

BLU-GARDEN

Systems 400-600: Extensive Applications



SUSTAINABLU

ON STRUCTURE STORMWATER MANAGEMENT SYSTEMS

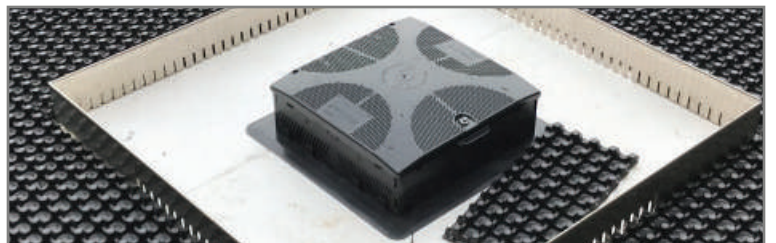
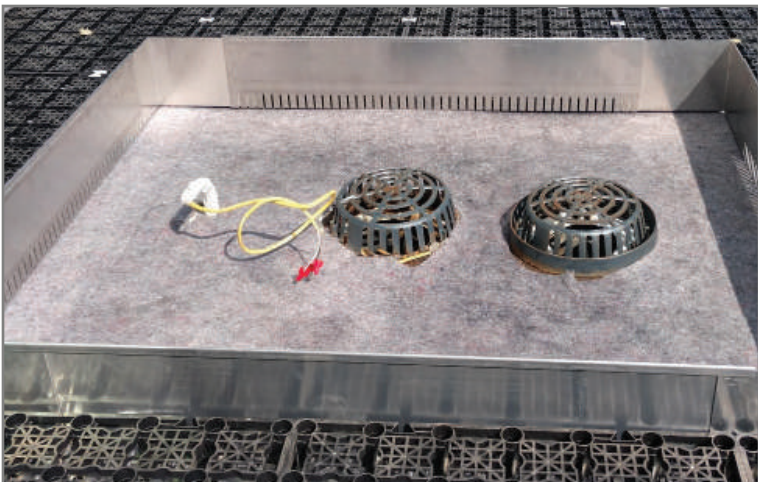


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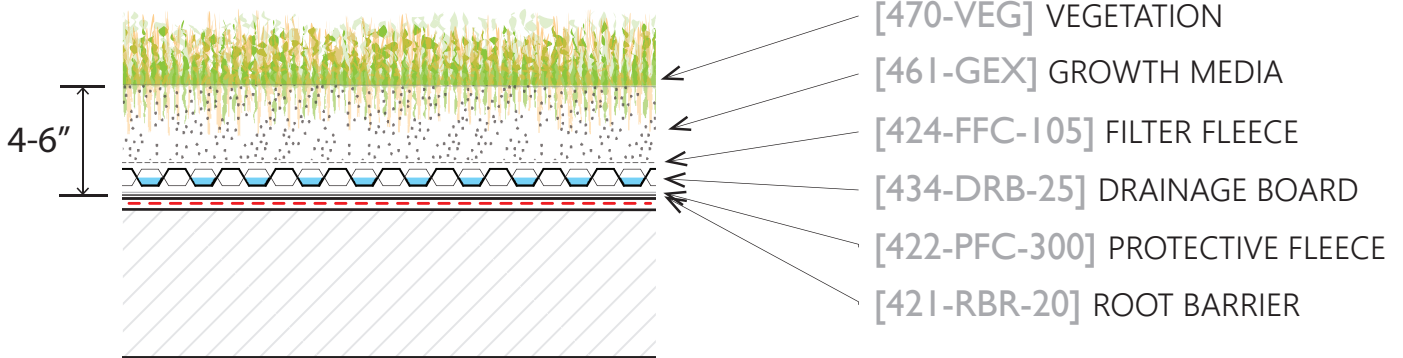
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BLU-GARDEN ASSEMBLIES - EXTENSIVE

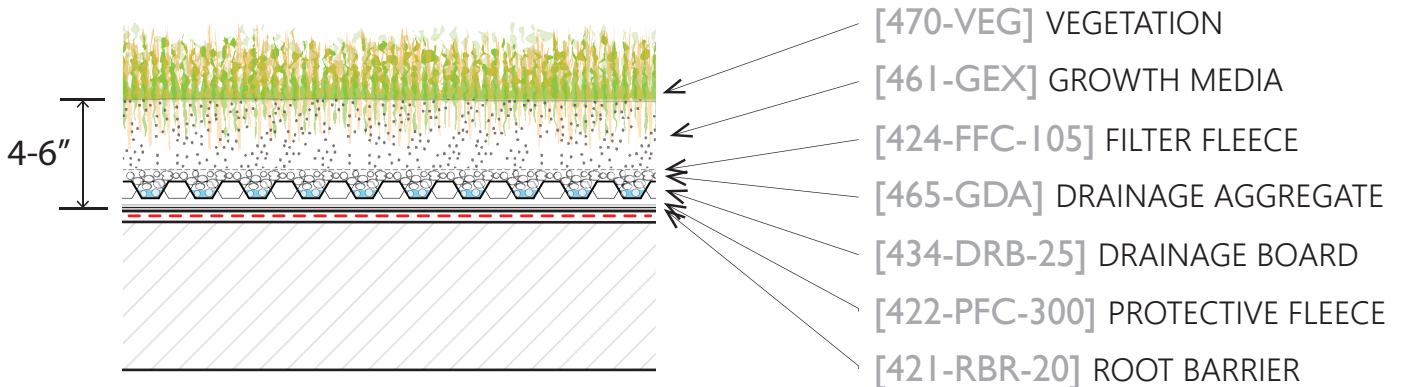
STORMWATER RETENTION
• 0.75 - 2.89 gallons / ft²

SATURATED WEIGHT
• 17 - 36 pounds / ft²

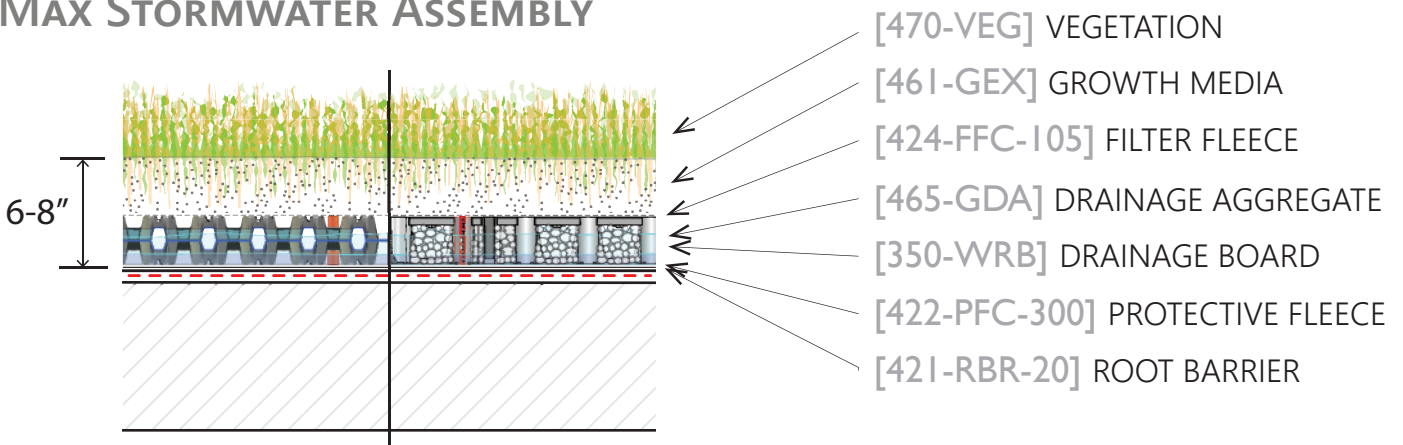
STANDARD ASSEMBLY



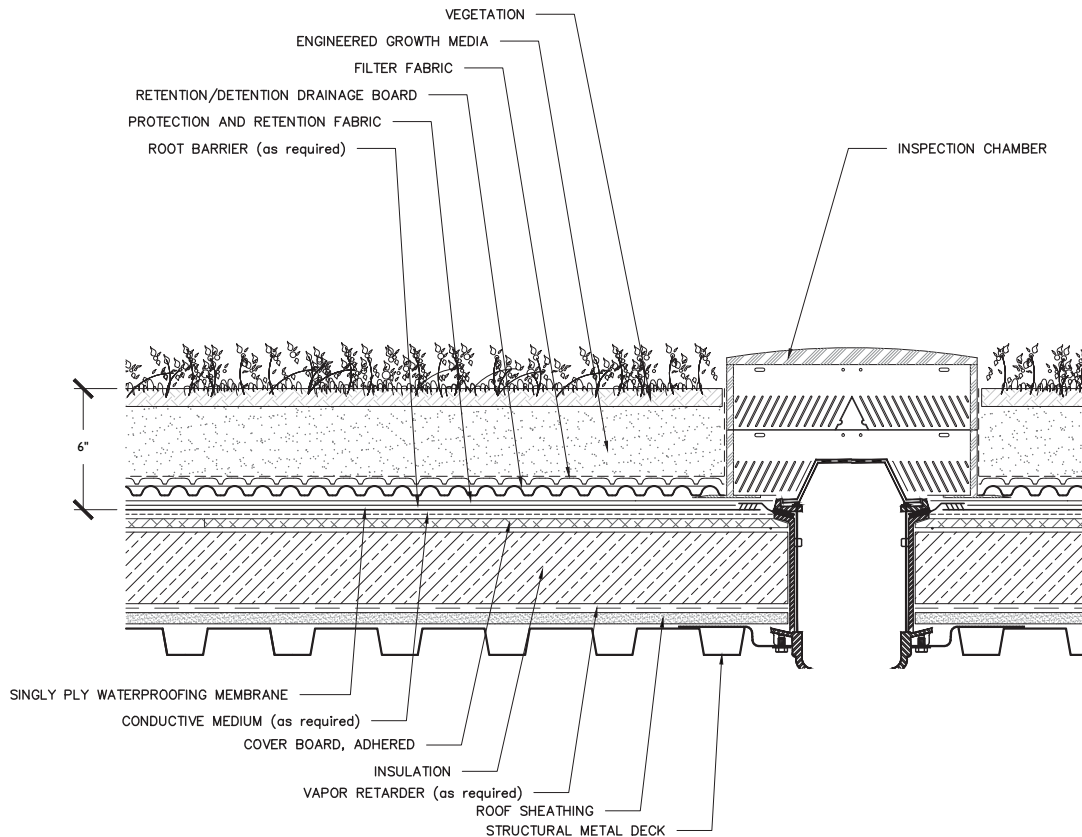
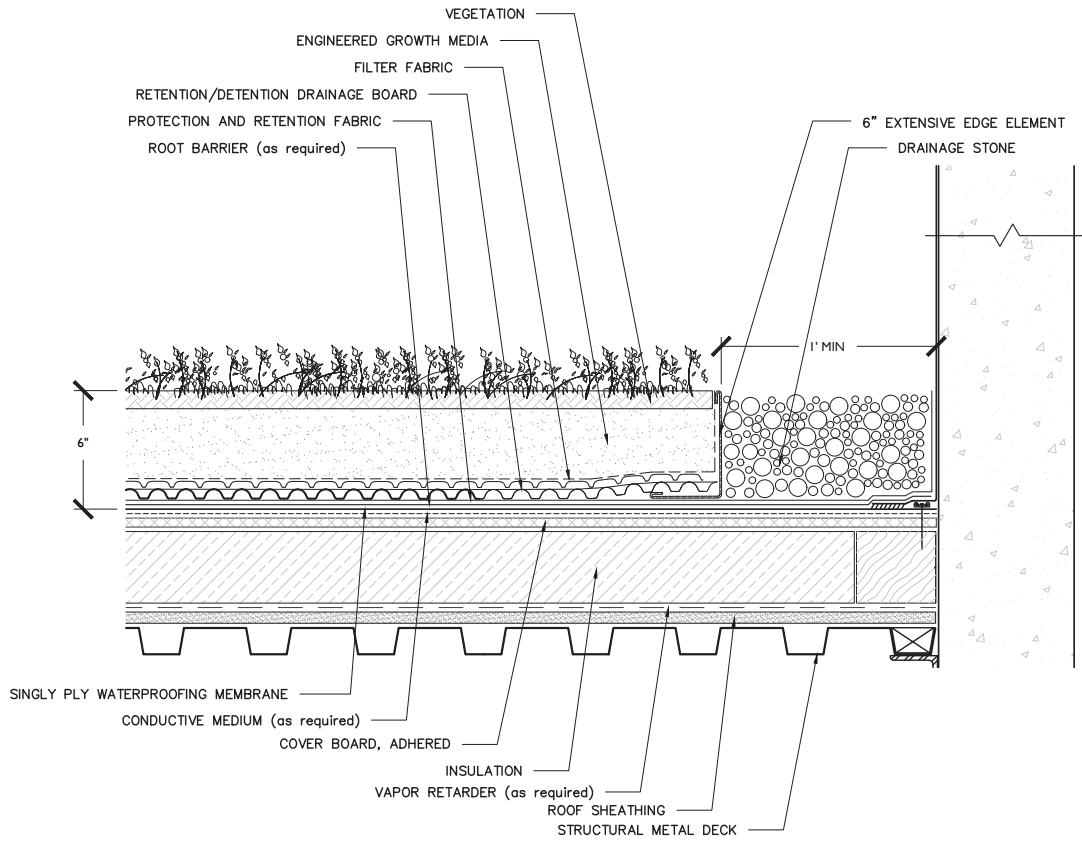
ENHANCED ASSEMBLY



