

BLU-SOLAR

Systems 5000: Solar Applications



SUSTAINABLU

ON STRUCTURE STORMWATER MANAGEMENT SYSTEMS

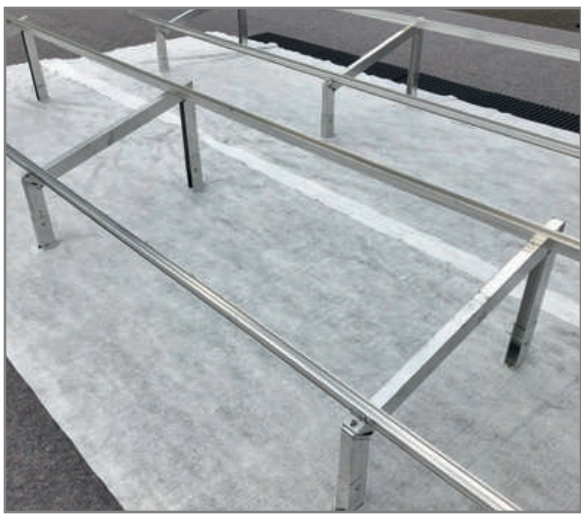


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Specifications

[07 33 63] 5000-Series Blu-Solar Roof System CSI Specification - FKD
[07 33 63] 5000-Series Blu-Solar Roof System CSI Specification - WRB

Installation Guides

[5000] Blu-Solar Installation Guidelines

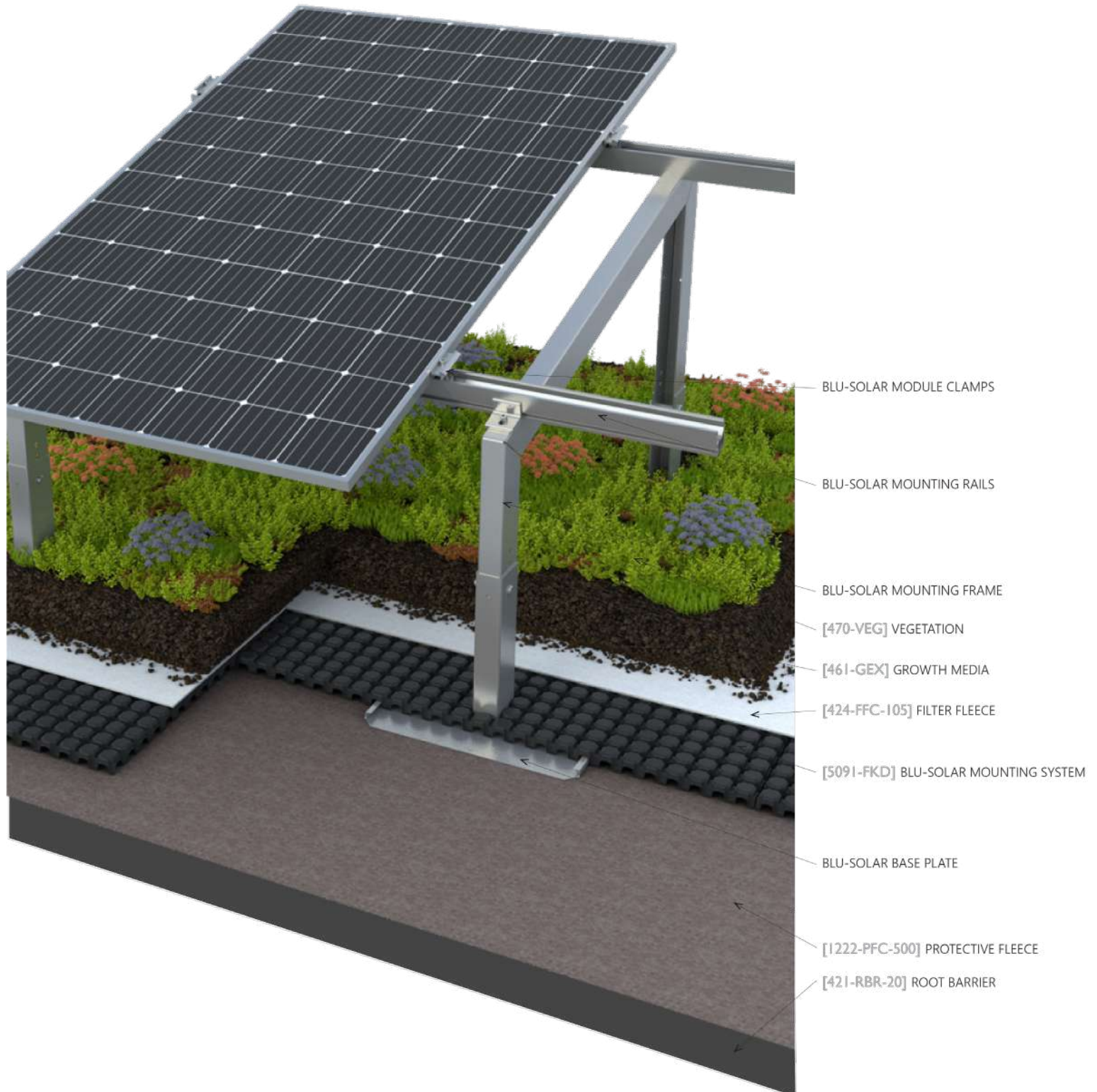
Operations & Maintenance (O&M)

Blu-Solar Maintenance Guidelines

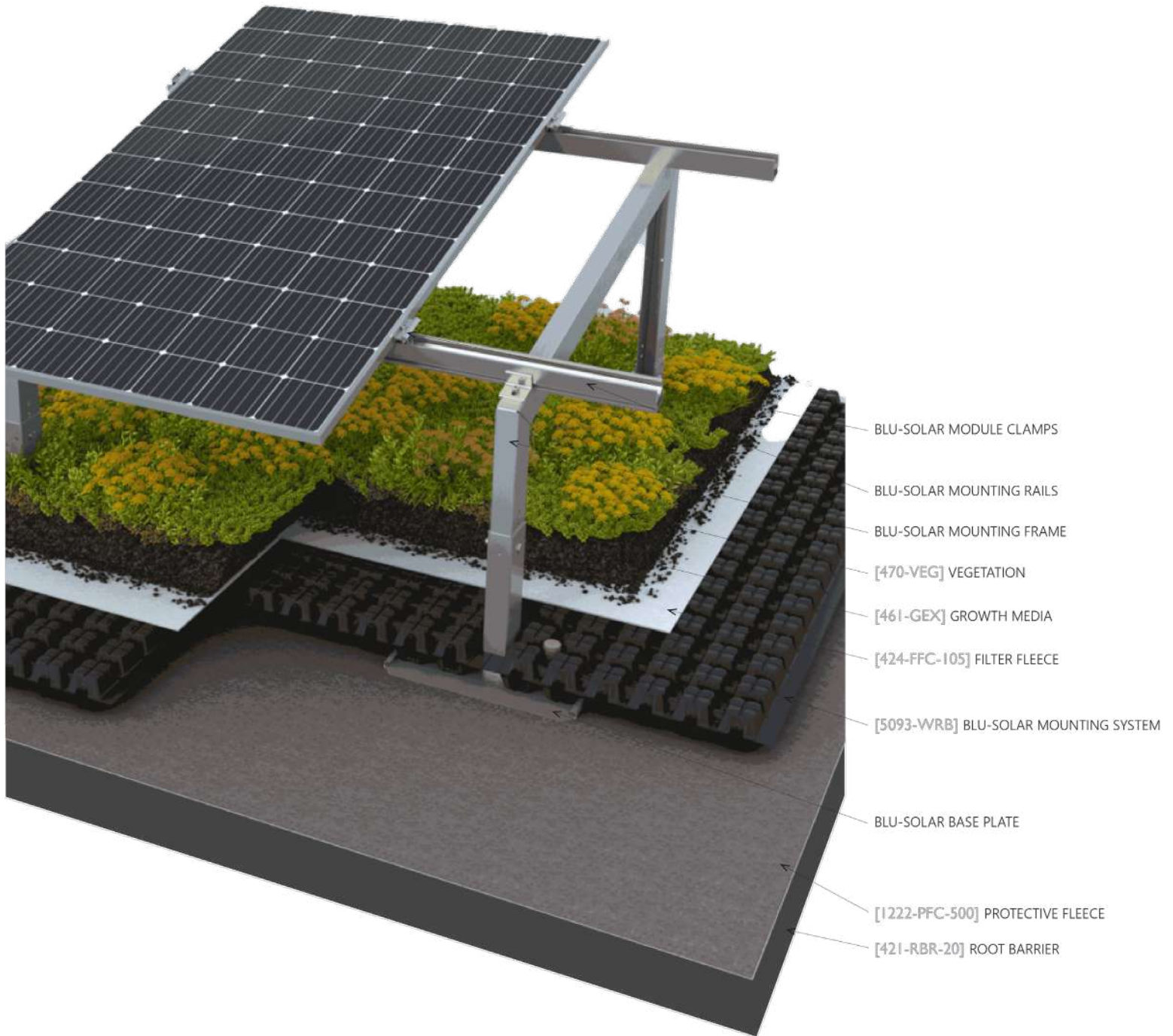
Warranty

Blu-Solar Materials Limited Warranty

BLU-SOLAR SYSTEM



BLU-SOLAR SYSTEM WITH RETENTION



20 MIL LLDPE ROOT BARRIER

Our 20 Mil Root Barrier is a low density polyethylene (LLDPE) sheet which is suggested for use over hot applied asphaltic, modified bitumen, cold tar pitch / built-up roofs, & EPDM Roof Membranes. Specific to this product, it:

- **directs root growth away** from waterproofing membrane, preventing it from root damage
- **withstands moderate construction traffic**
- provides **excellent protection from UV exposure** and harsh weather conditions
- features a **high tensile strength, high puncture and tear resistance**, and excellent chemical resistance
- requires a maintenance plan to prevent tree seedlings from germinating



