangled filaments and a specially formulated water retention fabric bonded to one side. The entangled filaments are molded into a square waffle pattern that maintains the flexible design of other Enkadrain products. The composite water retention fabric consists of a 8 oz/yd² - 100% post consumer recycled non-woven polyester fabric mechanically bonded to a 12 oz/yd² layer of synthetic hydrophilic (water) absorbent mat. The absorbent mat is designed to hold 10 to 12 times its unit weight of water. It is a very strong, durable composite that is extremely resistant to puncture and tearing. The composite is inert to biological degradation and naturally encountered chemicals, alkalis, and acids. This product can help contribute up to 2 LEED points when used in conjunction with other recycled content products. As a part of a green roof it can contribute towards additional LEED points by reducing stormwater runoff, heat islands and energy consumption.

Recommended Applications

- Extensive green roofs
- Intensive green roofs
- Exterior & interior planters

Features and Benefits

- Excellent durability
- Protects waterproofing during and after placing of planting media
- Conforms to irregular surfaces and offsets
- Waffle design creates open flow path — even during loading of planting media
- Recycled content polymer in core and fabric contributes towards LEED points
- Provides superior water holding capacity
- Reduces runoff volume in green roof applications

Technical Data

Physical Properties

Property	English Units	Metric Units
Core Material	Recycled Polypropylene	
Total Thickness	0.60 in	mm
Total Weight (avg.)	36.0 oz/yd ²	g/m ²
Core Thickness	0.40 in	mm
Core Weight (avg.)	16.0 oz/yd ²	g/m ²

Flow Rates

Pressure	1.0 Gradient	0.1 Gradient
1000 psf	23.0 gal/min/ft	6.9 gal/min/ft

Fabric Properties

Property	English Units	Metric Units	Test Method
Polymer	Polypropylene Recycled Polyester		
Fabric Color	Light Green		
Weight	20.0 oz/yd ²	g/m ²	ASTM D 5261
Thickness	165 mils		ASTM D-5199
Grab Strength MD	135.0 lbs	kN	ASTM D 4632
Grab Elongation MD	70%	70%	ASTM D 4632
Mullen Burst Strength	300 psig		ASTM D 3786
Puncture Strength	70.0 lbs	0.31 kN	ASTM D 4833
Water Holding Capacity	1000-1200%		ASTM D 4250
Water Holding Capacity	0.10– 0.15 gal/ft ²		ASTM D 4250

Polymer Properties

Polypropylene has excellent resistance to organic solvents, degreasing agents, acids, and alkalines. It has tensile strength superior to high density polyethylene. It has a low moisture absorption rate, is resistant to staining, and is very light weight.

rooflite® extensive mcl Specifications

rooflite® extensive mcl		
A very light growing medium for extensive green roof systems with a separate drainage course or a synthetic drainage layer. rooflite® extensive mcl is a precisely balanced blend of light weight mineral aggregates like HydRocks® or pumice and premium organic components like USCC STA approved compost complying with the following requirements:		
Particle Size Distribution		
Proportion of silting components < 0.063 mm	Mass %	≤ 10
Proportion of particles < 0.25 mm 60 mesh	Mass %	5 - 20
Proportion of particles < 1.00 mm 18 mesh	Mass %	10 - 40
Proportion of particles < 2.00 mm 10 mesh	Mass %	30 - 50
Proportion of particles < 3.20 mm 1/8 inch	Mass %	40 - 70
Proportion of particles < 6.30 mm 1/4 inch	Mass %	65 - 95
Proportion of particles < 9.50 mm 3/8 inch	Mass %	80 - 100
Proportion of particles < 12.50 mm 1/2 inch	Mass %	100
Density Measurements		
Bulk Density (dry weight basis)	g/cm ³	0.55 - 0.80
Bulk Density (dry weight basis)	lb/ft ³	35 - 50
Bulk Density (at max. water-holding capacity)	g/cm ³	1.05 - 1.15
Bulk Density (at max. water-holding capacity)	lb/ft ³	66 - 72
Water/Air Measurements		
Total Pore Volume	Vol. %	≥ 60
Maximum water-holding capacity	Vol. %	35 - 65
Air-filled porosity at max water-holding capacity	Vol. %	≥ 10
Water permeability (saturated hydraulic conductivity)	cm/sec	0.001 - 0.12
Water permeability (saturated hydraulic conductivity)	in/min	0.024 - 2.83
pH and Salt Content		
pH (in CaCl ₂)		6.0 - 8.5
Soluble salts (water, 1:10, m:v)	g (KCl)/L	< 3.5
Organic Measurements		
Organic matter content	g/L	25 - 60

Nutrients		
Phosphorus, P ₂ O ₅ (CAL)	mg/L	≤ 200
Potassium, K ₂ O (CAL)	mg/L	≤ 700
Magnesium, Mg (CaCl ₂)	mg/L	≤ 200
Nitrate + Ammonium (CaCl ₂)	mg/L	≤ 80
<p>Supplier: Please find your regional supplier at www.rooflite.us or call 1.877.268.0017</p> <p><i>All values are based on compacted materials according to laboratory standards and testing methods defined by the Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL) Landscape Development and Landscaping Research Society, Guidelines for the Planning Construction and Maintenance of Green-Roofing, Green Roofing Guideline, 2008</i></p> <p><small>Skyland USA LLC, March 2011</small></p>		

1.2

Notes:

Density Measurements reflect a typical range for rooflite extensive mc. For more detailed information please refer to our region specific analysis or inquire about latest test results.

If Air-filled Porosity is measured instead of being determined according the FLL Green Roofing Guidelines reference value may be below 10.

The details contained in these specifications correspond with Skyland USA's technical knowledge at the time of publication. Skyland USA, LLC reserves the right to update and adjust performance specifications from time to time in accordance with new insight and to modify the named properties of the product.

END OF SECTION