MAX STORMWATER ASSEMBLY



TYPICAL WALL & DRAIN DETAILS





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



 • Special order product

 • Individual Roll
• Full Pallet

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



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

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"

EXTENSIVE PROTECTIVE FLEECE - 9 OZ

Our Extensive Protective Fleece is designed specifically for use within Extensive 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 Extensive roof system in mind to give the perfect **balance of water holding capacity and protection**



Protection and Storage Fleece RMS 300 by

OPTIGRÜN[®]
ROOF GREENING



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



- Individual Roll
- Full Pallet



- 1,076 ft² per Roll
- 6 Rolls per Pallet (6,456 ft²)

TECHNICAL DATA

Materials:

- Polypropylene, Polyester & Recycled Acrylic Thread

Material Thickness:

- 0.14", 9 oz.

Roll Dimensions (W x L):

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

Roll Diameter:

- 1' 5 3/4"

Roll Weight:

- 66 lbs.

Total Saturated Weight:

- 0.47 lbs. / ft²

Water Holding Capacity:

- 0.08 in³ / in² (0.049 gal / ft²)

Rot & Pathogen Resistant:

- Yes

Puncture Resistant:

- Yes

Vegetated Roofing Use:

- Blu-Garden Extensive systems

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



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

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



- 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:	mm	Inches	% of Dry Weight
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:	g / cm³	lbs. / ft³	
Application Density	0.64 - 0.80	40 - 50	
Saturated Density	1.08 - 1.29	68 - 81	
Dry Media		% of Total Weight	
		31 - 62	
Water & Air Management:	% by Volume	in³ / ft³	
Saturated Water Capacity	35 - 75	604 - 1295	
Saturated Air Capacity	> 10	> 173	
	cm / hour	inches / hour	
Saturated Hydraulic Conductivity	> 5.0	> 1.9	
pH, Lime, & Salt Content:	units	% as CaCO₃	mmhos / cm
pH (saturated paste)	6.0 - 8.5	-	-
Carbonate Content	-	< 2.5	-
Electrical Conductivity	-	-	< 2.5
Organics:	% of Dry Weight		
Organic Matter	6.0 - 8.5		
C/N Ratio	< 25:1		
Nutrients:	mg / l Saturated Extract	lbs. / 1,000 ft³	FLL Parameters lbs. / 1,000 ft³
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:	meg / 100g dw		
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, middendorfanum, 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**
- **100% free** of any weeds or pathogens



• 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
- **100% free** of any weeds or pathogens



• 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 100% weed and pathogen free 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
- **100% free** of any weeds or pathogens



• 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 100% weed and pathogen free 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
- **100% free** of any weeds or pathogens



• 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 100% weed and pathogen free 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
- **100% free** of any weeds or pathogens



• 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

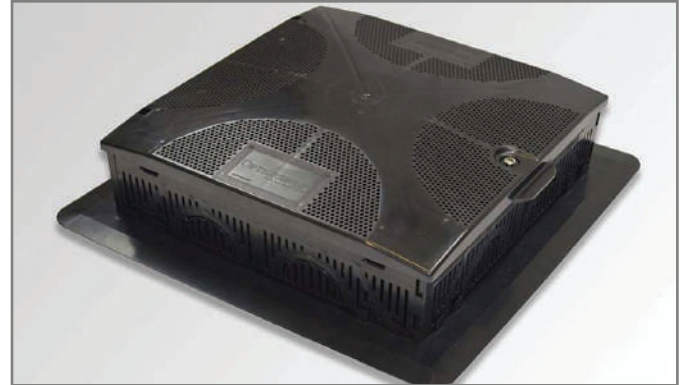
STANDARD INSPECTION CHAMBER

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

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



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

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

4" EXTENSIVE EDGE ELEMENT

Our 4" 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 100 A by



- 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:

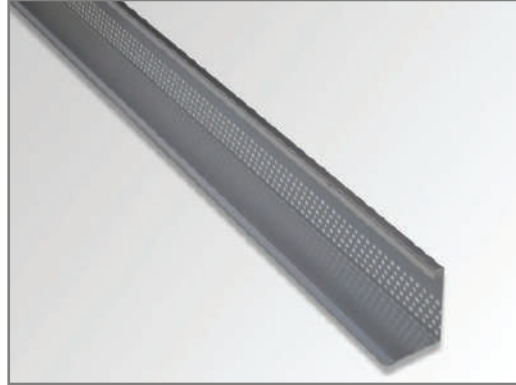
- Dependent on drainage/retention board chosen

Vegetated Roofing Use:

- Extensive vegetated roofs

Installation Requirements:

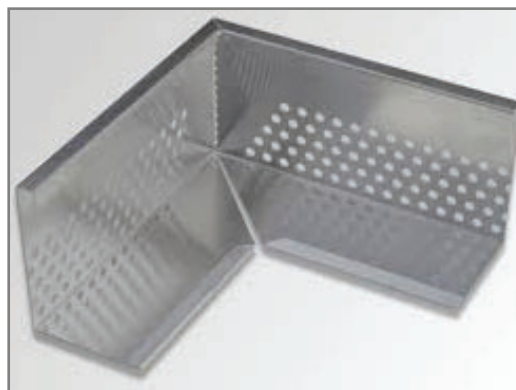
- Lay edge profile sections end to end on top of protective fleece, with foot of restraint toward vegetative portion of roof
- Slide Male Clips into Female Lengths
- Connect all components as shown on edging plan



Female Length [441-EDG-04F]
Dimensions (H x W x L): 4" x 3" x 8'-2"
Weight: 0.57 lbs. / LF



Male Clip [441-EDG-04M]
Dimensions (H x W x L): 3 3/4" x 2 3/4" x 5"



Corner [441-EDG-90]
Dimensions (H x W x L): 4" x 3" x 7 7/8" (each side)

5" EXTENSIVE EDGE ELEMENT

Our 5" 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 120 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:

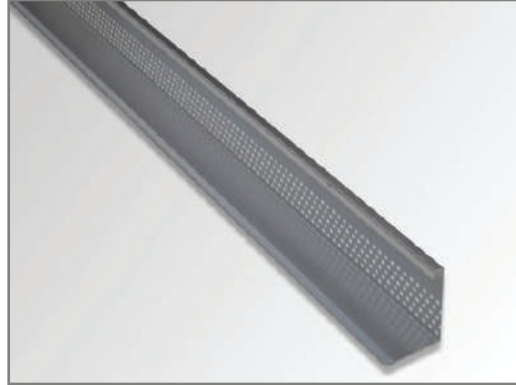
- Dependent on drainage/retention board chosen

Vegetated Roofing Use:

- Extensive vegetated roofs

Installation Requirements:

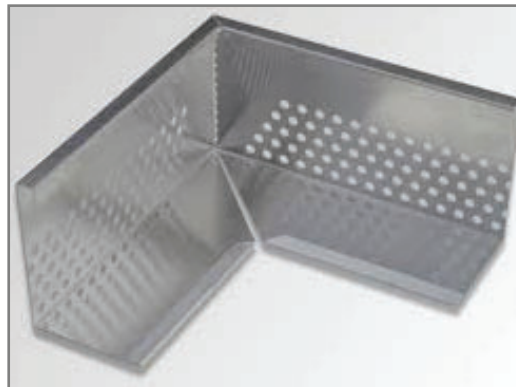
- Lay edge profile sections end to end on top of protective fleece, with foot of restraint toward vegetative portion of roof
- Slide Male Clips into Female Lengths
- Connect all components as shown on edging plan



Female Length [442-EDG-05F]
Dimensions (H x W x L): 5" x 5 1/2" x 8'-2"
Weight: 0.60 lbs. / LF



Male Clip [442-EDG-05M]
Dimensions (H x W x L): 4 3/4" x 5 1/4" x 5"



Corner [442-EDG-90]
Dimensions (H x W x L): 5" x 5 1/2" x 7 7/8" (each side)

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:

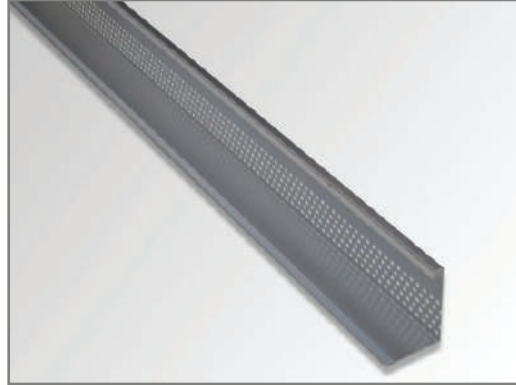
- Dependent on drainage/retention board chosen

Vegetated Roofing Use:

- Extensive vegetated roofs

Installation Requirements:

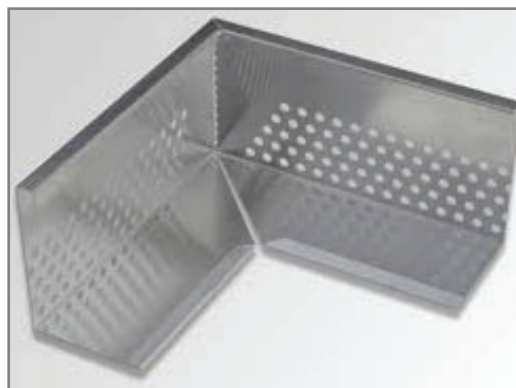
- Lay edge profile sections end to end on top of protective fleece, with foot of restraint toward vegetative portion of roof
- Slide Male Clips into Female Lengths
- Connect all components as shown on edging plan



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

Grain Size Distribution:	mm	Inches	% of Dry Weight
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

Density:	g / cm³	lbs. / ft³
Application Density	0.55 - 0.72	35 - 45
Saturated Density	0.70 - 0.95	44 - 60

Water & Air Management:	% by Volume	in³ / ft³
Saturated Water Capacity	15 - 25	260 - 432
Saturated Air Capacity	35 - 45	605 - 778

Pore Volume:	% by Volume
Total	50 - 75

pH, Lime, & Salt Content:	units	% as CaCO₃	mmhos / cm
pH (in CaCl ₂)	6.0 - 8.5	-	-
Carbonate Content	-	< 2.5	-
Electrical Conductivity	-	-	< 2.5



SUSTAINABLU
ON-STRUCTURE STORMWATER SYSTEMS

400-Series

Blu-Garden Extensive Vegetated Roof System
December 18, 2024

SECTION 07 33 63
BLU-GARDEN EXTENSIVE VEGETATED ROOF SYSTEM

PART 1 GENERAL

I) SUMMARY

- A) Furnish and install a completed Blu-Garden Vegetated Roof Assembly; including, but not limited to: root barrier, rot and pathogen protective fleece or, rot and pathogen resistant filter fabric, drainage and/or retention component, vegetated roof growing media and vegetation. This section should be completed in coordination with Section 07 72 00 Roof Accessories, {07-xx-xx **Applicable Waterproofing and Roofing Specifications**} and Section 07 59 00 Electronic Leak Detection (ELD), in order to maintain the system warranty.