LEED Credits available for:
• Materials & Resources (MR)



• Special order product



• Individual Roll
• Full Pallet



• 773 ft² per Roll
• 16 Rolls per Pallet (12,368 ft²)

TECHNICAL DATA

Materials:

- Recycled LLDPE

Material Thickness (ASTM D 5119):

- 0.02" (20 mils)

Roll Dimensions (W x L):

- 53" x 175'

Roll Weight:

- 76 lbs. / Roll (0.09 lbs. / ft²)

Tensile Strength at Break (ASTM D 6693):

- 96 ppi

Elongation at Break (ASTM D 6693):

- 900%

Tear Resistance (ASTM D 1004):

- 12 lbf

Puncture Resistance (ASTM D 4833):

- 40 lbf

Vegetated Roofing Use:

- Extensive vegetated roofs with plant materials with fibrous root systems only

Installation Requirements:

- Overlap seams by 6"
- Tape joints with RBS-20 Seam Tape if not utilizing Leak Detection

SEMI-INTENSIVE PROTECTIVE FLEECE - 15 oz

Our Semi-Intensive Protective Fleece is designed specifically for use within Semi-Intensive green roofing systems. Specific to this product, it:

- **protects the roof membrane** and/or root barrier against damage from light mechanical demands
- **separates materials** of incompatible substrates from one another
- **stores water** & nutrients, depending on its function
- has a mass/structure and water holding capacity designed with the dead load weight and plant palettes of the Semi-Intensive roof system in mind to give the perfect **balance of water holding capacity and protection**



Protection and Storage Fleece RMS 500 by

OPTIGRÜN®
ROOF GREENING



LEED Credits available for:
• Materials & Resources (MR)



- Individual Roll
- Full Pallet



- 1,076 ft² per Roll
- 5 Rolls per Pallet (5,380 ft²)

TECHNICAL DATA

Materials:

- Polypropylene, Polyester & Recycled Acrylic Thread

Material Thickness:

- 0.16", 15 oz.

Roll Dimensions (W x L):

- 6' 6 3/4" x 164' 1/2"

Roll Diameter:

- 1' 7 3/4"

Roll Weight:

- 110 lbs.

Total Saturated Weight:

- 0.81 lbs. / ft²

Water Holding Capacity:

- 0.14 in³ / in² (0.085 gal / ft²)

Rot & Pathogen Resistant:

- Yes

Puncture Resistant:

- Yes

Vegetated Roofing Use:

- Semi-Intensive vegetative roofs

Installation Requirements:

- Overlap fabric by 6"

EXTENSIVE 1" DRAINAGE / RETENTION BOARD

Our Extensive 1" Drainage / Retention (DR) Board is designed for extensive vegetated roofs requiring moderate water storage. Specific to this product, it:

- is a semi-rigid waffled plastic sheet that **retains water within pockets** on the upper side, making water available to vegetation
- has **drill holes to drainage channels** for diffusion and irrigation
- channels surplus water through its **bottom-sided canal system** for secure drainage
- allows for the incorporation of a complete array of zone appropriate **drought tolerant plantings**; in a less than 6" depth assembly



Drainage and Storage Board FKD 25 by

OPTIGRÜN®
ROOF GREENING



LEED Credits available for:
• Materials & Resources (MR)



- Individual Unit
- Full Section
- Full Pallet



- 21.52 ft² per Unit
- 50 Units per Section (1,076 ft²)
- 7 Sections per Pallet (7,532 ft²)

TECHNICAL DATA

Materials:

- Recycled HDPE

Material Thickness:

- 0.98"

Board Dimensions (W x L):

- 3' 3 3/8" x 6' 6 3/4"

Board Area:

- 21.52 ft²

Board Weight:

- 0.28 lbs. / ft²

Compressive Strength:

- 29.00 lbs. / in² (unfilled)
- 25.38 lbs. / in² (filled)

Water Holding Capacity:

- 0.20 in³ / in² (0.122 gal / ft²) (unfilled)

Drainage Performance (fully saturated):

- at 1% Slope = 18.41 in³ / ft / sec
- at 2% Slope = 26.22 in³ / ft / sec

Vegetated Roofing Use:

- Extensive vegetative roofs using a complete array of zone appropriate drought tolerant plantings

Installation Requirements:

- Overlap boards by one cup
- Cover boards with overburden immediately to protect from UV rays & wind uplift

BLU-VAULT 3.2" EXTENSIVE RETENTION BOARD

Our Blu-Vault 3.2" Drainage / Retention (DR) Board integrates with raised roof drains to provide water storage and stormwater discharge delay. Specific to this product, it:

- is a lightweight, sub-surface **multifunctional drainage module** used with extensive greenroofs with sedum, herb, grass, and perennial vegetation
- has **90% internal void volume** that allows for a large water retention capacity
- significantly **reduces daily irrigation needs**
- is available with special **capillary columns for vertical water transport** between the reservoir and vegetation layers



Water Retention Box WRB 80F by

OPTIGRÜN®
ROOF GREENING



LEED Credits available for:
• Materials & Resources (MR)



• Special order product



• Individual Unit
• Full Pallet
• Full Load



• 11.63 ft² per Board
• 200 Boards per Pallet (2,325 ft²)
• 12 Pallets per Load (27,900 ft²)

TECHNICAL DATA

Materials:

- Recycled HDPE

Material Thickness:

- 3.15"

Board Dimensions (W x L):

- 1' 9 21/32" x 6' 5 21/64"

Board Area:

- 11.63 ft²

Board Weight:

- 0.74 lbs. / ft²

Compressive Strength:

- 14.5 lbs. / in²

Water Holding Capacity:

- 2.84 in³ / in² (1.77 gal / ft²)

Drainage Performance (fully saturated):

- at 1% Slope = 46.5 in³ / ft / sec

Vegetated Roofing Use:

- Stormwater discharge delay, harvesting, and building cooling through raising roof drains and covering with a filter fleece

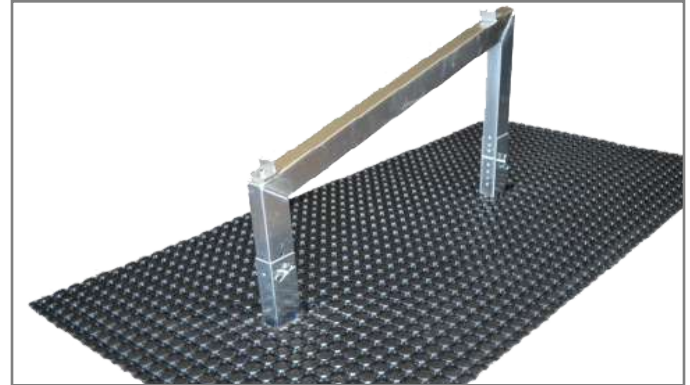
Installation Requirements:

- Fold board lengthwise & engage the click lock
- Overlap boards with locking side against hinge side
- Cover boards with overburden immediately to protect from UV rays & wind uplift

BLU-SOLAR INTEGRATED MOUNTING SYSTEM

Our Solar Integrated Mounting System consists of a drainage board, base plate, mounting frame, mounting rails, wind bracing, and clamps for securing solar modules angled at 10°, 15°, or 20° within vegetated roof systems without penetrating the waterproofing membrane. Specific to this product, it:

- is a semi-rigid waffled plastic sheet that **retains water within pockets** on the upper side, making water available to vegetation
- channels surplus water through its **bottom-sided canal system** for secure drainage
- **increases output** and prolongs the life of the photovoltaic system, when in conjunction with a vegetated roof system
- is available in inclines of **10°, 15°, or 20°**



Solar FKD Mounting Frame by

OPTIGRÜN
ROOF GREENING



- Special order product



- Individual Unit
- Full Pallet
- Full Load



- According to size of order



LEED Credits available for:
• Materials & Resources (MR)

TECHNICAL DATA

Materials:

- Recycled HDPE (Board) & Aluminum (Frame)

Board Thickness:

- 0.98"

Board Dimensions (W x L):

- 3' 3 3/8" x 6' 6 3/4"

Board Area:

- 21.52 ft²

Mounting Frame Weight:

- 9.26 lbs.

Board Compressive Strength:

- 29.00 lbs. / in² (unfilled)
- 25.38 lbs. / in² (10% compression & 1.25" overfill)

Water Holding Capacity:

- 0.20 in³ / in² (0.122 gal / ft²)

Drainage Performance (fully saturated):

- at 1% Slope = 18.41 in³ / ft / sec
- at 2% Slope = 26.22 in³ / ft / sec

Vegetated Roofing Use:

- Provides a non-penetrating solution for supporting PV modules.

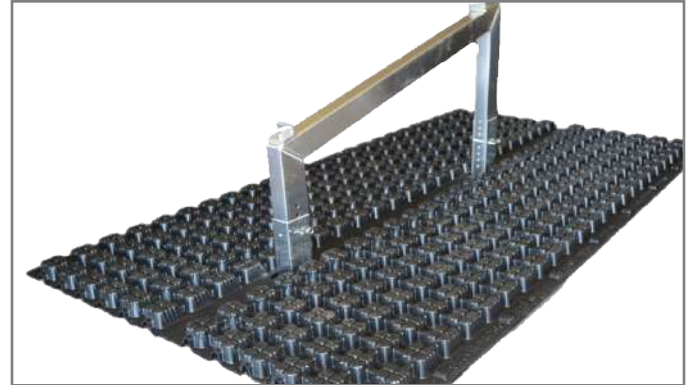
Installation Requirements:

- Set base plates on protective fleece and place drainage boards above
- Roll out filter fleece over drainage boards
- Fasten aluminum rails to mounting frame
- Cover boards with overburden immediately to protect from UV rays & wind uplift

BLU-SOLAR INTEGRATED MOUNTING SYSTEM WITH RETENTION

Our Solar Integrated Mounting System consists of a drainage board, base plate, mounting frame, mounting rails, wind bracing, and clamps for securing solar modules angled at 10°, 15°, or 20° within vegetated roof systems without penetrating the waterproofing membrane. Specific to this product, it:

- is a lightweight, sub-surface **multifunctional drainage module** used with extensive greenroofs with sedum, herb, grass, and perennial vegetation
- has **90% internal void volume** that allows for a large water retention capacity
- **increases output** and prolongs the life of the photovoltaic system, when in conjunction with a vegetated roof system
- is available in inclines of **10°, 15°, or 20°**



Solar WRB Mounting Frame by

OPTIGRÜN®
ROOF GREENING



- Special order product



- Individual Unit
- Full Pallet
- Full Load



- According to size of order



LEED Credits available for:
• Materials & Resources (MR)

TECHNICAL DATA

Materials:

- Recycled HDPE (Board) & Aluminum (Frame)

Board Thickness:

- 3.15"

Board Dimensions (W x L):

- 3' 7 5/16" x 6' 5 21/64"

Board Area:

- 23.25 ft²

Mounting Frame Weight:

- 9.70 lbs.