**SPEC NOTE: Summary section to be modified on a job-by-job basis. Please contact Sustainable for specific details. Architect to reference related hardscape and leak detection section if applicable.*

II) RELATED TRADES

- A) Section 02 40 00 Demolition
- B) Section 03 30 00 Concrete
- C) Section 04 00 00 Masonry
- D) Section 06 00 00 Carpentry
- E) Section 06 15 20 Composite Synthetic and Other Decking
- F) Section 07 14 01 Instant Setting Fluid Applied Rubber
- G) Section 07 14 13 Hot Rubberized Asphalt Waterproofing
- H) Section 07 18 13 PMMA Liquid Applied Waterproofing
- I) Section 07 52 16 Modified Bitumen Roofing
- J) Section 07 53 23 EPDM Roofing
- K) Section 07 54 00 Fluid Applied Waterproofing
- L) Section 07 54 19 Thermoplastic Roofing
- M) Section 07 59 00 Electronic Leak Detection – High & Low Voltage
- N) Section 07 60 00 Sheet Metal
- O) Section 07 72 00 Roofing Accessories
- P) Section 07 76 00 Roof Paver and/or Tile on Pedestal System
- Q) Section 07 90 00 Caulking & Sealants
- R) Section 22 14 16 Roof Drains
- S) Section 26 05 19 Low Voltage Electrical
- T) Section 32 84 00 Landscape Irrigation
- U) Section 32 90 00 Landscaping

III) REFERENCES

- A) ANSI: American National Standards Institute www.ansi.org
- B) ANLA: American Nursery and Landscape Association www.anla.org
- C) ASTM: American Society of Testing Materials www.astm.org
- D) EN-ISO: International Organization for Standardization
- E) FLL (German): Guidelines for the Planning, Execution and Upkeep of Green-roof sites
- F) MSA: Methods of Soil Analysis, American Society of Agronomy
- G) RCSTP: Recommended Chemical Soil Testing Procedures
- H) TMECC: Test Methods for the Examination of Composting and Compost
- I) OSHA: Occupational Safety and Health Administration

- J) Factory Mutual Insurance Co. 1-35 Green Roof Systems
- K) USGBC: US Green Building Council,
 - 1) Leadership in Energy and Environmental Design LEED Reference Guide, Version 3.0
 - 2) USGBC Project Calculation Spreadsheet. www.usgbc.org.
- L) Sustainable Sites Initiative
 - 1) SITES Rating System, version 2
 - 2) SITES v2 Rating Scorecard, www.sustainablesites.org

IV) DEFINITIONS

- A) Biological Soil Fertility Amendments: Bio-stimulants and bio-fertilizers used to stimulate and feed microorganism populations and increase biological function of the Blu-Garden Vegetated Roof Assembly.
- B) Captured Water: Water that is retained in the drainage layer of a Blu-Garden Vegetated Roof Assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.
- C) Finish Elevation: Elevation of finished growing media surface of planting area.
- D) Planting Area: Areas to be planted.
- E) Plant, Plants, Plant Material: Vegetation in general, ornamental grasses, or herbaceous vegetation.
- F) Growth Media: Lightweight soil mixture that promotes good growing conditions for specific varieties of plants.
- G) System Provider: Sustainablu, LLC
- H) Blu-Garden Vegetated Roof Assembly Installer: A pre-certified installer with appropriate experience approved by the System Provider to maintain warranty.
- I) Maintenance Contractor: The pre-approved entity contracted by building owner to ensure maintenance on the system is carried out through specified timeframe.

V) QUALIFICATIONS

- A) Only a contractor approved and licensed by the System Provider shall install the Blu-Garden Vegetated Roof Assembly components. An independent laboratory may test materials for compliance with published physical properties and these specifications.

VI) SUBMITTALS

- A) Completed Dead Load Worksheet for each Vegetated Roof System profile (ASTM E2397)
 - 1) Submit System Provider's written approval or license for contractors for Blu-Garden Vegetated Roof Assembly,
- B) Submit most recent copy of System Provider's literature applicable to products and specifications to be used, as specified herein,
- C) Product Data Sheets: For each component within the Blu-Garden Vegetated Roof Assembly
- D) Samples for Verification on request: For each of the following components of Blu-Garden Vegetated Roof Assembly:
 - 1) Submit three sheet samples approximately 6 x 6 inches or alternately 3 units that are representative of the following products:
 - (a) Root Barrier
 - (b) Protection Fleece
 - (c) Drainage/Retention Board
 - (d) Filter Fleece
 - (e) Edge Element

- 2) Growth Media: 1-quart volume of each growth media specified, in sealed plastic bags labeled with content and source. Each sample shall be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
- E) Product Test Reports on request: For each growth media, including complete analysis coordinated and approved through Sustainablu's approved testing facility, demonstrating compliance with specified requirements.
- F) Warranty: Sample of [5] [10] [15] [20] year warranty from the System Provider.
**SPEC NOTE: Choose one, or contact Sustainablu for extended warranty options.*

VII) QUALITY ASSURANCE

- A) Blu-Garden Vegetated Roof Assembly Installer Qualifications: A qualified assembly Installer approved, authorized, or licensed by Sustainablu, whose work has resulted in successful establishment of vegetated roofs.
 - 1) Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2) Provide a list of at least 3 projects, satisfactorily completed within the past 5 years, of similar scope and complexity to this project.
 - 3) Installer must provide at time of proposal submittal a general liability insurance certificate showing \$1,000,000 in coverage.
- B) Source Limitations: All Blu-Garden Vegetated Roof Assembly components including but not limited to growth media, walkway pavers and accessories are to be sourced or approved by the System Provider.
- C) Pre-installation Conference: Conduct conference at project site.
 - 1) After award of Contract and prior to the commencement of the Work of this Section, schedule and conduct meeting to discuss the Work of this Section and to coordinate with related work. Coordinate with pre-construction meeting specified in Section (xxxxxx). Convene pre-construction meeting to comply with requirements of Division 1 and as follows:
 - (a) General Contractor to notify all attendees at least two weeks prior to the conference.
 - (b) Require attendance of parties directly affecting Work of this Section, including, but not limited to: Owner, Contractor, Architect, System Provider, System Installer, Roofing Membrane Provider, Roofing Membrane Installer and Plumbing Installers.
 - (c) Review methods and procedures related to installation and operation of Work of this Section, including coordination with related Work.
 - (d) Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

VIII) DELIVERY, STORAGE, AND HANDLING

- A) Packaged Materials:
 - 1) Contractor to designate Project Coordinator to be responsible for coordinating all shipments with the System Provider, Project Coordinator to alert System Provider a minimum of 3 weeks prior to delivery to ensure availability of product, additional lead time may be required for certain products or plantings, reference System Provider's Terms and Conditions for exact lead times.
 - 2) Store materials under cover and elevated above ground, out of direct sunlight.
 - 3) Store roll material lying down and on pallets. Fully protect from moisture and direct sunlight exposure.
 - 4) Remove damaged material from job site. Report and replace damage materials.

- 5) Plant materials must be watched carefully. Watering the plants can be necessary during a long storage period. Ensure plants are properly ventilated to prevent overheating. Planting materials are to be installed within twenty-four hours from the time that they are received on the project site and may not remain stacked on a pallet for more than 2 hours.
 - 6) When storing materials on the roof be sure that the load of the materials does not exceed the load of the structure. Coordinate with architect and general contractor on structural allowances for placing pallets on the roof and ensure crane is appropriately sized to reach designated areas of the roof.
 - 7) Store materials in dry, protected areas in an upright position. Control temperature of storage areas in accordance with Manufacturer's instructions. Protect moisture sensitive materials with breathable tarps on sides and top surfaces.
- B) Bulk Materials:
- 1) Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
 - 2) Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3) Accompany each delivery of bulk materials with product certificates.

IX) PROJECT CONDITIONS

- A) Codes/Regulations
- 1) Follow local, state and federal regulations, safety standards and codes. When a conflict exists use the stricter requirement.
- B) Weather Limitations
- 1) Wind speeds are not to exceed 40 mph.
 - 2) Low visibility
- C) Planting Limitations
- 1) Soil must not be frozen.
 - 2) Soil temperature must be over 36° F for 72 hours.
 - 3) Do not install vegetation above 96° F.
 - 4) Consider appropriate protection against weather extremes for 1 week.

X) WARRANTY

- A) The System Provider shall furnish its standard [5] [10] [15] [20] warranty for all Blu-Garden Vegetated Roof Assembly components supplied.

**SPEC NOTE: Choose one, or contact Sustainablu for either applicator only or extended warranty options.*

- B) Warranty for Plant Growth: Installer agrees to submit growers' product guarantee. Installer and owner agree to adhere to Sustainablu's maintenance plan regarding repair or replace plantings within a specified establishment warranty period after installation of vegetation. Establishment warranty shall be defined as: 2 months after vegetation installation, or otherwise known as substantial completion.
- 1) Start Date: If chosen, the start date of the warranty for plant growth shall be the substantial date of completion of Blu-Garden Vegetated Roof Assembly.
 - 2) Coverage: Labor and Plantings
 - 3) Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse or incidents that are beyond contractor's control including, but not limited to, damage caused by other trades or foot traffic caused by others.
 - (a) Visual failure will be determined by no more than 1 square foot of area within a 10 square foot area.

- (i) For Sedum Mat / Sod, diversity shall be a minimum of 4 species per 10 square foot area.
- 4) Minimum Foliage Cover: Planted materials shall grow to achieve and maintain at least:
 - (a) 50 percent foliage cover over planting area commencing 12 months after planting, through the duration of this warranty.
 - (b) 80 percent foliage cover over planting area commencing 24 months after planting, through the duration of this warranty.
- 5) Include the following remedial actions as a minimum:
 - (a) Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - (b) Installation time of replacement planting(s) to be completed by installer, at their discretion in relation to weather, by no longer than 12 months from removal of dead vegetation.
 - (c) If the death of 25 percent or greater of plant materials installed occurs at a single time that is not related to an act of God or owner negligence, Sustainablu is to provide owner and installer a remediation plan to remedy the situation.
 - (d) Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - (i) A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

XI) BIDDING REQUIREMENTS

- A) Pre-Bid Meeting: A pre-bid meeting shall be held with the Owner's Representative and involved trades to discuss all aspects of the project. The Applicator's field representative or roofing foreman for the work shall be in attendance. Procedures to avoid rooftop damage by other trades shall be determined.
- B) Site Visit: Bidders shall visit the site and carefully examine the areas in question as to conditions that may affect proper execution of the work. All dimensions and quantities shall be determined or verified by the contractor. No claims for extra costs will be allowed because of lack of full knowledge of the existing conditions unless agreed to in advance with the Owner or Owner's Representative.

XII) MAINTENANCE SERVICE

- A) Initial Maintenance Service: Provide maintenance by skilled employees of Blu-Garden Vegetated Roof Assembly Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but not for less than the following maintenance period:
 - 1) Initial maintenance period: [30][60][90] days from date of Planting Completion.

**SPEC NOTE: Choose time based on project schedule. The length of time should be as minimal as possible to ensure project has a committed maintenance team working on project. For greater times than 90 days, please contact Sustainablu.*
- B) Continuing Maintenance Proposal: From Blu-Garden Vegetated Roof Assembly Installer to Owner, provide a minimum of 24-month maintenance plan meeting Sustainablu's maintenance requirements.
 - 1) Maintenance Period: 24 months from date of Planting Completion.

PART 2 PRODUCTS

I) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Basis of Design: Sustainablu, <http://www.sustainablu.us>

- B) All products and services shall be approved/procured through the system provider, Sustainability, in order to ensure integrity of the system and maintain system warranty.

II) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Root Barrier: To prevent root penetration into the waterproof membrane. **(AS REQUIRED BY ROOFING/WATERPROOFING TYPE)**
- 1) Type: 20 Mil LDPE Root Barrier [421-RBR-20]
 - (a) Properties: 20 MIL LLDPE Root Barrier
 - (b) Weight: 10 lbs/100 ft²
- B) Protective / Retention Fleece: To protect membrane from paver pedestals and Blu-Garden Vegetated Roof Assembly.
- 1) Type: Extensive Protective Fleece [422-PFC-300]
 - (a) Properties: 9 oz Polypropylene, Polyester and Recycled Acrylic Thread
 - (b) Water Holding Capacity: 11.52 in³/ft²
 - (c) Total Saturated Weight: 0.47 lbs/ft²
- C) Drainage / Retention Board: To provide stormwater retention while simultaneously allowing for continuous drainage.
- 1) Type: Extensive 1" Drainage/Retention Board [434-DRB-25]
 - (a) Properties: High-density polyethylene, double sided form of interlocking cups with depth 1". Perforated holes on top surface for continuous aeration. High load bearing capacity, excellent water retention, passive distribution and drainage properties.
 - (b) Water Holding Capacity: 28.8 in³/ft²
 - (c) Compressive Strength: 23.35 lbs/in² (unfilled), 25.38 lbs/in² (filled)
- D) Granular Drainage Material:
- 1) Type: TerraPor DR - Drainage Aggregate [465-GDA]
 - (a) Granular drainage medium designed for use as a filler substrate beneath multi-layer green roof systems capable of enhancing the compressive strength of the drainage/ water retention panel, a bedding material for pavers as a maintenance path/ patio, and embedded drainage channels may be used to transfer excess water quickly to roof drains or scuppers.
- E) Filter Fleece: Filter separation layer between drainage and substrate layers.
- 1) Type: Extensive Filter Fleece [424-FFC-105]
 - (a) Properties: 4.5 oz system filter, rot and pathogen resistant, non-woven, polymeric, geotextile fabric.
 - (b) Tensile Strength: 1.08 lbs/in²
 - (c) Total Saturated Weight: 0.02 lbs/ft²
- F) Edge Elements: Self-supporting vertical separation between paver and growing media.
- 1) Type: 4" Extensive Edge Element [441-EDG-04O]
 - (a) Properties: L-shaped self-supporting 18 GA Aluminum with perforations along the manifold for continuous drainage. Male & female pieces allow for ease in installation and minimize cutting. Inside and outside corners also manufactured to create seamless corners.
 - (b) Size: 4" height x 3" flange x 8'-2" sections.
- G) Inspection Chamber: Control shaft for use as roof outlet inspection units.
- 1) Type: Standard Inspection Chamber [431-ISC-FUA]
 - (a) Properties: UV Resistant ABS Plastic with inlet slots in shaft walls and cover.
 - (b) Size: 14 1/2" x 14 1/2" x 4"
 - (c) Components: Includes a lockable lid and stainless-steel filter to prevent debris from entering the drainage system.
 - (d) Extenders available in increments of 4" to achieve desired height.

- H) Growth Media: Vegetated roof assembly supplier's lightweight, custom manufactured soil mixture designed for project location, stormwater retention and/or detention requirements and plant pallet.
- 1) Type: TerraPor EX - Extensive Growth Media [461-GEX]
 - (a) Properties: Formulated growth media to meet European FLL Guidelines for particle size gradation, dry vs saturated bulk density, porosity, water retention hydraulic conductivity, pH balance and organic matter content and all requirements for stormwater retention and/or detention.
 - I) Vegetation
 - 1) Vegetated Roof Seeds
 - (a) Type: Vegetated Roof Seed [471-VSE]
 - (i) Seeds are mixed with sand for an even sowing.
 - (i) Product comes in 25lb bags
 - (ii) Product may be stored for up to ninety (90) days in a temperate environment
 1. 55° – 75° F
 - (ii) Seed Mix Varieties:
 - (i) Basic Sedum Mix [471-VSE-BSC]
 - (ii) Premium Sedum Mix [471-VSE-PRM]
 - (iii) Extensive Perennial Mix [471-VSE-CSM]
 - (iv) Ornamental Grass & Perennial Mix [471-VSE-LGM]
 - 2) Mixed Sedum Cuttings
 - (a) Type: Sedum Cuttings [472-CUT]
 - (i) Sedum Cuttings shall be harvested from healthy, vigorous plants while in a vegetative growth mode and shall range in length from ½" to 3" and possess enough rooting nodes to allow for rapid root development once sown.
 - (ii) Sedum Cuttings shall be harvested, cooled and dried for 24 hours prior to boxing for shipment and delivered in an insulated box with enclosed ice packs to ensure the cuttings remain cool until they are delivered.
 - (iii) Storage of cuttings on project site shall be no longer than 2 days and temperatures shall not exceed 70° F where cuttings are stored.
 - (iv) Available cutting varieties (subject to availability, please contact Sustainable for availabilities):
 - (i) Sedum acre 'Aurea'
 - (ii) Sedum album 'Coral Carpet' & 'Green Ice'
 - (iii) Sedum caucolicum
 - (iv) Sedum divergens
 - (v) Sedum hispanicum 'Purple Form'
 - (vi) Sedum hybridum 'Immergrunchen'
 - (vii) Sedum kamtschaticum 'Variegatum', & 'Weihenstephaner Gold'
 - (viii) Sedum middendorffianum diffusum
 - (ix) Sedum pachyclados
 - (x) Sedum reflexum 'Blue Spruce' & 'Green Spruce'
 - (xi) Sedum rupestre 'Angelina'
 - (xii) Sedum sexangulare
 - (xiii) Sedum spurium 'Album Superbum', 'Dragon's Blood', 'Fuldaglut', 'John Creech', 'Red Carpet', 'Summer Glory', 'Tricolor', & 'Voodoo'
 - (xiv) Sedum stefco
 - (xv) Sedum takesimensis 'Golden Carpet'
 - (xvi) Sedum tetractinum 'Coral Reef'
 - (v) Sedum Cuttings shall be provided in the aforementioned varieties and pounds.

**SPEC NOTE: Sustainable recommends 12 lbs/100 SF for application to attain 85% coverage in 3 years.*

- (vi) Contact System Provider for available and/or In-Season varieties.
- 3) Perennial Plugs
 - (a) Type: Perennial Plugs [473-PPP]
 - (i) Perennial Plugs shall be healthy vigorous plants that will provide rapid root development.
 - (ii) Perennial Plugs shall be delivered in the following means to ensure plants are healthy at receipt of materials:
 - (i) For air shipment, an insulated box with enclosed ice packs to ensure the perennial plugs remain cool and temperate until they are delivered.
 - (ii) For local shipment, all trucks need to be vented and/or plants must be in protected conditions that moderates temperatures from 40°F-85°F during shipment. Shipments of greater than four hours shall require air shipping standards.
 - (iii) Contact System Provider for available and/or In-Season varieties. Reference Sustainable's website for commonly available plantings.
- 4) Fully Vegetated Sedum Mat
 - (a) Type: Fully Vegetated Sedum Mat [474-SMT]
 - (i) Sedum Mats are planted with 5 to 8 different species of Sedum, each mix compiled to suit every particular climate.
 - (ii) Sedum Mats shall consist of 5-8 of the following:
 - (i) Sedum spurium 'Fuldaglut'
 - (ii) Sedum spurium 'John Creech'
 - (iii) Sedum spurium 'Red Carpet'
 - (iv) Sedum kamtschaticum
 - (v) Sedum kamtschaticum 'Variegatum'
 - (vi) Sedum takesimensis 'Golden Carpet'
 - (vii) Sedum acre 'Aureum'
 - (viii) Sedum acre 'Gold Moss'
 - (ix) Sedum album 'Coral Carpet'
 - (x) Sedum album 'Murale'
 - (xi) Sedum stefco
 - (xii) Sedum floriferum 'Weihenstephaner Gold'
 - (xiii) Sedum hispanicum
 - (xiv) Sedum reflexum 'Blue Spruce'
 - (xv) Sedum rupestre 'Angelina'
 - (xvi) Sedum sexangulare
 - (xvii) Sedum x immergrunchen
 - (iii) Properties: Made up of coconut fiber base filled with a planting substrate, and pre-cultivated with a layer of low-profile, drought-tolerant vegetation adapted to rooftop conditions.
 - (iv) Size: Mats come in rolls of 4' x 6'-3" (25 ft² per roll)
- 5) Fully Vegetated Sedum Sod
 - (a) Type: Fully Vegetated Sedum Sod
 - (i) Four Season Mix [475-SMM-FOU]
 - (i) Properties: A blend of Sedums that provide flowers throughout the growing season. Winter interest and seasonal foliage color changes are also found in this group. This is a good, general purpose mix that provides year-round roof top beauty.
 - (ii) Four Season Mix Sedum Sod shall consist of at least 12 of the following:
 - 1. Sedum Kamtschaticum
 - 2. Sedum Spurium 'Dragons Blood'
 - 3. Sedum Acre 'Oktoberfest'

4. Sedum Album
 5. Sedum Stoloniferum
 6. Sedum Ellacombanium
 7. Sedum Floriferum 'Weihenstephaner Gold'
 8. Sedum Spurium 'Voodoo'
 9. Sedum Foresterianum 'Silver Stone'
 10. Sedum Hybridum 'Czar's Gold'
 11. Sedum Spurium 'Summer Glory'
 12. Sedum Sexangulare
 13. Sedum Reflexum 'Blue Spruce'
 14. Sedum Spurium 'Fuldaglut'
 15. Sedum Sediforme
 16. Sedum Spurium 'Coccineum'
 17. Sedum Spurium 'Red Carpet'
- (ii) Color Blast Mix [475-SMM-COL]
- (i) Properties: A blend of Sedums for the roof where maximum color is desired. Comes in the form of brightly colored foliage, flowers in abundance, and colors that blend and go together well.
 - (ii) Color Blast Mix Sedum Sod shall consist of the following:
 1. Sedum Acre 'Aureum'
 2. Sedum Rupestre 'Angelina'
 3. Sedum Reflexum 'Blue Spruce'
 4. Sedum Hybridum 'Immergrunchen'
 5. Sedum Kamtschaticum 'Variegatum'
 6. Sedum Sexangulare
 7. Sedum Spurium 'Summer Glory'
 8. Sedum Spurium 'Voodoo'
 9. Sedum Spurium 'Fuldaglut'
 10. Sedum Dasphyllum 'Blue Cadet'
 11. Sedum Spurium 'Tricolor'
- (iii) Growers Choice Mix [475-SMM-GRO]
- (i) Growers Choice Mix Sedum Sod shall consist of at least 12 of the following:
 1. Sedum Acre
 2. Sedum Acre 'Oktoberfest'
 3. Sedum Album
 4. Sedum Floriferum 'Weihenstephaner Gold'
 5. Sedum Stoloniferum
 6. Sedum Foresterianum 'Silver Stone'
 7. Sedum Kamtschaticum
 8. Sedum Kamtschaticum 'Variegatum'
 9. Sedum Reflexum 'Blue Spruce'
 10. Sedum Rupestre 'Angelina'
 11. Sedum Spurium 'Fuldaglut'
 12. Sedum Spurium 'Coccineum'
 13. Sedum Spurium 'Summer Glory'
 14. Sedum Hybridum 'Czar's Gold'
 15. Sedum Ellacombanium
 16. Sedum Spurium 'Voodoo'
 17. Sedum Spurium 'Tricolor'
 18. Sedum Hybridum 'Immergrunchen'
 19. Sedum Sexangulare
 - (iv) For a Custom Mix, contact System Provider for available varieties.

**SPEC NOTE: For custom sedum sod, please choose from [472-CUT] Sedum Cuttings; Subject to availability. Please allow 120 days for procurement for custom sedum tiles.*

- (b) Properties: Made up of coconut fiber base filled with a planting substrate, and pre-cultivated with a layer of low-profile, drought-tolerant vegetation adapted to rooftop conditions.
 - (c) Size: 12" x 24" and range in height from 2" - 4". The fiber/soil base is approximately 1" thick. Max weight of 3-4 lbs/ft² fully saturated.
- J) Drainage Stone (**NOT PROVIDED BY SUSTAINABLU**)
- 1) Material: Smooth landscape stone
 - 2) Size: 1"-3" diameter
 - 3) Shape: Round / elliptical. Any stone with sharp edges will be rejected.

PART 3 EXECUTION

I) EXAMINATION

- A) Verify that the surfaces and site conditions are ready to receive work.
- B) Verify that the roof surfaces are dry and free of ice or snow.
- C) Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.
- D) Applicator shall verify that the work done under related sections meets the following conditions:
 - 1) Roof drains and/or scuppers have been reconditioned and/or replaced and installed properly.
 - 2) Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured.
 - 3) All surfaces are free of dirt, debris and incompatible materials.