Board Compressive Strength:

- 14.5 lbs. / in²

Water Holding Capacity:

- 2.84 in³ / in² (1.77 gal / ft²)

Drainage Performance (fully saturated):

- at 1% Slope = 46.5 in³ / ft / sec

Vegetated Roofing Use:

- Provides a non-penetrating solution for supporting PV modules and stormwater discharge delay

Installation Requirements:

- Set base plates on protective fleece and place drainage boards above
- Roll out filter fleece over drainage boards
- Fasten aluminum rails to mounting frame
- Cover boards with overburden immediately to protect from UV rays & wind uplift

STANDARD FILTER FLEECE

Our Standard Filter Fleece is used when the drainage system needs to be protected from fine particles entering from the substrate layer. Specific to this product, it:

- acts as a separation between vegetation areas and vegetation-free zones
- **separates drainage and substrate layers** in multi-layered structures
- is designed with the perfect elasticity to **allow the fibrous root structures of extensive plant species** to penetrate it
- **enables plants to uptake water** from the drainage / retention board without deteriorating the fleece's filtration capacity



Filter Fleece FIL 105 by

OPTIGRÜN®
ROOF GREENING



- Individual Roll
- Full Pallet



- 2,153 ft² per Roll
- 11 Rolls per Pallet (23,683 ft²)

TECHNICAL DATA

Materials:

- Polypropylene Thread

Material Thickness:

- 0.04", 3 oz.

Roll Dimensions (W x L):

- 6' 6 3/4" x 328' 1"

Roll Diameter:

- 11"

Filtration Capability:

- Up to No. 140 Sieve

Total Saturated Weight:

- 0.02 lbs. / ft²

Tensile Strength (CBR Test):

- 1.08 lbs. / in²

Puncture Resistance:

- 269.7 lbs.

Rot & Pathogen Resistance:

- Yes

Vegetated Roofing Use:

- Vegetative roofs with either a drainage/retention board or dual-media system

Installation Requirements:

- Overlap seams by 6"
- Cover with growth media

TERRAPOR EX - EXTENSIVE GROWTH MEDIA

Our Extensive Blend is our bread & butter blend for extensive vegetated roofs with drought tolerant plantings. We custom blend growth media per a project's plant palette. Extensive Blend growth media offers many advantages:

- a precisely blended growth media designed for extensive green roof systems with a **media depth of 3-6 inches**
- designed to be **lightweight**, Extensive Blend growth media uses porous materials designed to **retain maximum amounts of water** while simultaneously **promoting drainage**
- suitable for **shallow rooting green roof plants** such as sedums and other drought tolerant species
- blended to strict **FLL-compliant** guidelines



LEED Credits available for:
• Materials & Resources (MR)



- 2 yd³ Supersack
- Bulk



- 2 yd³ Supersack
- Bulk

QUICK REFERENCE & SHIPPING DATA

Vegetated Roofing Use:

- Extensive vegetated roofs

Coverage (1 yd³):

- at 3" = 108 ft²
- at 4" = 81 ft²
- at 6" = 54 ft²

Dry Weight (approximate):

- 43 lbs. / ft³

Saturated Weight (approximate):

- 74 lbs. / ft³
 - at 3" = 18.5 lbs. / ft²
 - at 4" = 24.6 lbs. / ft²
 - at 6" = 37.0 lbs. / ft²

Bulk Shipping Data:

- Bulk material weighs approximately 1,780 lbs. / yd³
- 32 - 34 yd³ in dump trailer, 22 - 24 yd³ in a tri-axle

2 yd³ Super Sacks:

- 2 yd³ Super Sacks weigh approximately 3,560 lbs.
- 15 - 16 2 yd³ Super Sacks / flatbed trailer

TECHNICAL DATA

*Third party growth media analysis & testing completed by an authorized FLL Laboratory.

Grain Size Distribution:

	<u>mm</u>	<u>Inches</u>	<u>% of Dry Weight</u>
Passing 1/2" Sieve	12.50	0.50	100
Passing 3/8" Sieve	9.53	0.375	80 - 100
Passing 1/8" Sieve	3.18	0.125	40 - 80
Passing #18 Sieve	1.00	0.039	20 - 50
Passing #60 Sieve	0.25	0.010	15 - 30
Passing #230 Sieve	0.06	0.002	5 - 20
Silt & Clay Fraction	< 0.06	< 0.002	< 5

Density:

	<u>g / cm³</u>	<u>lbs. / ft³</u>	<u>% of Total Weight</u>
Application Density	0.64 - 0.80	40 - 50	
Saturated Density	1.08 - 1.29	68 - 81	
Dry Media		31 - 62	

Water & Air Management:

	<u>% by Volume</u>	<u>in³ / ft³</u>
Saturated Water Capacity	35 - 75	604 - 1295
Saturated Air Capacity	> 10	> 173
	<u>cm / hour</u>	<u>inches / hour</u>
Saturated Hydraulic Conductivity	> 5.0	> 1.9

pH, Lime, & Salt Content:

	<u>units</u>	<u>% as CaCO₃</u>	<u>mmhos / cm</u>
pH (saturated paste)	6.0 - 8.5	-	-
Carbonate Content	-	< 2.5	-
Electrical Conductivity	-	-	< 2.5

Organics:

	<u>% of Dry Weight</u>
Organic Matter	6.0 - 8.5
C/N Ratio	< 25:1

Nutrients:

	<u>mg / l Saturated Extract</u>	<u>lbs. / 1,000 ft³</u>	<u>FLL Parameters lbs. / 1,000 ft³</u>
Nitrogen (NO ₃ + NH ₄ as N)	270 - 417	7 - 11	3 - 15
Phosphorous (as P ₂ O ₅)	162 - 189	4 - 5	1 - 7
Potassium (K ₂ O)	324 - 417	8 - 11	6 - 15
Calcium (Ca)	621 - 1134	19 - 30	19 - 65
Magnesium (Mg)	243 - 378	6 - 10	3 - 15
Sulfur (as SO ₄ -S)	27 - 97	1 - 2.5	1 - 3.5
Copper (Cu)	7 - 14	0.25 - 0.50	0.25 - 0.50
Zinc (Zn)	0.28 - 0.83	0.01 - 0.03	0.01 - 0.03
Iron (Fe)	27 - 81	1 - 3	1 - 3
Manganese (Mn)	27 - 81	1 - 3	1 - 3
Boron (Water Soluble B)	7 - 14	0.25 - 0.50	0.25 - 0.50

Cation Exchange Capacity:

	<u>meg / 100g dw</u>
CE _{cap}	> 5

SEED & SEED MIXES

Vegetated Roof Seed and Seed Mixes provide a diverse & adaptive means for roof greening. We recommend a two-year maintenance plan by a contractor with an intermediate skill level to ensure success. Vegetated Roof Seed and Seed Mixes offer many advantages:

- a good choice for **overall green roof planting**, filling in sparse areas of plug or cuttings installations, as well as **provide planting diversity**
- an **economical** method of planting that is inexpensive, easy to convey onto the roof, and a fast installation
- **multi-stage establishment**, with full coverage within two years
- can be ordered by the ounce and blended on-site for application or pre-mixed in supersacks for **quick installation**



• Special order product



- < 10,000 SF
- 10,000 - 24,999 SF
- 25,000 - 49,999 SF
- 50,000 - 99,999 SF
- > 100,000 SF



- 1/4 to 1/2 ounce application per 2,500 SF
- 2 CY Supersack per 2,500 SF

TECHNICAL DATA

Seed & Seed Mix Planting Variety Options:

Basic Sedum Mix Planting Cultivars:

- Sedum acre, album, ellacombianum, floriferum, hybridum, middendorffianum, montanum, pulchellum, reflexum, selskianum, sexangulare, spurium.

Extensive Perennial Mix Planting Cultivars:

- Antennaria dioica, Armeria maritima, Campanula rotundifolia, Cymbalaria muralis, Dianthus arenarius, carthusianorum, deltoides, Gypsophila repens, Hieracium pilosella, Petrorhagia saxifraga, Saponaria ocymoides, Saxifraga granulata and encrusted types, Sedum acre, album, ellacombianum, hispanicum, hybridum, pulchellum, reflexum, sexangulare, spurium, Thymus pulegioides, serphyllum and other species

Premium Sedum Mix Planting Cultivars:

- Sedum acre, album, ellacombianum, floriferum, hispanicum, hybridum, montanum, oreganum, pulchellum, reflexum, selskianum, sexangulare, spurium, stoloniferum.

Ornamental Grass & Perennial Mix Planting Cultivars:

- Antennaria, Armeria, Campanula rotundifolia, Cymbalaria, Dianthus arenarius, carthus., deltoides, Gypsophila repens, Hieracium pilosella, Petrorhagia sax., Saponaria ocy., Saxifraga granulata, Sedum acre, album, ellacom., hispanicum, hybr., pulchellum, reflexum, sexangulare, spurium, Thymus pulegioides, serph. and grasses: Briza media, Carex flacca, Festuca cinerea, Koeleria glauca, Melica ciliata and other specie Sedum acre, album, ellacombianum, floriferum, hispanicum, hybridum, montanum, oreganum, pulchellum, reflexum, selskianum, sexangulare, spurium, stoloniferum.