II) PREPARATION

- A) Remove trash and debris from the roof.

III) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Root Barrier (**AS REQUIRED BY ROOFING/WATERPROOFING TYPE**)
 - 1) The primary root barrier shall be installed in accordance with manufacturer's recommendations over the protection course. Install primary root barrier with a minimum of 12-inch side and end laps of root barrier. Run root barrier past full height at all base flashings, drain access boxes, vent pipe access boxes and perimeters.
- B) Protection Fleece/Water Retention Mat(s)
 - 1) Roll out protective fleece on top of waterproof membrane roofing. Overlap seams a minimum of 4 inches along sides and 12 inches along ends. Wet fabric as necessary to provide short-term ballast. For long term ballast use sandbags or paver slabs. Never cut near the roofing membrane when cutting fabric for installation. Only cut fabric using industrial shears, and never with a utility knife.
- C) Drainage/Retention Board
 - 1) Type: Extensive 1" Drainage/Retention Board [434-DRB-25]
 - (a) Be sure to orient drainage board with large knobs up.
 - (b) Install boards starting at roof drains and work towards high elevations. Overlap boards similar to shingles to ensure continuous drainage to outlets. Overlap edges by interlocking 1-2 rows of cups. Overlap area should total approximately 8% of roof area and be uniform throughout.
 - (c) When cutting boards use only a circular saw for efficient use of all material and to ensure crisp edges upon cutting. Cut along valley between cups. Never use a utility knife.

- D) Granular Drainage Material
- 1) Granular drainage material to be placed carefully to avoid damage or displacement of other materials such as edge elements and drainage components.
 - 2) Fill drainage boards cups to depth specified on the roofing, landscaping and/or green roofing plans with a variation of no more than 1/2".
- E) Filter Fleece
- 1) Roll out filter fleece on top of drainage/retention board or granular drainage material. Overlap seams a minimum of 4 inches along sides and 12 inches along ends. Wet fabric as necessary to provide short-term ballast. For long term ballast use sandbags or paver slabs. Only cut fabric using industrial shears, and never with a utility knife. Never cut near the roofing membrane when cutting fabric for installation.
- F) Edge Elements
- 1) Type: Extensive Edge Element [441-EDG-04O]
 - (a) Lay edge profile sections end to end on top of the protective fleece layer.
 - (b) Corner pieces to be used for 90-degree corners. Corners of any angle may be formed by cutting the edging on site
 - (c) Follow the submitted edge installation plan to ensure correct mix of male and female pieces are used. This includes all corners and radiuses. Adjustments to be expected as growing media is being installed that edging remains in the indicated areas on the submitted edge installation plan.
 - (d) Connect edge pieces and corners with provided connectors
 - (e) Make sure edging does not come in direct contact with base waterproofing membrane.
 - (f) Tools: Rubber or rawhide hammer.
- G) Inspection Chamber
- 1) In the case that drainage board is installed adjacent to the drains then the inspection chambers are to be placed directly over top of the board.
 - 2) In the case that a drainage stone is used the inspection chambers should be placed directly on the protective fleece with the drainage stone abutting the outside walls.
 - 3) In the case of inverted roofs, the inspection chambers are placed on the thermal insulation. Following this, a separation ring is installed, which is filled with gravel thus forming the gravel strip surrounding the inspection chamber.
- H) Growth Media
- 1) Growth media to be placed carefully to avoid damage or displacement of other materials such as edge elements, filter fleece and drainage components.
 - 2) Spread growth media to the depths as specified on the roofing, landscaping and/or green roofing plans with a variation of no more than 1/2". Ensure that growth media does not get under the layers of filter fleece, between filter fleece overlap, or into drainage/retention board cups. Finish depth of media to be verified by manufacturer prior to vegetation installation.
 - (a) Apply Bio-Stimulant and Bio-Fertilizer soil amendments over approved growth media depth.
 - 3) Growth media can be shipped in a variety of forms depending on logistics.
 - (a) Supersacks: 2 Cubic Yards. Ideal for larger vegetated roofs. The load bearing capacity of the roof must be considered before unloading bags on top of roof. Access and operation of a crane must also be considered for this application.
 - (b) Blowing Trucks: The granulometric distribution may change depending on the source material. A watering arrangement may be used to keep the growing media moist and prevent erosion.

- (c) Only use flat-edge plastic shovels & landscaping rakes for placement, movement, and leveling of growth media, all other tools must be approved by manufacturer for use.
- 4) If there is spillage of growth media into drainage/retention board or subsequent layers beneath, use a portable shop vacuum to ensure that debris is removed and placed appropriately.
- I) Vegetated Roof Seed Sowing
 - 1) Apply when Growth Media is between 35° F (2°C) and 89° F (32°C).
 - 2) 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 vegetated roof seeds.
 - 3) Calibrate spreader.
 - 4) Apply with a spreader at a rate of 0.1 lbs/square foot.
 - 5) Seeds to be covered thinly with sand base (Sand will be seen on soils)
 - 6) Do not cover with compost, only press them in gently. Irrigate with a hand-sprayer or spray heads, so that the seeds will not be washed away.
 - 7) Seeds are rapidly germinating, keep seed in constant moisture (not saturated, moist),
 - 8) Irrigation settings for establishment
 - (a) Integrated moisture or rain gauge module to be included with irrigation system to prevent overwatering.
 - (b) Irrigation schedule:
 - (i) Once an hour for 5 minutes through the end of the 2nd week (14 days) after initial sowing
 - (ii) Once every other hour for 5 minutes for the 3rd through 5th week after initial sowing.
 - (iii) In the morning at 5am for 20 minutes and at 7pm for 20 minutes from the 6th week through the 13th week.
- J) Sedum Cuttings
 - 1) Apply when Growth Media is between 35° F (2°C) and 89° F (32°C).
 - 2) 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.
 - 3) Consult drawings for sedum cuttings layout and distribution rate. Unless otherwise noted the distribution rate shall be 12 lbs/100 SF
 - 4) Irrigation settings for establishment
 - (a) Integrated moisture or rain gauge module to be included with irrigation system to prevent overwatering.
 - (b) Irrigation schedule:
 - (i) Once an hour for 5 minutes through the end of the 2nd week (14 days) after initial sowing > 1" week
 - (ii) Once every other hour for 5 minutes for the 3rd through 5th week after initial sowing. > 0.75" week
 - (iii) In the morning at 5am for 20 minutes and at 7pm for 20 minutes from the 6th week through the 13th week. > 0.5" week
- K) Perennial Plugs
 - 1) Plant all specified nursery stock plantings in accordance with approved landscape design.
 - 2) If more than 24 hours has elapsed since installing and soaking the growth media, thoroughly re-soak growth media prior to commencing planting the plugs.
 - 3) Consult drawings for plug planting layout and rate.



SUSTAINABLU
ON-STRUCTURE STORMWATER SYSTEMS

500-Series

Blu-Garden Extensive Vegetated Roof System
December 18, 2024

SECTION 07 33 63 BLU-GARDEN EXTENSIVE VEGETATED ROOF SYSTEM

PART 1 GENERAL

I) SUMMARY

- A) Furnish and install a completed Blu-Garden Vegetated Roof Assembly; including, but not limited to: root barrier, rot and pathogen protective fleece or, rot and pathogen resistant filter fabric, drainage and/or retention component, vegetated roof growing media and vegetation. This section should be completed in coordination with Section 07 72 00 Roof Accessories, {07-xx-xx Applicable Waterproofing and Roofing Specifications} and Section 07 59 00 Electronic Leak Detection (ELD), in order to maintain the system warranty.

**SPEC NOTE: Summary section to be modified on a job-by-job basis. Please contact Sustainable for specific details. Architect to reference related hardscape and leak detection section if applicable.*

II) RELATED TRADES

- A) Section 02 40 00 Demolition
- B) Section 03 30 00 Concrete
- C) Section 04 00 00 Masonry
- D) Section 06 00 00 Carpentry
- E) Section 06 15 20 Composite Synthetic and Other Decking
- F) Section 07 14 01 Instant Setting Fluid Applied Rubber
- G) Section 07 14 13 Hot Rubberized Asphalt Waterproofing
- H) Section 07 18 13 PMMA Liquid Applied Waterproofing
- I) Section 07 52 16 Modified Bitumen Roofing
- J) Section 07 53 23 EPDM Roofing
- K) Section 07 54 00 Fluid Applied Waterproofing
- L) Section 07 54 19 Thermoplastic Roofing
- M) Section 07 59 00 Electronic Leak Detection – High & Low Voltage
- N) Section 07 60 00 Sheet Metal
- O) Section 07 72 00 Roofing Accessories
- P) Section 07 76 00 Roof Paver and/or Tile on Pedestal System
- Q) Section 07 90 00 Caulking & Sealants
- R) Section 22 14 16 Roof Drains
- S) Section 26 05 19 Low Voltage Electrical
- T) Section 32 84 00 Landscape Irrigation
- U) Section 32 90 00 Landscaping

III) REFERENCES

- A) ANSI: American National Standards Institute www.ansi.org
- B) ANLA: American Nursery and Landscape Association www.anla.org
- C) ASTM: American Society of Testing Materials www.astm.org
- D) EN-ISO: International Organization for Standardization
- E) FLL (German): Guidelines for the Planning, Execution and Upkeep of Green-roof sites
- F) MSA: Methods of Soil Analysis, American Society of Agronomy
- G) RCSTP: Recommended Chemical Soil Testing Procedures
- H) TMECC: Test Methods for the Examination of Composting and Compost
- I) OSHA: Occupational Safety and Health Administration

- J) Factory Mutual Insurance Co. 1-35 Green Roof Systems
- K) USGBC: US Green Building Council,
 - 1) Leadership in Energy and Environmental Design LEED Reference Guide, Version 3.0
 - 2) USGBC Project Calculation Spreadsheet. www.usgbc.org.
- L) Sustainable Sites Initiative
 - 1) SITES Rating System, version 2
 - 2) SITES v2 Rating Scorecard, www.sustainablesites.org

IV) DEFINITIONS

- A) Biological Soil Fertility Amendments: Bio-stimulants and bio-fertilizers used to stimulate and feed microorganism populations and increase biological function of the Blu-Garden Vegetated Roof Assembly.
- B) Captured Water: Water that is retained in the drainage layer of a Blu-Garden Vegetated Roof Assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.
- C) Finish Elevation: Elevation of finished growing media surface of planting area.
- D) Planting Area: Areas to be planted.
- E) Plant, Plants, Plant Material: Vegetation in general, ornamental grasses, or herbaceous vegetation.
- F) Growth Media: Lightweight soil mixture that promotes good growing conditions for specific varieties of plants.
- G) System Provider: Sustainablu, LLC
- H) Blu-Garden Vegetated Roof Assembly Installer: A pre-certified installer with appropriate experience approved by the System Provider to maintain warranty.
- I) Maintenance Contractor: The pre-approved entity contracted by building owner to ensure maintenance on the system is carried out through specified timeframe.

V) QUALIFICATIONS

- A) Only a contractor approved and licensed by the System Provider shall install the Blu-Garden Vegetated Roof Assembly components. An independent laboratory may test materials for compliance with published physical properties and these specifications.