MIXED SEDUM CUTTINGS

The sedum cuttings style roof is one of the most commonly used systems worldwide. We recommend a two-year maintenance plan by a contractor with an intermediate skill level to ensure success. Sedum Cuttings offer many advantages:

- a good choice for **overall green roof planting**, overplanting plug installations, **filling in sparse areas**, as well as mat or module production
- an **economical** method of planting that is inexpensive, easy to convey onto the roof, and a fast installation
- **quick establishment**, full vegetation within a year
- can be ordered by the pound, by variety, or pre-mixed in the percentage you request to create **customized mixes**



• Special order product



- < 10,000 SF
- 10,000 - 24,999 SF
- 25,000 - 49,999 SF
- 50,000 - 99,999 SF
- > 100,000 SF



- 30 lbs. per Box (200-600 cuttings / lb)
- 28 Boxes per Pallet (840 lbs.)

TECHNICAL DATA

Cuttings Length:

- 1/2" - 3"

Sedum Cutting Varieties:

- Sedum acre 'Aurea'
- Sedum album 'Coral Carpet' & 'Green Ice'
- Sedum cauciculum
- Sedum divergens
- Sedum hispanicum 'Purple Form'
- Sedum hybridum 'Immergrunchen'
- Sedum kamtschaticum 'Variegatum', & 'Weihenstephaner Gold'
- Sedum middendorffianum diffusum
- Sedum pachyclados
- Sedum reflexum 'Blue Spruce' & 'Green Spruce'
- Sedum rupestre 'Angelina'
- Sedum sexangulare
- Sedum spurium 'Album Superbum', 'Dragon's Blood', 'Fuldaglut', 'John Creech', 'Red Carpet', 'Summer Glory', 'Tricolor', & 'Voodoo'
- Sedum stefco
- Sedum takesimensis 'Golden Carpet'
- Sedum tetractinum 'Coral Reef'

VEGETATED ROOF PERENNIAL PLUGS

The installation of drought tolerant Perennial Plug rooftop gardens is the second most commonly used system worldwide. We recommend a two-year maintenance plan by a contractor with an intermediate skill level to ensure success. Perennial Plugs offer many advantages and guarantees:

- **individual immature plants** or “plugs” are planted into the substrate by hand and grow to provide full coverage over the next 12 - 24 months
- an **economical** method of planting that is inexpensive, easy to convey onto the roof, and a fast installation
- broad palette of sedums, wildflowers, herbs, and grasses for **greater biodiversity** and **varied aesthetic appearance**
- variable growth habits and huge diversity of flower shapes and colors facilitate **visual differentiation** to create unique roof spaces



• Special order product



• Full Flat - Single Species



• Minimum order: 24 trays, 10 trays per variety
• Based on availability

TECHNICAL DATA

Plug Cell Sizes:

- 24 Cell
- 72 Cell
- 128 Cell

Plug Dimensions (W x D):

- 24 Cell - 2 5/8" x 2 1/2"
- 72 Cell - 1 1/2" x 2"
- 128 Cell - 1 1/8" x 1 7/8"

Typical Perennial Plug Varieties:

- Achillea 'Desert Eve Deep Rose', 'Desert Eve Red', 'Desert Eve Terracotta', '&' 'Desert Eve Yellow'
- Achillea lewisii 'King Edward'
- Allium schoenoprasum
- Antennaria dioica 'Rubra'

- Armeria maritima 'Dusseldorf Pride'
- Calamagrostis 'Karl Foerster' & 'Overdam'
- Delosperma cooperi
- Dianthus 'Firewitch'
- Echinacea 'Magnus', 'PowWow White', & 'PowWow Wild Berry'
- Festuca 'Elijah Blue'
- Fragaria chiloensis & 'Lipstick'
- Phlox subulata 'Drummons Pink'
- Rudbeckia 'Goldstrum'
- Sedum Sunsparkler 'Cherry Tart', 'Dazzleberry', 'Firecracker', & 'Lime Zinger'
- Sedum 'Autumn Fire' & 'Autumn Joy'
- Stipa tenuissima

FULLY VEGETATED SEDUM MATS

Fully Vegetated Sedum Mats are an instantaneous landscape. Our Sedum Mats come with a standardized plant palette that works amazingly from USDA plant zones 2-7. Each blanket includes five to eight of the varieties specified to provide all season interest, maximum color, shade tolerance, or durability. Sedum Mats offer many advantages:

- the sebaceous Sedum plants are adept at storing water in their leaves, making them extremely suitable for **varying weather conditions**
- can be installed on both **flat or pitched roofs**, as well as on-grade ground cover for areas that are difficult to plant or maintain
- is **simple and light to install** with installation rates as high as 500 ft² per man hour
- the **coconut fiber base** assures effective rooting of the plants to the underlying growth media
- **minimal maintenance** requirements once established



• Special order product



• Full Roll



• 25 ft² per Roll
• 15 Rolls per Pallet (375 ft²)

TECHNICAL DATA

Coir Fiber / Soil Base Thickness:

- 3/4"

Mat Dimensions (W x L):

- 48" x 75"

Vegetation Height:

- Up to 3"

Mat Area:

- 25 ft²

Mat Weight:

- 3.5 - 4lbs. / ft² (dry)
- 4.5 - 5 lbs. / ft² (fully saturated)

Vegetation Coverage:

- 85 - 95%

Sedum Varieties:

- Sedum spurium 'Fuldaglut'
- Sedum spurium 'John Creech'
- Sedum spurium 'Red Carpet'
- Sedum kamtschaticum 'Variegatum'
- Sedum floriferum 'Weihenstephaner Gold'
- Sedum takesimensis 'Golden Carpet'
- Sedum x 'Immergrunchen'
- Sedum rupestre 'Angelina'
- Sedum reflexum 'Blue Spruce'
- Sedum acre 'Aureum'
- Sedum acre 'Gold Moss'
- Sedum album 'Coral Carpet'
- Sedum album 'Murale'
- Sedum sexangulare
- Sedum stefco

FULLY VEGETATED SEDUM SOD - FOUR SEASON MIX

Fully Vegetated Sedum Sod is an instantaneous landscape. Our Sedum Sod comes in three proven mixes to meet the unique needs of various green roof environments. Each tile includes at least 12 of the varieties specified to provide all season interest, maximum color, shade tolerance, or durability. Four Season Mix Sedum Sod offers many advantages:

- provides **flowers throughout the growing season**. Winter interest and seasonal foliage color changes are also found within this mix
- a good, general-purpose mix that provides **year-round beauty**
- is **simple and light to install** with installation rates as high as 1,000 ft² per man hour
- the **coconut fiber base** assures effective rooting of the plants to the underlying growth media
- **minimal maintenance** requirements once established



• Special order product



• Individual Unit



• 2 ft² per Unit
• 125 Units per Pallet (250 ft²)

TECHNICAL DATA

Coir Fiber / Soil Base Thickness:

- ~1"

Tile Dimensions (W x L):

- 12" x 24"

Vegetation Height:

- Up to 3"

Tile Area:

- 2 ft²

Tile Weight (fully saturated):

- 3-4 lbs. / ft²

Vegetation Coverage:

- 95% (minimum)

Four Season Mix Sedum Varieties:

- Sedum kamtschaticum
- Sedum spurium 'Dragons Blood'
- Sedum acre 'Oktoberfest'
- Sedum stoloniferum
- Sedum ellacombianum
- Sedum floriferum 'Weihenstephaner Gold'
- Sedum spurium 'Voodoo'
- Sedum foresterianum 'Silver Stone'
- Sedum hybridum 'Czar's Gold'
- Sedum spurium 'Summer Glory'
- Sedum sexangulare
- Sedum reflexum 'Blue Spruce'
- Sedum spurium 'Fuldaglut'
- Sedum spurium 'Coccineum'
- Sedum spurium 'Red Carpet'

FULLY VEGETATED SEDUM SOD - COLOR BLAST MIX

Fully Vegetated Sedum Sod is an instantaneous landscape. Our Sedum Sod comes in three proven mixes to meet the unique needs of various green roof environments. Each tile includes the varieties specified to provide all season interest, maximum color, shade tolerance, or durability. Color Blast Mix Sedum Sod offers many advantages:

- includes a blend of sedums for use when **maximum color** is desired
- comes in the form of **brightly colored foliage**, flowers in abundance, and colors that blend and go together well
- is **simple and light to install** with installation rates as high as 1,000 ft² per man hour
- the **coconut fiber base** assures effective rooting of the plants to the underlying growth media
- **minimal maintenance** requirements once established



• Special order product



• Individual Unit



• 2 ft² per Unit
• 125 Units per Pallet (250 ft²)

TECHNICAL DATA

Coir Fiber / Soil Base Thickness:

- ~1"

Tile Dimensions (W x L):

- 12" x 24"

Vegetation Height:

- Up to 3"

Tile Area:

- 2 ft²

Tile Weight (fully saturated):

- 3-4 lbs. / ft²

Vegetation Coverage:

- 95% (minimum)

Color Blast Mix Sedum Varieties:

- Sedum acre 'Aureum'
- Sedum rupestre 'Angelina'
- Sedum reflexum 'Blue Spruce'
- Sedum hybridum 'immergrunchen'
- Sedum kamtschaticum 'Variegatum'
- Sedum sexangulare
- Sedum spurium 'Summer Glory'
- Sedum spurium 'Voodoo'
- Sedum spurium 'Fuldaglut'
- Sedum dasphyllum 'Blue Cadet'
- Sedum spurium 'Tricolor'

FULLY VEGETATED SEDUM SOD - GROWERS CHOICE MIX

Fully Vegetated Sedum Sod is an instantaneous landscape. Our Sedum Sod comes in three proven mixes to meet the unique needs of various green roof environments. Each tile includes at least 12 of the varieties specified to provide all season interest, maximum color, shade tolerance, or durability. Growers Choice Mix Sedum Sod offers many advantages:

- includes a blend of sedums that are the **toughest, most durable, and most drought resistant** choices available
- proven **ability to survive wind, cold, heat, drought, and tough environments** that limit plant choices
- is **simple and light to install** with installation rates as high as 1,000 ft² per man hour
- the **coconut fiber base** assures effective rooting of the plants to the underlying growth media
- **minimal maintenance** requirements once established



• Special order product



• Individual Unit



• 2 ft² per Unit
• 125 Units per Pallet (250 ft²)

TECHNICAL DATA

Coir Fiber / Soil Base Thickness:

- ~1"

Tile Dimensions (W x L):

- 12" x 24"

Vegetation Height:

- Up to 3"

Tile Area:

- 2 ft²

Tile Weight (fully saturated):

- 3-4 lbs. / ft²

Vegetation Coverage:

- 95% (minimum)

Growers Choice Mix Sedum Varieties:

- Sedum acre 'Oktoberfest'
- Sedum floriferum 'Weihenstephaner Gold'
- Sedum foresterianum 'Silver Stone'
- Sedum kamtschaticum 'Variegatum'
- Sedum reflexum 'Blue Spruce'
- Sedum rupestre 'Angelina'
- Sedum spurium 'Fuldaglut'
- Sedum spurium 'Coccineum'
- Sedum spurium 'Summer Glory'
- Sedum hybridum 'Czar's Gold'
- Sedum spurium 'Voodoo'
- Sedum spurium 'Tricolor'
- Sedum hybridum 'immergrunchen'
- Sedum sexangulare
- Sedum sediforme

STANDARD INSPECTION CHAMBER

The Triangle Water Conduit System is designed for vegetative roofs requiring rapid water drainage and distribution. The Triangle Water Conduit System consists of:

- **ISC-FUA** - Standard Inspection Chamber
- **TWC-WLP** - Triangle Water Conduit Profile

Specific to this product, it:

- has **connection options** for one Triangle Water Conduit Profile on each side of the Standard Inspection Chamber
- **protects the outlets** from severe external effects
- incorporates **drainage slots on all sides** that retain growth media while allowing water to flow freely through
- is capped by an **easily removable cover** to allow access for inspection and for simple maintenance to remove any excess debris



Combi Inspection Chamber TKS Plus by

OPTIGRÜN
ROOF GREENING



LEED Credits available for:
• Materials & Resources (MR)



- Individual Unit
- Full Carton
- Full Pallet



- 6 Units per Carton
- 16 Cartons per Pallet (96 Units)

TECHNICAL DATA

Materials:

- UV Resistant Recycled ABS Plastic

Inspection Chamber Dimensions (W x L):

- 14.5" x 14.5" (shaft)
- 18.5" x 18.5" (base)

Inspection Chamber Height:

- 4.33" minimum
- Height adjustable in 4" segments
- Maximum Height of 32"

Inspection Chamber Weight:

- 5.3 lbs. / unit

Shaft Floor Opening:

- 11 3/4"

Water Discharge Capacity (each system):

- at 0% Slope = 17.91 gallons / minute
- at 1% Slope = 19.33 gallons / minute
- at 2% Slope = 19.65 gallons / minute
- at 3% Slope = 19.81 gallons / minute

*dependent on media type

Compressive Strength:

- 330 lbs.

Vegetated Roofing Use:

- Ancillary drainage component for use as a roof outlet inspection on vegetated roofs

Installation Requirements (Per 2,000 ft² area):

- (1) ISC-FUA Standard Inspection Chamber
- (30) TWC-WLP Triangle Water Conduit Profiles

PEDESTRIAN PAVING DRAINAGE MAT

Our Pedestrian Paving Drainage Mat is designed for drainage beneath accessible areas that do not need water storage and on vertical building components. Specific to this product, it:

- is a **composite drainage layer** consisting of a three-dimensional drainage core and a filter fabric
- includes a **filter fabric bonded to the core**, preventing intrusion of the overburden into the drainage channels
- **retains soil or sand particles** as well as freshly placed concrete allowing filtered water to pass through to the drainage core
- is typically used in areas necessitating a **moderate compressive strength material for drainage**, specifically for low load pedestrian accessibility for pavers, concrete or asphalt walkways, and patios



• Special order product



• Individual Roll
• Full Pallet



LEED Credits available for:
• Materials & Resources (MR)



• 200 ft² per Roll
• 7 Rolls per Pallet (1,400 ft²)

TECHNICAL DATA

Materials:

- Recycled HDPE, Polypropylene Thread

Material Thickness:

- 0.40"

Roll Dimensions (W x L):

- 4' x 50'

Roll Weight:

- 39 lbs.

Compressive Strength (ASTM D 1621):

- 15,000 lbs. / ft²

Drainage Core Flow (ASTM D 4716):

- 21 gal / min / ft

Filter Fabric Flow Rate (ASTM D 4491):

- 140 gal / min / ft²

CBR Puncture (ASTM D 6241):

- 250 lbs.

Grab Tensile (ASTM D 4632):

- 100 lbs.

Use:

- Drainage below insulation in inverted assemblies
- Pedestrian compressive strength grade drainage used below pathways or vegetated areas that do not need water storage

Installation Requirements:

- Peel fabric back two dimples and overlap two rows of dimples, snap in place.
- Fold fabric back over joint.
- Cover boards with overburden immediately to protect from UV rays & wind uplift

6" EXTENSIVE EDGE ELEMENT

Our 6" Extensive Edge Element is designed as a definite boundary between gravel / paver and growth media that allows the flow of water but not of the substrate. Specific to this product, it:

- utilizes a **"smooth slide" design** to make secure, invisible connections
- has **pre-fabricated corners** for ease of installation
- **prevents overly moist media conditions** around the perimeter or in transition areas of the roof thus preventing anaerobic growing conditions



Edge Trim ZP 150 A by

OPTIGRÜN®
ROOF GREENING



- Individual Length & Clip
- Full Section
- Full Pallet



- 8'-2" per Length & Clip
- 50 Lengths & Clips per Section (408'-4")
- 4 Sections per Pallet (1,633'-4")

TECHNICAL DATA

System Type:

- Monolithic / Contiguous / Modular

Materials:

- Aluminum

Material Thickness:

- 18 GA

Material Finish:

- Mill (natural aluminum)

Roof / Deck Slope Constraint:

- Up to 5° slope or 1:12 roof pitch

Water Permeability:

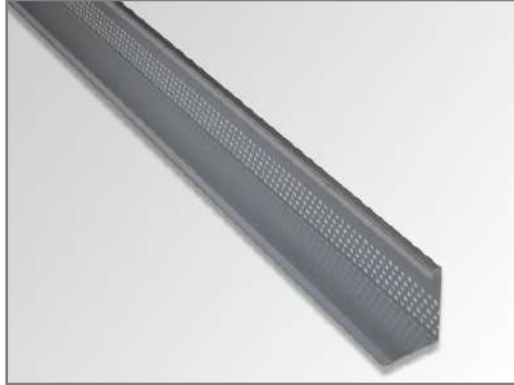
- Dependent on drainage/retention board chosen

Vegetated Roofing Use:

- Extensive vegetated roofs

Installation Requirements:

- Lay edge profile sections end to end on top of protective fleece, with foot of restraint toward vegetative portion of roof
- Slide Male Clips into Female Lengths
- Connect all components as shown on edging plan



Female Length [443-EDG-06F]

Dimensions (H x W x L): 6" x 4 1/2" x 8'-2"
Weight: 0.67 lbs. / LF



Male Clip [443-EDG-06M]

Dimensions (H x W x L): 5 3/4" x 4 1/4" x 5"



Corner [443-EDG-90]

Dimensions (H x W x L): 6" x 4 1/2" x 7 7/8" (each side)

TERRAPOR DR - DRAINAGE AGGREGATE

Our Drainage Aggregate is a granular drainage medium specifically designed for use as a filler substrate beneath our multi-layer green roof systems. We provide extensive, semi-intensive, & intensive blends of our Drainage Aggregate. Drainage Aggregate offers many advantages:

- most commonly used as a **pressure-resistant fill** within drainage boards
- an **excellent bedding material** for pavers as a maintenance path or patio
- **embedded drainage channels** may be used to transfer excess water quickly to roof drains or scuppers



LEED Credits available for:
• Materials & Resources (MR)



- 2 yd³ Supersack
- Bulk



- 2 yd³ Supersack
- Bulk

QUICK REFERENCE & SHIPPING DATA

Vegetated Roofing Use:

- Granular drainage layer

Coverage (1 yd³):

- at 3" = 108 ft²
- at 4" = 81 ft²
- at 6" = 54 ft²

Dry Weight (approximate):

- 40 lbs. / ft³

Saturated Weight (approximate):

- 52 lbs. / ft³
 - at 3" = 14.0 lbs. / ft²
 - at 4" = 17.33 lbs. / ft²
 - at 6" = 26.0 lbs. / ft²

Bulk Shipping Data:

- Bulk material weighs approximately 1,080 lbs. / yd³
- 32 - 34 yd³ in dump trailer, 22 - 24 yd³ in a tri-axle

2 yd³ Super Sacks:

- 2 yd³ Super Sacks weigh approximately 2,160 lbs.
- 15 - 16 2 yd³ Super Sacks / flatbed trailer

TECHNICAL DATA

<u>Grain Size Distribution:</u>	<u>mm</u>	<u>Inches</u>	<u>% of Dry Weight</u>
Passing 1/2" Sieve	12.50	0.50	95 - 100
Passing 3/8" Sieve	9.53	0.375	75 - 90
Passing 1/4" Sieve	6.35	0.25	30 - 45
Passing 1/8" Sieve	3.18	0.125	10 - 25
Passing #18 Sieve	1.00	0.039	0 - 15
Passing #60 Sieve	0.25	0.010	0 - 10
Passing #230 Sieve	0.06	0.002	0 - 5
<u>Density:</u>	<u>g / cm³</u>	<u>lbs. / ft³</u>	
Application Density	0.55 - 0.72	35 - 45	
Saturated Density	0.70 - 0.95	44 - 60	
<u>Water & Air Management:</u>	<u>% by Volume</u>	<u>in³ / ft³</u>	
Saturated Water Capacity	15 - 25	260 - 432	
Saturated Air Capacity	35 - 45	605 - 778	
<u>Pore Volume:</u>	<u>% by Volume</u>		
Total	50 - 75		
<u>pH, Lime, & Salt Content:</u>	<u>units</u>	<u>% as CaCO₃</u>	<u>mmhos / cm</u>
pH (in CaCl ₂)	6.0 - 8.5	-	-
Carbonate Content	-	< 2.5	-
Electrical Conductivity	-	-	< 2.5

[5000] BLU-SOLAR INSTALLATION GUIDELINES

1 PREPARATION

Ensure all roof surfaces are free of dirt, debris and incompatible materials.