VI) SUBMITTALS

- A) Completed Dead Load Worksheet for each Vegetated Roof System profile (ASTM E2397)
 - 1) Submit System Provider's written approval or license for contractors for Blu-Garden Vegetated Roof Assembly,
- B) Submit most recent copy of System Provider's literature applicable to products and specifications to be used, as specified herein,
- C) Product Data Sheets: For each component within the Blu-Garden Vegetated Roof Assembly
- D) Samples for Verification on request: For each of the following components of Blu-Garden Vegetated Roof Assembly:
 - 1) Submit three sheet samples approximately 6 x 6 inches or alternately 3 units that are representative of the following products:
 - (a) Root Barrier
 - (b) Protection Fleece
 - (c) Drainage/Retention Board
 - (d) Filter Fleece
 - (e) Edge Element

- 2) Growth Media: 1-quart volume of each growth media specified, in sealed plastic bags labeled with content and source. Each sample shall be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
- E) Product Test Reports on request: For each growth media, including complete analysis coordinated and approved through Sustainablu's approved testing facility, demonstrating compliance with specified requirements.
- F) Warranty: Sample of [5] [10] [15] [20] year warranty from the System Provider.
**SPEC NOTE: Choose one, or contact Sustainablu for extended warranty options.*

VII) QUALITY ASSURANCE

- A) Blu-Garden Vegetated Roof Assembly Installer Qualifications: A qualified assembly Installer approved, authorized, or licensed by Sustainablu, whose work has resulted in successful establishment of vegetated roofs.
 - 1) Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2) Provide a list of at least 3 projects, satisfactorily completed within the past 5 years, of similar scope and complexity to this project.
 - 3) Installer must provide at time of proposal submittal a general liability insurance certificate showing \$1,000,000 in coverage.
- B) Source Limitations: All Blu-Garden Vegetated Roof Assembly components including but not limited to growth media, walkway pavers and accessories are to be sourced or approved by the System Provider.
- C) Pre-installation Conference: Conduct conference at project site.
 - 1) After award of Contract and prior to the commencement of the Work of this Section, schedule and conduct meeting to discuss the Work of this Section and to coordinate with related work. Coordinate with pre-construction meeting specified in Section (xxxxxx). Convene pre-construction meeting to comply with requirements of Division 1 and as follows:
 - (a) General Contractor to notify all attendees at least two weeks prior to the conference.
 - (b) Require attendance of parties directly affecting Work of this Section, including, but not limited to: Owner, Contractor, Architect, System Provider, System Installer, Roofing Membrane Provider, Roofing Membrane Installer and Plumbing Installers.
 - (c) Review methods and procedures related to installation and operation of Work of this Section, including coordination with related Work.
 - (d) Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

VIII) DELIVERY, STORAGE, AND HANDLING

- A) Packaged Materials:
 - 1) Contractor to designate Project Coordinator to be responsible for coordinating all shipments with the System Provider, Project Coordinator to alert System Provider a minimum of 3 weeks prior to delivery to ensure availability of product, additional lead time may be required for certain products or plantings, reference System Provider's Terms and Conditions for exact lead times.
 - 2) Store materials under cover and elevated above ground, out of direct sunlight.
 - 3) Store roll material lying down and on pallets. Fully protect from moisture and direct sunlight exposure.
 - 4) Remove damaged material from job site. Report and replace damage materials.

- 5) Plant materials must be watched carefully. Watering the plants can be necessary during a long storage period. Ensure plants are properly ventilated to prevent overheating. Planting materials are to be installed within twenty-four hours from the time that they are received on the project site and may not remain stacked on a pallet for more than 2 hours.
 - 6) When storing materials on the roof be sure that the load of the materials does not exceed the load of the structure. Coordinate with architect and general contractor on structural allowances for placing pallets on the roof and ensure crane is appropriately sized to reach designated areas of the roof.
 - 7) Store materials in dry, protected areas in an upright position. Control temperature of storage areas in accordance with Manufacturer's instructions. Protect moisture sensitive materials with breathable tarps on sides and top surfaces.
- B) Bulk Materials:
- 1) Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
 - 2) Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3) Accompany each delivery of bulk materials with product certificates.

IX) PROJECT CONDITIONS

- A) Codes/Regulations
- 1) Follow local, state and federal regulations, safety standards and codes. When a conflict exists use the stricter requirement.
- B) Weather Limitations
- 1) Wind speeds are not to exceed 40 mph.
 - 2) Low visibility
- C) Planting Limitations
- 1) Soil must not be frozen.
 - 2) Soil temperature must be over 36° F for 72 hours.
 - 3) Do not install vegetation above 96° F.
 - 4) Consider appropriate protection against weather extremes for 1 week.

X) WARRANTY

- A) The System Provider shall furnish its standard [5] [10] [15] [20] warranty for all Blu-Garden Vegetated Roof Assembly components supplied.

**SPEC NOTE: Choose one, or contact Sustainabl for either applicator only or extended warranty options.*

- B) Warranty for Plant Growth: Installer agrees to submit growers' product guarantee. Installer and owner agree to adhere to Sustainabl's maintenance plan regarding repair or replace plantings within a specified establishment warranty period after installation of vegetation. Establishment warranty shall be defined as: 2 months after vegetation installation, or otherwise known as substantial completion.
- 1) Start Date: If chosen, the start date of the warranty for plant growth shall be the substantial date of completion of Blu-Garden Vegetated Roof Assembly.
 - 2) Coverage: Labor and Plantings
 - 3) Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse or incidents that are beyond contractor's control including, but not limited to, damage caused by other trades or foot traffic caused by others.
 - (a) Visual failure will be determined by no more than 1 square foot of area within a 10 square foot area.

- (i) For Sedum Mat / Sod, diversity shall be a minimum of 4 species per 10 square foot area.
- 4) Minimum Foliage Cover: Planted materials shall grow to achieve and maintain at least:
 - (a) 50 percent foliage cover over planting area commencing 12 months after planting, through the duration of this warranty.
 - (b) 80 percent foliage cover over planting area commencing 24 months after planting, through the duration of this warranty.
- 5) Include the following remedial actions as a minimum:
 - (a) Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - (b) Installation time of replacement planting(s) to be completed by installer, at their discretion in relation to weather, by no longer than 12 months from removal of dead vegetation.
 - (c) If the death of 25 percent or greater of plant materials installed occurs at a single time that is not related to an act of God or owner negligence, Sustainablu is to provide owner and installer a remediation plan to remedy the situation.
 - (d) Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - (i) A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

XI) BIDDING REQUIREMENTS

- A) Pre-Bid Meeting: A pre-bid meeting shall be held with the Owner's Representative and involved trades to discuss all aspects of the project. The Applicator's field representative or roofing foreman for the work shall be in attendance. Procedures to avoid rooftop damage by other trades shall be determined.
- B) Site Visit: Bidders shall visit the site and carefully examine the areas in question as to conditions that may affect proper execution of the work. All dimensions and quantities shall be determined or verified by the contractor. No claims for extra costs will be allowed because of lack of full knowledge of the existing conditions unless agreed to in advance with the Owner or Owner's Representative.

XII) MAINTENANCE SERVICE

- A) Initial Maintenance Service: Provide maintenance by skilled employees of Blu-Garden Vegetated Roof Assembly Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but not for less than the following maintenance period:
 - 1) Initial maintenance period: [30][60][90] days from date of Planting Completion.

**SPEC NOTE: Choose time based on project schedule. The length of time should be as minimal as possible to ensure project has a committed maintenance team working on project. For greater times than 90 days, please contact Sustainablu.*
- B) Continuing Maintenance Proposal: From Blu-Garden Vegetated Roof Assembly Installer to Owner, provide a minimum of 24-month maintenance plan meeting Sustainablu's maintenance requirements.
 - 1) Maintenance Period: 24 months from date of Planting Completion.

PART 2 PRODUCTS

I) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Basis of Design: Sustainablu, <http://www.sustainablu.us>

- B) All products and services shall be approved/procured through the system provider, Sustainability, in order to ensure integrity of the system and maintain system warranty.

II) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Root Barrier: To prevent root penetration into the waterproof membrane. **(AS REQUIRED BY ROOFING/WATERPROOFING TYPE)**
- 1) Type: 20 Mil LDPE Root Barrier [421-RBR-20]
 - (a) Properties: 20 MIL LLDPE Root Barrier
 - (b) Weight: 10 lbs/100 ft²
- B) Protective / Retention Fleece: To protect membrane from paver pedestals and Blu-Garden Vegetated Roof Assembly.
- 1) Type: Extensive Protective Fleece [422-PFC-300]
 - (a) Properties: 9 oz Polypropylene, Polyester and Recycled Acrylic Thread
 - (b) Water Holding Capacity: 11.52 in³/ft²
 - (c) Total Saturated Weight: 0.47 lbs/ft²
- C) Drainage / Retention Board: To provide stormwater retention while simultaneously allowing for continuous drainage.
- 1) Type: Extensive 1" Drainage/Retention Board [434-DRB-25]
 - (a) Properties: High-density polyethylene, double sided form of interlocking cups with depth 1". Perforated holes on top surface for continuous aeration. High load bearing capacity, excellent water retention, passive distribution and drainage properties.
 - (b) Water Holding Capacity: 28.8 in³/ft²
 - (c) Compressive Strength: 23.35 lbs/in² (unfilled), 25.38 lbs/in² (filled)
- D) Granular Drainage Material:
- 1) Type: TerraPor DR - Drainage Aggregate [465-GDA]
 - (a) Granular drainage medium designed for use as a filler substrate beneath multi-layer green roof systems capable of enhancing the compressive strength of the drainage/ water retention panel, a bedding material for pavers as a maintenance path/ patio, and embedded drainage channels may be used to transfer excess water quickly to roof drains or scuppers.
- E) Filter Fleece: Filter separation layer between drainage and substrate layers.
- 1) Type: Extensive Filter Fleece [424-FFC-105]
 - (a) Properties: 4.5 oz system filter, rot and pathogen resistant, non-woven, polymeric, geotextile fabric.
 - (b) Tensile Strength: 1.08 lbs/in²
 - (c) Total Saturated Weight: 0.02 lbs/ft²
- F) Edge Elements: Self-supporting vertical separation between paver and growing media.
- 1) Type: 5" Extensive Edge Element [442-EDG-050]
 - (a) Properties: L-shaped self-supporting 18 GA Aluminum with perforations along the manifold for continuous drainage. Male & female pieces allow for ease in installation and minimize cutting. Inside and outside corners also manufactured to create seamless corners.
 - (b) Size: 5" height x 5 1/2" flange x 8'-2" sections.
- G) Inspection Chamber: Control shaft for use as roof outlet inspection units.
- 1) Type: Standard Inspection Chamber [431-ISC-FUA]
 - (a) Properties: UV Resistant ABS Plastic with inlet slots in shaft walls and cover.
 - (b) Size: 14 1/2" x 14 1/2" x 4"
 - (c) Components: Includes a lockable lid and stainless-steel filter to prevent debris from entering the drainage system.
 - (d) Extenders available in increments of 4" to achieve desired height.

- H) Growth Media: Vegetated roof assembly supplier's lightweight, custom manufactured soil mixture designed for project location, stormwater retention and/or detention requirements and plant pallet.
- 1) Type: TerraPor EX - Extensive Growth Media [461-GEX]
 - (a) Properties: Formulated growth media to meet European FLL Guidelines for particle size gradation, dry vs saturated bulk density, porosity, water retention hydraulic conductivity, pH balance and organic matter content and all requirements for stormwater retention and/or detention.
 - I) Vegetation
 - 1) Vegetated Roof Seeds
 - (a) Type: Vegetated Roof Seed [471-VSE]
 - (i) Seeds are mixed with sand for an even sowing.
 - (i) Product comes in 25lb bags
 - (ii) Product may be stored for up to ninety (90) days in a temperate environment
 1. 55° – 75° F
 - (ii) Seed Mix Varieties:
 - (i) Basic Sedum Mix [471-VSE-BSC]
 - (ii) Premium Sedum Mix [471-VSE-PRM]
 - (iii) Extensive Perennial Mix [471-VSE-CSM]
 - (iv) Ornamental Grass & Perennial Mix [471-VSE-LGM]
 - 2) Mixed Sedum Cuttings
 - (a) Type: Sedum Cuttings [472-CUT]
 - (i) Sedum Cuttings shall be harvested from healthy, vigorous plants while in a vegetative growth mode and shall range in length from ½" to 3" and possess enough rooting nodes to allow for rapid root development once sown.
 - (ii) Sedum Cuttings shall be harvested, cooled and dried for 24 hours prior to boxing for shipment and delivered in an insulated box with enclosed ice packs to ensure the cuttings remain cool until they are delivered.
 - (iii) Storage of cuttings on project site shall be no longer than 2 days and temperatures shall not exceed 70° F where cuttings are stored.
 - (iv) Available cutting varieties (subject to availability, please contact Sustainability for availabilities):
 - (i) Sedum acre 'Aurea'
 - (ii) Sedum album 'Coral Carpet' & 'Green Ice'
 - (iii) Sedum caucolicum
 - (iv) Sedum divergens
 - (v) Sedum hispanicum 'Purple Form'
 - (vi) Sedum hybridum 'Immergrunchen'
 - (vii) Sedum kamtschaticum 'Variegatum', & 'Weihenstephaner Gold'
 - (viii) Sedum middendorffianum diffusum
 - (ix) Sedum pachyclados
 - (x) Sedum reflexum 'Blue Spruce' & 'Green Spruce'
 - (xi) Sedum rupestre 'Angelina'
 - (xii) Sedum sexangulare
 - (xiii) Sedum spurium 'Album Superbum', 'Dragon's Blood', 'Fuldaglut', 'John Creech', 'Red Carpet', 'Summer Glory', 'Tricolor', & 'Voodoo'
 - (xiv) Sedum stefco
 - (xv) Sedum takesimensis 'Golden Carpet'
 - (xvi) Sedum tetractinum 'Coral Reef'
 - (v) Sedum Cuttings shall be provided in the aforementioned varieties and pounds.

**SPEC NOTE: Sustainable recommends 12 lbs/100 SF for application to attain 85% coverage in 3 years.*

- (vi) Contact System Provider for available and/or In-Season varieties.
- 3) Perennial Plugs
 - (a) Type: Perennial Plugs [473-PPP]
 - (i) Perennial Plugs shall be healthy vigorous plants that will provide rapid root development.
 - (ii) Perennial Plugs shall be delivered in the following means to ensure plants are healthy at receipt of materials:
 - (i) For air shipment, an insulated box with enclosed ice packs to ensure the perennial plugs remain cool and temperate until they are delivered.
 - (ii) For local shipment, all trucks need to be vented and/or plants must be in protected conditions that moderates temperatures from 40°F-85°F during shipment. Shipments of greater than four hours shall require air shipping standards.
 - (iii) Contact System Provider for available and/or In-Season varieties. Reference Sustainable's website for commonly available plantings.
- 4) Fully Vegetated Sedum Mat
 - (a) Type: Fully Vegetated Sedum Mat [474-SMT]
 - (i) Sedum Mats are planted with 5 to 8 different species of Sedum, each mix compiled to suit every particular climate.
 - (ii) Sedum Mats shall consist of 5-8 of the following:
 - (i) Sedum spurium 'Fuldaglut'
 - (ii) Sedum spurium 'John Creech'
 - (iii) Sedum spurium 'Red Carpet'
 - (iv) Sedum kamtschaticum
 - (v) Sedum kamtschaticum 'Variegatum'
 - (vi) Sedum takesimensis 'Golden Carpet'
 - (vii) Sedum acre 'Aureum'
 - (viii) Sedum acre 'Gold Moss'
 - (ix) Sedum album 'Coral Carpet'
 - (x) Sedum album 'Murale'
 - (xi) Sedum stefco
 - (xii) Sedum floriferum 'Weihenstephaner Gold'
 - (xiii) Sedum hispanicum
 - (xiv) Sedum reflexum 'Blue Spruce'
 - (xv) Sedum rupestre 'Angelina'
 - (xvi) Sedum sexangulare
 - (xvii) Sedum x immergrunchen
 - (iii) Properties: Made up of coconut fiber base filled with a planting substrate, and pre-cultivated with a layer of low-profile, drought-tolerant vegetation adapted to rooftop conditions.
 - (iv) Size: Mats come in rolls of 4' x 6'-3" (25 ft² per roll)
- 5) Fully Vegetated Sedum Sod
 - (a) Type: Fully Vegetated Sedum Sod
 - (i) Four Season Mix [475-SMM-FOU]
 - (i) Properties: A blend of Sedums that provide flowers throughout the growing season. Winter interest and seasonal foliage color changes are also found in this group. This is a good, general purpose mix that provides year-round roof top beauty.
 - (ii) Four Season Mix Sedum Sod shall consist of at least 12 of the following:
 - 1. Sedum Kamtschaticum
 - 2. Sedum Spurium 'Dragons Blood'
 - 3. Sedum Acre 'Oktoberfest'

4. Sedum Album
 5. Sedum Stoloniferum
 6. Sedum Ellacombanium
 7. Sedum Floriferum 'Weihenstephaner Gold'
 8. Sedum Spurium 'Voodoo'
 9. Sedum Foresterianum 'Silver Stone'
 10. Sedum Hybridum 'Czar's Gold'
 11. Sedum Spurium 'Summer Glory'
 12. Sedum Sexangulare
 13. Sedum Reflexum 'Blue Spruce'
 14. Sedum Spurium 'Fuldaglut'
 15. Sedum Sediforme
 16. Sedum Spurium 'Coccineum'
 17. Sedum Spurium 'Red Carpet'
- (ii) Color Blast Mix [475-SMM-COL]
- (i) Properties: A blend of Sedums for the roof where maximum color is desired. Comes in the form of brightly colored foliage, flowers in abundance, and colors that blend and go together well.
 - (ii) Color Blast Mix Sedum Sod shall consist of the following:
 1. Sedum Acre 'Aureum'
 2. Sedum Rupestre 'Angelina'
 3. Sedum Reflexum 'Blue Spruce'
 4. Sedum Hybridum 'Immergrunchen'
 5. Sedum Kamtschaticum 'Variegatum'
 6. Sedum Sexangulare
 7. Sedum Spurium 'Summer Glory'
 8. Sedum Spurium 'Voodoo'
 9. Sedum Spurium 'Fuldaglut'
 10. Sedum Dasphyllum 'Blue Cadet'
 11. Sedum Spurium 'Tricolor'
- (iii) Growers Choice Mix [475-SMM-GRO]
- (i) Growers Choice Mix Sedum Sod shall consist of at least 12 of the following:
 1. Sedum Acre
 2. Sedum Acre 'Oktoberfest'
 3. Sedum Album
 4. Sedum Floriferum 'Weihenstephaner Gold'
 5. Sedum Stoloniferum
 6. Sedum Foresterianum 'Silver Stone'
 7. Sedum Kamtschaticum
 8. Sedum Kamtschaticum 'Variegatum'
 9. Sedum Reflexum 'Blue Spruce'
 10. Sedum Rupestre 'Angelina'
 11. Sedum Spurium 'Fuldaglut'
 12. Sedum Spurium 'Coccineum'
 13. Sedum Spurium 'Summer Glory'
 14. Sedum Hybridum 'Czar's Gold'
 15. Sedum Ellacombanium
 16. Sedum Spurium 'Voodoo'
 17. Sedum Spurium 'Tricolor'
 18. Sedum Hybridum 'Immergrunchen'
 19. Sedum Sexangulare
 - (iv) For a Custom Mix, contact System Provider for available varieties.

**SPEC NOTE: For custom sedum sod, please choose from [472-CUT] Sedum Cuttings; Subject to availability. Please allow 120 days for procurement for custom sedum tiles.*

- (b) Properties: Made up of coconut fiber base filled with a planting substrate, and pre-cultivated with a layer of low-profile, drought-tolerant vegetation adapted to rooftop conditions.
 - (c) Size: 12" x 24" and range in height from 2" - 4". The fiber/soil base is approximately 1" thick. Max weight of 3-4 lbs/ft² fully saturated.
- J) Drainage Stone (**NOT PROVIDED BY SUSTAINABLU**)
- 1) Material: Smooth landscape stone
 - 2) Size: 1"-3" diameter
 - 3) Shape: Round / elliptical. Any stone with sharp edges will be rejected.

PART 3 EXECUTION

I) EXAMINATION

- A) Verify that the surfaces and site conditions are ready to receive work.
- B) Verify that the roof surfaces are dry and free of ice or snow.
- C) Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.
- D) Applicator shall verify that the work done under related sections meets the following conditions:
 - 1) Roof drains and/or scuppers have been reconditioned and/or replaced and installed properly.
 - 2) Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured.
 - 3) All surfaces are free of dirt, debris and incompatible materials.

II) PREPARATION

- A) Remove trash and debris from the roof.

III) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Root Barrier (**AS REQUIRED BY ROOFING/WATERPROOFING TYPE**)
 - 1) The primary root barrier shall be installed in accordance with manufacturer's recommendations over the protection course. Install primary root barrier with a minimum of 12-inch side and end laps of root barrier. Run root barrier past full height at all base flashings, drain access boxes, vent pipe access boxes and perimeters.
- B) Protection Fleece/Water Retention Mat(s)
 - 1) Roll out protective fleece on top of waterproof membrane roofing. Overlap seams a minimum of 4 inches along sides and 12 inches along ends. Wet fabric as necessary to provide short-term ballast. For long term ballast use sandbags or paver slabs. Never cut near the roofing membrane when cutting fabric for installation. Only cut fabric using industrial shears, and never with a utility knife.
- C) Drainage/Retention Board
 - 1) Type: Extensive 1" Drainage/Retention Board [434-DRB-25]
 - (a) Be sure to orient drainage board with large knobs up..
 - (b) Install boards starting at roof drains and work towards high elevations. Overlap boards similar to shingles to ensure continuous drainage to outlets. Overlap edges by interlocking 1-2 rows of cups. Overlap area should total approximately 8% of roof area and be uniform throughout.
 - (c) When cutting boards use only a circular saw for efficient use of all material and to ensure crisp edges upon cutting. Cut along valley between cups. Never use a utility knife.

- D) Granular Drainage Material
- 1) Granular drainage material to be placed carefully to avoid damage or displacement of other materials such as edge elements and drainage components.
 - 2) Fill drainage boards cups to depth specified on the roofing, landscaping and/or green roofing plans with a variation of no more than 1/2".
- E) Filter Fleece
- 1) Roll out filter fleece on top of drainage/retention board or granular drainage material. Overlap seams a minimum of 4 inches along sides and 12 inches along ends. Wet fabric as necessary to provide short-term ballast. For long term ballast use sandbags or paver slabs. Only cut fabric using industrial shears, and never with a utility knife. Never cut near the roofing membrane when cutting fabric for installation.
- F) Edge Elements
- 1) Type: Extensive Edge Element [442-EDG-050]
 - (a) Lay edge profile sections end to end on top of the protective fleece layer.
 - (b) Corner pieces to be used for 90-degree corners. Corners of any angle may be formed by cutting the edging on site
 - (c) Follow the submitted edge installation plan to ensure correct mix of male and female pieces are used. This includes all corners and radiuses. Adjustments to be expected as growing media is being installed that edging remains in the indicated areas on the submitted edge installation plan.
 - (d) Connect edge pieces and corners with provided connectors
 - (e) Make sure edging does not come in direct contact with base waterproofing membrane.
 - (f) Tools: Rubber or rawhide hammer.
- G) Inspection Chamber
- 1) In the case that drainage board is installed adjacent to the drains then the inspection chambers are to be placed directly over top of the board.
 - 2) In the case that a drainage stone is used the inspection chambers should be placed directly on the protective fleece with the drainage stone abutting the outside walls.
 - 3) In the case of inverted roofs, the inspection chambers are placed on the thermal insulation. Following this, a separation ring is installed, which is filled with gravel thus forming the gravel strip surrounding the inspection chamber.
- H) Growth Media
- 1) Growth media to be placed carefully to avoid damage or displacement of other materials such as edge elements, filter fleece and drainage components.
 - 2) Spread growth media to the depths as specified on the roofing, landscaping and/or green roofing plans with a variation of no more than 1/2". Ensure that growth media does not get under the layers of filter fleece, between filter fleece overlap, or into drainage/retention board cups. Finish depth of media to be verified by manufacturer prior to vegetation installation.
 - (a) Apply Bio-Stimulant and Bio-Fertilizer soil amendments over approved growth media depth.
 - 3) Growth media can be shipped in a variety of forms depending on logistics.
 - (a) Supersacks: 2 Cubic Yards. Ideal for larger vegetated roofs. The load bearing capacity of the roof must be considered before unloading bags on top of roof. Access and operation of a crane must also be considered for this application.
 - (b) Blowing Trucks: The granulometric distribution may change depending on the source material. A watering arrangement may be used to keep the growing media moist and prevent erosion.