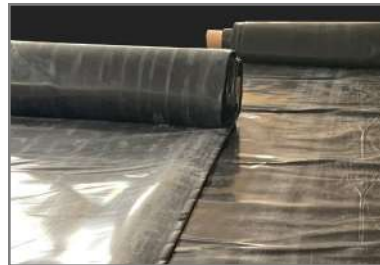


2 ROOT BARRIER

To prevent root damage to the waterproofing membrane, roll out root barrier over the entire green roof area, extending beyond green roof extents a minimum of 12" in all directions.

Install root barrier with a minimum of 12" side and end overlaps.

Turn up root barrier a minimum of 4" above finish elevation line at all vertical perimeters and projections.



3 PROTECTION FLEECE

To protect the waterproofing membrane, roll out protection fleece over the entire roof surface.

Install protection fleece with a minimum of 4" side and 12" end overlaps.

Turn up protection fleece a minimum of 4" above finish elevation line at all vertical perimeters and projections.

Wet fabric as necessary to provide short-term ballast. For long-term ballast, use sandbags or paver slabs. Never cut near the roofing membrane for installation. Only cut fabric using industrial shears, and never with a utility knife.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

4A BASE PLATES & DRAINAGE BOARD - FKD

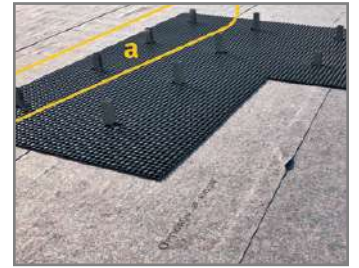
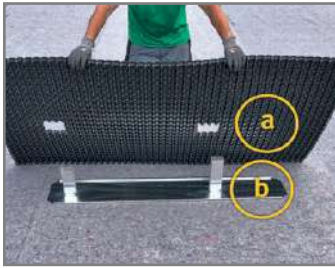
Place drainage board (a) above the base plate (b), making sure that the longer side of the drainage board is above the longer side of the base plate.

Distribute the first rows of base plates with drainage boards according to layout plan.

To achieve the correct spacing between base plates, drainage boards without base plates may have to be laid in-between.

Align base plates so that the support on the base plate without a notch (a, Fig. 4) points toward the specified solar direction.

For better orientation, it is recommended to first place rows along the transverse and longitudinal sides of the roof to form a right angle.



5A ADDITIONAL DRAINAGE BOARDS - FKD

Install drainage boards on top of protection fleece (and on top of edge element foot, if applicable) at green roof areas starting at roof drains and working towards higher elevations.

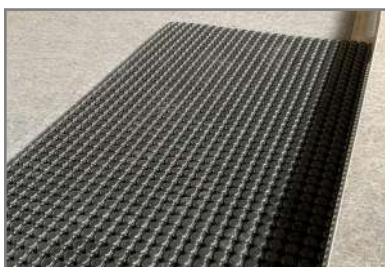
Wide corrugation peak must be facing upwards (FKD 25 must be visible from above).

Overlap drainage boards a minimum of 1-2 corrugations on both sides and ends.

If necessary, cut drainage boards with a circular saw for efficient use of material and to ensure crisp edges upon cutting. Always cut along valley between corrugations. Never use a utility knife or cut near the roof surface.

At roof drains, cut out the inside dimension of the inspection chamber in order to ensure optimum water discharge into the roof drain.

Drainage boards should be filled with overburden immediately after installation to protect from UV rays and wind uplift.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

4B BASE PLATES & DRAINAGE BOARD - WRB

Place unfolded drainage board with open side facing upwards above the base plate, making sure that the longer side of the drainage board is above the longer side of the base plate.

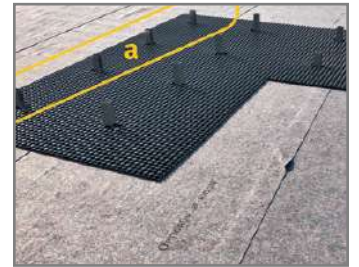
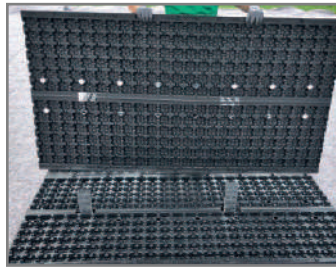
Then place another unfolded drainage board with the open side facing downwards on top of the previously placed drainage board and connect via the click-system on the long sides.

Insert (4) Capillary Wicks per drainage board to ensure vertical water transport between the drainage and vegetation levels.

Distribute the first rows of base plates with drainage boards according to layout plan. To achieve the correct spacing between base plates, drainage boards without base plates may have to be laid inbetween.

Align base plates so that the support on the base plate without a notch (a, Fig. 4) points toward the specified solar direction.

For better orientation, it is recommended to first place rows along the transverse and longitudinal sides of the roof to form a right angle.



5B ADDITIONAL DRAINAGE BOARDS - WRB

Install folded drainage boards on top of protection fleece (and on top of edge element foot, if applicable) at green roof areas starting at roof drains and working towards higher elevations.

Insert (2) Capillary Wicks per folded drainage board to ensure vertical water transport between the drainage and vegetation levels.

If necessary, cut drainage boards with a circular saw for efficient use of material and to ensure crisp edges upon cutting. Always cut along valley between corrugations. Never use a utility knife or cut near the roof surface.

At roof drains, cut out the inside dimension of the inspection chamber in order to ensure optimum water discharge into the roof drain.

Drainage boards should be covered immediately after installation to protect from UV rays and wind uplift.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

6 INSPECTION CHAMBER

If drainage board is installed adjacent to roof drains, inspection chamber is to be placed directly on top of drainage board.

If a drainage/ballast stone is to be installed, inspection chamber should be placed directly on the protection fleece, with the drainage/ballast stone abutting the outside walls.

For inverted roof assemblies, inspection chambers are placed on the thermal insulation. A separation ring is then installed and filled with gravel, thus forming the gravel strip surrounding the inspection chamber.



7 EDGE ELEMENTS

To separate green roof areas from hardscaping/aggregate areas without restricting roof drainage, install edge elements according to drawings.

Place edge element sections, connectors, and corners end to end on top of protection fleece, with foot of edge element toward vegetative portion of roof.

Slide connectors and corner components into edge profiles.



8 GRANULAR DRAINAGE MATERIAL

Spread granular drainage material to depths specified with no more than 1/2" variation.

Granular drainage material is to be placed carefully to avoid damage or displacement of other materials such as edge elements and drainage components.

Only use flat-edge plastic shovels and landscaping rakes for placement, movement, and leveling of granular drainage material. All other tools must be approved by manufacturer for use.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

9 FILTER FLEECE

To separate drainage from substrate layers, roll out filter fleece on top of granular drainage material as close as possible to the middle of the row of installed base plates.

Pierce the center of the outer edge of the U-shaped supports with scissors and make a cut approximately the same length as the support width.

Pull the cut fleece down over the support.

Install filter fleece with a minimum of 4" side and 12" end overlaps.

Turn up filter fleece a minimum of 4" above finish elevation line at all vertical perimeters and projections.

Wet fabric as necessary to provide short-term ballast. For long-term ballast, use sandbags or paver slabs. Never cut near the roofing membrane for installation. Only cut fabric using industrial shears, and never with a utility knife.



10 MOUNTING FRAMES

Insert mounting frame as far as it will go into the support on the base plate, making sure notch on mounting frame matches up with notch on base plate.

Secure mounting frame on both supports with the supplied shaft screws and cap nuts.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

11 MOUNTING RAILS

Latch the mounting rails into the rail fixings on the mountin frame and tighten the cylinder head screw on the rail fixings.

Leave the necessary overhang of the mounting rails at the end of the row according to layout plan. Loosen the threaded joints of the rail fixings if necessary before latching.

To form a row of rails, screw together the adjacent mounting rails without spacing using the supplied rail connector kit.

Mounting rails should only be assembled in a set of 4 due to thermal expansion. A distance of 2 cm (3/4") in every fifth connector is to be left between mounting rails.



12 WIND BRACING

Remove any protective film from wind bracing. Create one wind brace per row with two flat strips.

Connect two solar mounting frames in a row using the flat strips and the supplied stainless steel drilling screws, making a cross shape.

Use the drill holes provided for this purpose (a & b)

Cut off the overhanging parts of the wind bracing with an angle grinder.

On the long side of the mounting frame, there is an additional hole on the outside that can be used for installing lightning protection devices or cable ducts.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

13 GROWTH MEDIA

Spread growth media to depths specified with no more than 1/2" variation.

Growth media is to be placed carefully to avoid damage or displacement of other materials such as edge elements, filter fleece and drainage components.

Only use flat-edge plastic shovels and landscaping rakes for placement, movement, and leveling of growth media. All other tools must be approved by manufacturer for use.

Ensure that growth media does not get under the filter fleece, between filter fleece overlap, or into the drainage board cups. If this does occur, use a portable shop vacuum to make sure the debris is removed and placed appropriately.



14A SEED SOWING

Calibrate spreader.

Thoroughly wet growth media and distribute seeds throughout green roof area according to drawings and specified distribution rate.

Apply when temperature is between 35° F (2°C) and 89° F (32°C).

Seeds to be covered thinly with sand base. Do not cover with compost, only press seeds in gently.

Irrigate with a hand-sprayer or spray heads so that the seeds will not be washed away.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

14B SEDUM CUTTINGS

Thoroughly wet growth media and distribute sedum cuttings throughout green roof area according to drawings and specified distribution rate. Unless otherwise noted, the recommended distribution rate shall be 12 lbs/100 SF.

Apply when temperature is between 35° F (2°C) and 89° F (32°C).

If more than 24 hours has elapsed since installing and soaking the growth media, thoroughly re-soak growth media prior to commencing the broadcast distribution of sedum cuttings.



14C PERENNIAL PLUGS

Set plugs into growth media to their full depth and then press the growth media firmly around the installed plug according to approved landscape design.

If more than 24 hours has elapsed since installing and soaking the growth media, thoroughly re-soak growth media prior to commencing the planting of plugs.

If an erosion/wind netting is required, make cuts in the erosion/wind netting as required to insert the plugs.

At the end of each day of planting, soak those areas that have been newly planted.



14D SEDUM MAT / SOD

Thoroughly wet growth media and overlay pre-vegetated mats, making sure mats are tight together and maintaining good overall contact with growth media layer.

Pre-vegetated mats should be installed immediately after delivery, ideally on the same day. If that is not possible, they need to be unrolled and stored flat.

After all mats have been installed, thoroughly water entire roof.



[5000] BLU-SOLAR INSTALLATION GUIDELINES

15 FASTENING OF PV MODULES

Fix the PV modules to the mounting rails vertically (portrait) or horizontally (landscape) using module clamps.

Apply the first module at one end of a row. Align the module in the middle and at a right angle on the mounting rails.

Secure the module at the end of the mounting rails using two module end clamps and tighten it with 14 Nm of torque.

On the other side of the module, attach two module middle clamps and apply and align the next module.

Fasten the modules with the module middle clamps and tighten middle clamps with 14 Nm of torque.

Apply and fasten the whole row, based on the layout plan. The last module must be fixed once again with two module end clamps on the outer side.

BLU-SOLAR MAINTENANCE GUIDELINES

BLU-SOLAR DEFINITION AND STANDARD DISCLAIMER:

Sustainablu' Blu-Solar is an integrated Solar/Green Roofing System that collects runoff, on an approved roofing or waterproofing system. It provides a vegetated environment on a rooftop and/or plaza deck that can provide biodiversity, a reduction of the urban heat island effect and is specifically designed to manage stormwater volume and control runoff rate, i.e. stormwater retention and detention.

For Blu-Solar System to qualify for specified warranties, the system specifications and design must completely follow Sustainablu's Blu-Solar System design and installation criteria. Warranties from roofing/waterproofing manufacturers may additionally require Blu-Alert Constant Monitoring Leak Detection. Please check with specific Sustainablu partner roofing/waterproofing companies for warranty requirements. There are no exceptions to this disclaimer.

BLU-SOLAR OPERATIONS:

Sustainablu's Blu-Solar system on its own without Blu-Smart, passively manage stormwater volume and control runoff rate. As they are vegetated systems, their effectiveness is in direct relation to the health of the ecosystem, including the plantings. That said, it is important to adhere to the following owner responsibilities and maintenance recommendations to ensure best results.

OWNER'S RESPONSIBILITIES:

Controlled access to Blu-Solar System, for both approved maintenance and inspection personnel and other personnel is recommended. The monitoring of activities, related and unrelated to maintenance, helps to ensure that those with access do not negatively impact any parts of the Blu-Solar System. Such activities may include, but are not limited to the maintenance to rooftop equipment, damage from swing stages, use of any cleaning agents or other chemicals, etc.

No personnel should access the Blu-Solar System until they check in with Owner. Prior to access to the Blu-Solar System, owner should note in writing, the date and time that personnel access the roof.

MAINTENANCE ACTIVITIES

WEEDING:

Blu-Solar System requires weeding. Left unattended, weeds can attain heights that block solar panels, potentially reducing their efficiency. Additionally, weeds can choke out desirable plants and compete with desirable plants for nutrients and water. Because weeds can grow in small cracks, vegetative free zones as well as vegetated areas will require weeding, i.e. ballast stone perimeters. Wind and birds still carry weed seeds to rooftop locations. The roof typically has exposed media during the establishment period, making weeding particularly important until the roof is fully established.

To protect the waterproof membrane, do not use herbicides, pesticides or any other chemicals, that could negatively affect the roofing membrane or compromise any corresponding warranty. All chemicals must be approved by Sustainablu, LLC and the waterproofing manufacturer prior to application.

Once the vegetation is established, a vegetated roof typically needs to be weeded as infected. The Owner should inspect the roof monthly through the growing season in order to determine the exact number of required weedings. Blu-Solar System should be weeded more frequently if tree seedlings or any other species threaten the integrity of the roofing assembly. Pulling weeds when they are small maximizes the effectiveness of maintenance. If frequent observations of the roof condition are not practical, then the Owner should schedule more frequent weeding or hire a maintenance contractor with experience in vegetated roofing maintenance. At request, Sustainablu, LLC will provide contractors who specialize in such maintenance activities.

PLANT REPLACEMENT:

Some plant mortality is normal during the establishment period. Construction documents and warranties will state how much plant mortality is acceptable, the required plant cover and expected plant diversity shall be over the life of the vegetated roof. These documents will also state who is responsible for replacement of plants if a warranty is executed.

Areas with disappointing or sparse plant coverage or diversity can be remedied by harvesting cuttings, seed, or healthy plants from other areas of the roof and transplanting. Micro-climatic factors can have dramatic effects on plant success. Please refer to Warranty for specific plant replacement criteria for your project.

BLU-SOLAR MAINTENANCE GUIDELINES

IRRIGATION:

All vegetated roofs require irrigation during the establishment period. Overhead watering is required immediately after installing trees, shrubs, plugs, seed, or cuttings. Vegetated roofs with underground drip irrigation systems will need overhead watering until the roots have grown enough to reach water from the drip lines.

After the vegetation is well established, irrigation requirements will depend on the plant species chosen, project goals, and the water holding capacity of the vegetated roof growing medium and other components. If growing medium is installed to the proper depth, extensive vegetated roofs with drought tolerant vegetation do not need permanent irrigation.

Estimates of seasonal irrigation demand should be adjusted based on the regular field observation. Each maintenance visit should include a determination of moisture conditions at the bottom of the profile (usually the level of the filter fabric). During dry weather conditions, media on irrigated roofs should be moist and cool to the touch, but not saturated. Fabrics exposed at drains should be wet, but little or no water should be escaping at the drain.

VEGETATED ROOF MEDIA TESTING:

Every five (5) years, vegetated roof media testing is required to ensure vegetative roof media is in a condition to maximum plant vigor, while also minimizing nutrient leaching. Below are the standard nutrient parameters for FLL/ASTM approved vegetated roof medias:

Parameter	Vegetated Roofs
pH	6.5 to 7.8
Nitrate-N (mg/L)	1 to 4
Ammonium-N (mg/L)	0.1 to 0.8
Nitrogen (total) (mg/L)	2 to 8
Phosphorus (total) (mg/L)	2 to 10
Potassium (mg/L)	8 to 32
Calcium (mg/L)	100 to 300
Magnesium	10 to 80
Iron (mg/L)	8 to 32
Manganese	1 to 8
Boron (mg/L)	0.04 to 0.6
Sodium (mg/L)	<20
Zinc (mg/L)	1 to 10
Soluble salts (mmhos/cm)	0.4 to 1.2
Sodium Absorption Ratio (SAR)	<2

A certified soil test is required during the warranty period. It should be performed every 5 years as detailed below:

Every five (5) years a FLL/ASTM testing of a one-gallon sample of rooftop soil per each 10,000 square feet of vegetated roof area is required for extended warranties. The five-year test includes a soil analysis as shown above as well as granular distribution, water and air capacity, porosity and crushing value and cation exchange.

FERTILIZATION:

Vegetated roofs only need periodic fertilization when soil tests or plant health indicate a lack of nutrients. Fertilizing only when needed will also lessen weed growth and maintenance needs. When fertilizing a vegetated roof, use slow-release organic fertilizer in the spring. See soil tests below for guidance on determining whether fertilization is needed.

SPRING CLEANUP:

Remove dried vegetation using a scythe, trimmer, or weed whip prior to spring growth flush.

OTHER FACTORS TO CONSIDER FOR BLU-SOLAR MAINTENANCE PERIODS:

Ensure that activities not directly related to vegetated roof maintenance do not negatively impact vegetated roof vegetation, including but not limited to power washing, rooftop equipment maintenance, or use of cleaning agents and chemicals.

BLU-SOLAR MATERIALS LIMITED WARRANTY

The offer to sell Sustainablu, LLC products is expressly limited to acceptance of the warranty terms set forth in this LIMITED WARRANTY. By purchasing a Sustainablu, LLC product, you accept the LIMITED WARRANTY terms herein. THIS LIMITED WARRANTY AND REMEDIES HEREIN ARE EXCLUSIVE AND INSTEAD OF ALL OTHER WARRANTIES AND REMEDIES, WHETHER ORAL, WRITTEN, STATUTORY, LEGAL OR EQUITABLE, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AS WELL AS WARRANTIES AGAINST HIDDEN OR LATENT DEFECTS. ALL WARRANTIES ARE EXCLUDED EXCEPT THOSE EXPRESS WARRANTIES STATED ON THE FACE OF THIS LIMITED WARRANTY. REMEDIES FOR ANY BREACH OF THIS LIMITED WARRANTY ARE LIMITED TO SUSTAINABLU' ABSOLUTE OPTION TO REPAIR OR REPLACE THE DEFECTIVE PRODUCT AND THERE IS NO OTHER REMEDY AVAILABLE. SUSTAINABLU, LLC SHALL NOT BE LIABLE FOR DAMAGE TO PROPERTY BEYOND SUSTAINABLU' PRODUCT; AND, SUSTAINABLU, LLC IS NOT LIABLE FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES FOR ANY CLAIMS, INCLUDING BUT NOT LIMITED TO TORT, STRICT LIABILITY, STATUTORY, BREACH OF EXPRESS WARRANTY, BREACH OF IMPLIED WARRANTY, AND BREACH OF CONTRACT. NO PERSON IS AUTHORIZED TO MAKE ADDITIONAL STATEMENTS, PROMISES, GUARANTIES, WARRANTIES OR REPRESENTATIONS REGARDING PERFORMANCE OF SUSTAINABLU' PRODUCTS. Terms that are either additional to, conflicting with or different from those herein are excluded unless specifically agreed to in a separate writing and signed by a corporate officer of Sustainablu, LLC. This LIMITED WARRANTY is for the benefit of the original purchaser of the Sustainablu, LLC product who may transfer this LIMITED WARRANTY to the owner of the real estate where the warranted product is originally installed.

Blu-Solar products, aside of growing medias and vegetation, are intended to be in a protected environment from UV degradation. If protected from the harmful exposure of UV, products have the following limited warranties:

- Product Line x21 Root Barriers are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line x22 Protective / Retention Fleeces are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line x24 Filter Fleeces are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line x31, x32 & x33 Drainage products are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line x34 Drainage / Retention Boards are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line 35x Blu-Vault Drainage / Retention Boards are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line xx4x Edge Systems are warranted for (20) twenty years if properly installed according to project specifications.
- Product Line 5xxx Blu-Solar Systems are warranted for (20) twenty years if properly installed according to project specifications.

Blu-Solar growing medias require maintenance. If maintenance is conducted per Sustainablu's maintenance guidelines, growing medias have the following limited warranty:

- Product Line xx6x Growing Medias are warranted for (20) twenty years if properly installed according to project specifications.

Blu-Solar vegetations require maintenance. If maintenance is conducted per Sustainablu's maintenance guidelines, vegetations have the following limited warranty:

- Product Line 47x Vegetations are warranted for (20) twenty years if properly installed according to project specifications.

If any Sustainablu, LLC product fails to perform due to a defect in workmanship or materials within the applicable warranty period, then Sustainablu, LLC, at its sole option, will either repair or replace the defective product. The dollar amount of warranty coverage under this LIMITED WARRANTY shall not exceed the invoiced price for the defective product itself, excluding, installation, sales tax and freight. This LIMITED WARRANTY is void if the product is not maintained as recommended by Sustainablu, LLC. Sustainablu, LLC's warranty does not cover cosmetic scratches, dents, normal discoloration or fading. Due to inherent properties of concrete, wood and porcelain products, it is normal for variations in shading or color to be present in a finished product or occur over time due to sunlight exposure or other environmental factors and such variations in shading or color are not covered by this LIMITED WARRANTY. Sustainablu, LLC's LIMITED WARRANTY does not cover cracking, chipping or other damage caused by: (a) settling or other foundation movement or failures regardless whether caused by man-made or natural environmental (such as flood, hurricane, earthquake, lightning, fire, et al) and environmental conditions (such as air pollution, mold, mildew, et al), (b) Improper installation of Sustainablu, LLC's products and/or failure to abide by Sustainablu, LLC's installation guidelines, including but not limited to failure to install the tiles on a solid, flat surface or a surface that is not properly drained, (c) failure of non- Sustainablu, LLC products, (d) Use of Sustainablu, LLC's products in an application not recommended by Sustainablu, LLC's guidelines and local building codes, (e) Improper storage or handling after delivery, (f) Ordinary wear and tear, AND FOR ANY PRODUCT IN WHICH SUSTAINABLU, LLC HAS NOT BEEN PAID IN FULL (This will be based on Sustainablu, LLC's records). There is no warranty for damage caused by impact, neglect, and vandalism; acts of third parties or natural disaster. Alteration of product, floor or tiles voids this LIMITED WARRANTY. Installation of structures, fixtures or utilities on or through the product without prior written approval from Sustainablu voids this LIMITED WARRANTY.

It is not Sustainablu, LLC's responsibility to determine the effectiveness, fitness, suitability and safety of the Sustainablu LLC's products in connection with its use in any particular application. No person or entity is authorized by Sustainablu LLC to make any statement or representation as to the quality or performance of Sustainablu LLC products other than as contained in this warranty and Sustainablu LLC shall not be bound by any such statements or representations. This warranty may not be altered or amended except by means of a written document signed by both Sustainablu LLC and owner of said warranty. As a precondition to validate any warranty claim, purchaser must present written notice of a warranty claim to Sustainablu, LLC within 30 days after a warranty claim accrues or within 30 days after purchaser first notices an alleged defect, whichever is earlier. If purchaser or its installer believes a defect exists, do not install the product; instead, contact Sustainablu, LLC within 24 hours after notice of alleged defect and make a warranty claim to Sustainablu, LLC. While this LIMITED WARRANTY is in effect, Sustainablu, LLC and its agents shall have free access to inspect, test, repair or remedy the warranted product and Sustainablu shall have the first opportunity to remedy any alleged defect.

In any dispute as to the LIMITED WARRANTY or defective product, the purchaser or Owner making a claim (Claimant) has the burden of proving all elements under applicable law plus: (1) the product was installed according to applicable industry and project specifications, (2) the product was maintained according to applicable maintenance recommendations, and (3) the product was defective within the meaning of this LIMITED WARRANTY. In the event a civil action is filed, Sustainablu, LLC and Claimant shall attempt mediation facilitated by a mutually agreed upon neutral mediator before conducting formal discovery. At mediation, Sustainablu, LLC and Claimant shall each have a designated representative attend who has full authority to settle the civil action. Sustainablu, LLC and Claimant shall be responsible for their own attorney fees and any other expense associated with mediation as well as paying for an equal share of the mediator's fee. To obtain installation or maintenance recommendations, request information on extended warranties or make a warranty claim contact: Sustainablu, LLC, c/o Chief Financial Officer, by mail at 531 S. Water Street, Milwaukee, WI 53204.

This warranty shall only be applicable and enforceable in the United States of America and Canada.



SUSTAINABLU FOCUSES ON DESIGN INTEGRATION, PROJECT DELIVERY, AND PRODUCTS FOR ON STRUCTURE STORMWATER MANAGEMENT AND GREEN INFRASTRUCTURE. CAPABILITIES RANGE FROM **AMENITY DECKS, GREEN ROOFS, BLUE ROOFS, SOLAR ROOFS AND SMART LEAK DETECTION SYSTEMS**, PROVIDING THE MOST COMPLETE LINE FOR EFFECTIVE ON STRUCTURE STORMWATER MANAGEMENT SYSTEMS AND PRODUCTS AVAILABLE.

WITH ON-STAFF DESIGNERS AND A NETWORK OF LANDSCAPE ARCHITECTS, CONTRACTORS, ARCHITECTS, ENGINEERS, AND DEVELOPERS, SUSTAINABLU IS THE COMMON THREAD FROM IDEA CONCEPTION TO COMPLETION. THE COMPANY PROVIDES PRODUCTS FROM TOP VENDORS AROUND THE WORLD, TAILORING PRODUCTS TO EACH UNIQUE DESIGN. PRODUCT LINES OFFERED INCLUDE PAVER PEDESTALS, CONCRETE ROOF PAVERS, WOOD DECK TILES, PORCELAIN TILES, GREEN ROOFING SOLUTIONS, SMART DRAINS AND LEAK DETECTION SYSTEMS.

SUSTAINABLU HAS COMPLETED PROJECTS IN CITIES ACROSS NORTH AMERICA AND HAS REPRESENTATION AND WAREHOUSES THROUGHOUT THE UNITED STATES.

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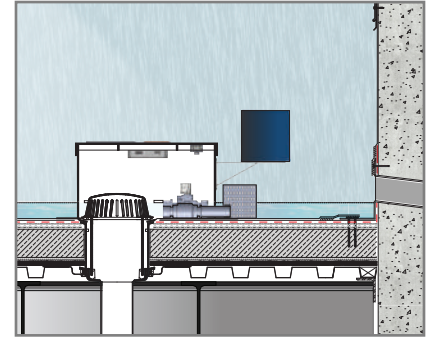
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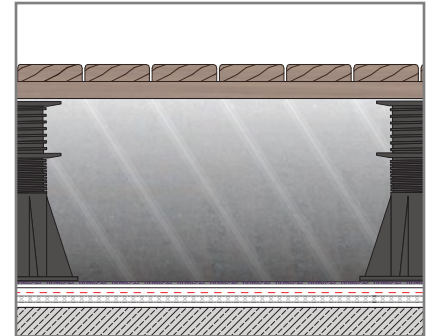
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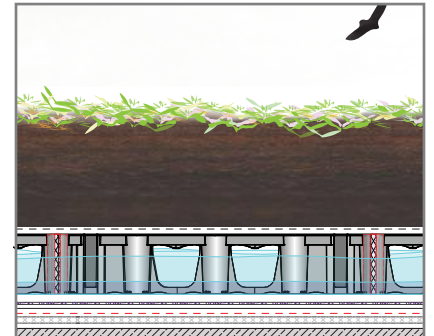
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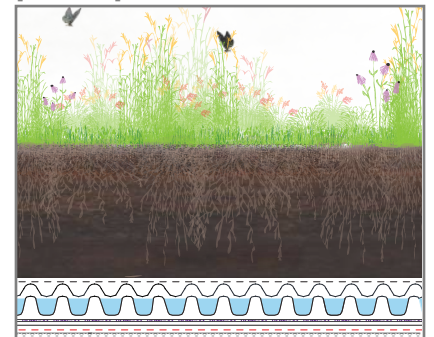
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BLU-GARDEN

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BLU-SOLAR

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