- (c) Only use flat-edge plastic shovels & landscaping rakes for placement, movement, and leveling of growth media, all other tools must be approved by manufacturer for use.
- 4) If there is spillage of growth media into drainage/retention board or subsequent layers beneath, use a portable shop vacuum to ensure that debris is removed and placed appropriately.
- I) Vegetated Roof Seed Sowing
 - 1) Apply when Growth Media is between 35° F (2°C) and 89° F (32°C).
 - 2) 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 vegetated roof seeds.
 - 3) Calibrate spreader.
 - 4) Apply with a spreader at a rate of 0.1 lbs/square foot.
 - 5) Seeds to be covered thinly with sand base (Sand will be seen on soils)
 - 6) Do not cover with compost, only press them in gently. Irrigate with a hand-sprayer or spray heads, so that the seeds will not be washed away.
 - 7) Seeds are rapidly germinating, keep seed in constant moisture (not saturated, moist),
 - 8) Irrigation settings for establishment
 - (a) Integrated moisture or rain gauge module to be included with irrigation system to prevent overwatering.
 - (b) Irrigation schedule:
 - (i) Once an hour for 5 minutes through the end of the 2nd week (14 days) after initial sowing
 - (ii) Once every other hour for 5 minutes for the 3rd through 5th week after initial sowing.
 - (iii) In the morning at 5am for 20 minutes and at 7pm for 20 minutes from the 6th week through the 13th week.
- J) Sedum Cuttings
 - 1) Apply when Growth Media is between 35° F (2°C) and 89° F (32°C).
 - 2) 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.
 - 3) Consult drawings for sedum cuttings layout and distribution rate. Unless otherwise noted the distribution rate shall be 12 lbs/100 SF
 - 4) Irrigation settings for establishment
 - (a) Integrated moisture or rain gauge module to be included with irrigation system to prevent overwatering.
 - (b) Irrigation schedule:
 - (i) Once an hour for 5 minutes through the end of the 2nd week (14 days) after initial sowing > 1" week
 - (ii) Once every other hour for 5 minutes for the 3rd through 5th week after initial sowing. > 0.75" week
 - (iii) In the morning at 5am for 20 minutes and at 7pm for 20 minutes from the 6th week through the 13th week. > 0.5" week
- K) Perennial Plugs
 - 1) Plant all specified nursery stock plantings in accordance with approved landscape design.
 - 2) If more than 24 hours has elapsed since installing and soaking the growth media, thoroughly re-soak growth media prior to commencing planting the plugs.
 - 3) Consult drawings for plug planting layout and rate.



SUSTAINABLU
ON-STRUCTURE STORMWATER SYSTEMS

600-Series

Blu-Garden Extensive Vegetated Roof System
December 18, 2024

SECTION 07 33 63 BLU-GARDEN EXTENSIVE VEGETATED ROOF SYSTEM

PART 1 GENERAL

I) SUMMARY

- A) Furnish and install a completed Blu-Garden Vegetated Roof Assembly; including, but not limited to: root barrier, rot and pathogen protective fleece or, rot and pathogen resistant filter fabric, drainage and/or retention component, vegetated roof growing media and vegetation. This section should be completed in coordination with Section 07 72 00 Roof Accessories, {07-xx-xx Applicable Waterproofing and Roofing Specifications} and Section 07 59 00 Electronic Leak Detection (ELD), in order to maintain the system warranty.

**SPEC NOTE: Summary section to be modified on a job-by-job basis. Please contact Sustainable for specific details. Architect to reference related hardscape and leak detection section if applicable.*

II) RELATED TRADES

- A) Section 02 40 00 Demolition
- B) Section 03 30 00 Concrete
- C) Section 04 00 00 Masonry
- D) Section 06 00 00 Carpentry
- E) Section 06 15 20 Composite Synthetic and Other Decking
- F) Section 07 14 01 Instant Setting Fluid Applied Rubber
- G) Section 07 14 13 Hot Rubberized Asphalt Waterproofing
- H) Section 07 18 13 PMMA Liquid Applied Waterproofing
- I) Section 07 52 16 Modified Bitumen Roofing
- J) Section 07 53 23 EPDM Roofing
- K) Section 07 54 00 Fluid Applied Waterproofing
- L) Section 07 54 19 Thermoplastic Roofing
- M) Section 07 59 00 Electronic Leak Detection – High & Low Voltage
- N) Section 07 60 00 Sheet Metal
- O) Section 07 72 00 Roofing Accessories
- P) Section 07 76 00 Roof Paver and/or Tile on Pedestal System
- Q) Section 07 90 00 Caulking & Sealants
- R) Section 22 14 16 Roof Drains
- S) Section 26 05 19 Low Voltage Electrical
- T) Section 32 84 00 Landscape Irrigation
- U) Section 32 90 00 Landscaping

III) REFERENCES

- A) ANSI: American National Standards Institute www.ansi.org
- B) ANLA: American Nursery and Landscape Association www.anla.org
- C) ASTM: American Society of Testing Materials www.astm.org
- D) EN-ISO: International Organization for Standardization
- E) FLL (German): Guidelines for the Planning, Execution and Upkeep of Green-roof sites
- F) MSA: Methods of Soil Analysis, American Society of Agronomy
- G) RCSTP: Recommended Chemical Soil Testing Procedures
- H) TMECC: Test Methods for the Examination of Composting and Compost
- I) OSHA: Occupational Safety and Health Administration

- J) Factory Mutual Insurance Co. 1-35 Green Roof Systems
- K) USGBC: US Green Building Council,
 - 1) Leadership in Energy and Environmental Design LEED Reference Guide, Version 3.0
 - 2) USGBC Project Calculation Spreadsheet. www.usgbc.org.
- L) Sustainable Sites Initiative
 - 1) SITES Rating System, version 2
 - 2) SITES v2 Rating Scorecard, www.sustainablesites.org

IV) DEFINITIONS

- A) Biological Soil Fertility Amendments: Bio-stimulants and bio-fertilizers used to stimulate and feed microorganism populations and increase biological function of the Blu-Garden Vegetated Roof Assembly.
- B) Captured Water: Water that is retained in the drainage layer of a Blu-Garden Vegetated Roof Assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.
- C) Finish Elevation: Elevation of finished growing media surface of planting area.
- D) Planting Area: Areas to be planted.
- E) Plant, Plants, Plant Material: Vegetation in general, ornamental grasses, or herbaceous vegetation.
- F) Growth Media: Lightweight soil mixture that promotes good growing conditions for specific varieties of plants.
- G) System Provider: Sustainablu, LLC
- H) Blu-Garden Vegetated Roof Assembly Installer: A pre-certified installer with appropriate experience approved by the System Provider to maintain warranty.
- I) Maintenance Contractor: The pre-approved entity contracted by building owner to ensure maintenance on the system is carried out through specified timeframe.

V) QUALIFICATIONS

- A) Only a contractor approved and licensed by the System Provider shall install the Blu-Garden Vegetated Roof Assembly components. An independent laboratory may test materials for compliance with published physical properties and these specifications.

VI) SUBMITTALS

- A) Completed Dead Load Worksheet for each Vegetated Roof System profile (ASTM E2397)
 - 1) Submit System Provider's written approval or license for contractors for Blu-Garden Vegetated Roof Assembly,
- B) Submit most recent copy of System Provider's literature applicable to products and specifications to be used, as specified herein,
- C) Product Data Sheets: For each component within the Blu-Garden Vegetated Roof Assembly
- D) Samples for Verification on request: For each of the following components of Blu-Garden Vegetated Roof Assembly:
 - 1) Submit three sheet samples approximately 6 x 6 inches or alternately 3 units that are representative of the following products:
 - (a) Root Barrier
 - (b) Protection Fleece
 - (c) Drainage/Retention Board
 - (d) Filter Fleece
 - (e) Edge Element

- 2) Growth Media: 1-quart volume of each growth media specified, in sealed plastic bags labeled with content and source. Each sample shall be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
- E) Product Test Reports on request: For each growth media, including complete analysis coordinated and approved through Sustainablu's approved testing facility, demonstrating compliance with specified requirements.
- F) Warranty: Sample of [5] [10] [15] [20] year warranty from the System Provider.
**SPEC NOTE: Choose one, or contact Sustainablu for extended warranty options.*

VII) QUALITY ASSURANCE

- A) Blu-Garden Vegetated Roof Assembly Installer Qualifications: A qualified assembly Installer approved, authorized, or licensed by Sustainablu, whose work has resulted in successful establishment of vegetated roofs.
 - 1) Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2) Provide a list of at least 3 projects, satisfactorily completed within the past 5 years, of similar scope and complexity to this project.
 - 3) Installer must provide at time of proposal submittal a general liability insurance certificate showing \$1,000,000 in coverage.
- B) Source Limitations: All Blu-Garden Vegetated Roof Assembly components including but not limited to growth media, walkway pavers and accessories are to be sourced or approved by the System Provider.
- C) Pre-installation Conference: Conduct conference at project site.
 - 1) After award of Contract and prior to the commencement of the Work of this Section, schedule and conduct meeting to discuss the Work of this Section and to coordinate with related work. Coordinate with pre-construction meeting specified in Section (xxxxxx). Convene pre-construction meeting to comply with requirements of Division 1 and as follows:
 - (a) General Contractor to notify all attendees at least two weeks prior to the conference.
 - (b) Require attendance of parties directly affecting Work of this Section, including, but not limited to: Owner, Contractor, Architect, System Provider, System Installer, Roofing Membrane Provider, Roofing Membrane Installer and Plumbing Installers.
 - (c) Review methods and procedures related to installation and operation of Work of this Section, including coordination with related Work.
 - (d) Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

VIII) DELIVERY, STORAGE, AND HANDLING

- A) Packaged Materials:
 - 1) Contractor to designate Project Coordinator to be responsible for coordinating all shipments with the System Provider, Project Coordinator to alert System Provider a minimum of 3 weeks prior to delivery to ensure availability of product, additional lead time may be required for certain products or plantings, reference System Provider's Terms and Conditions for exact lead times.
 - 2) Store materials under cover and elevated above ground, out of direct sunlight.
 - 3) Store roll material lying down and on pallets. Fully protect from moisture and direct sunlight exposure.
 - 4) Remove damaged material from job site. Report and replace damage materials.

- 5) Plant materials must be watched carefully. Watering the plants can be necessary during a long storage period. Ensure plants are properly ventilated to prevent overheating. Planting materials are to be installed within twenty-four hours from the time that they are received on the project site and may not remain stacked on a pallet for more than 2 hours.
 - 6) When storing materials on the roof be sure that the load of the materials does not exceed the load of the structure. Coordinate with architect and general contractor on structural allowances for placing pallets on the roof and ensure crane is appropriately sized to reach designated areas of the roof.
 - 7) Store materials in dry, protected areas in an upright position. Control temperature of storage areas in accordance with Manufacturer's instructions. Protect moisture sensitive materials with breathable tarps on sides and top surfaces.
- B) Bulk Materials:
- 1) Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
 - 2) Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3) Accompany each delivery of bulk materials with product certificates.

IX) PROJECT CONDITIONS

- A) Codes/Regulations
- 1) Follow local, state and federal regulations, safety standards and codes. When a conflict exists use the stricter requirement.
- B) Weather Limitations
- 1) Wind speeds are not to exceed 40 mph.
 - 2) Low visibility
- C) Planting Limitations
- 1) Soil must not be frozen.
 - 2) Soil temperature must be over 36° F for 72 hours.
 - 3) Do not install vegetation above 96° F.
 - 4) Consider appropriate protection against weather extremes for 1 week.

X) WARRANTY

- A) The System Provider shall furnish its standard [5] [10] [15] [20] warranty for all Blu-Garden Vegetated Roof Assembly components supplied.

**SPEC NOTE: Choose one, or contact Sustainablu for either applicator only or extended warranty options.*

- B) Warranty for Plant Growth: Installer agrees to submit growers' product guarantee. Installer and owner agree to adhere to Sustainablu's maintenance plan regarding repair or replace plantings within a specified establishment warranty period after installation of vegetation. Establishment warranty shall be defined as: 2 months after vegetation installation, or otherwise known as substantial completion.
- 1) Start Date: If chosen, the start date of the warranty for plant growth shall be the substantial date of completion of Blu-Garden Vegetated Roof Assembly.
 - 2) Coverage: Labor and Plantings
 - 3) Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse or incidents that are beyond contractor's control including, but not limited to, damage caused by other trades or foot traffic caused by others.
 - (a) Visual failure will be determined by no more than 1 square foot of area within a 10 square foot area.

- (i) For Sedum Mat / Sod, diversity shall be a minimum of 4 species per 10 square foot area.
- 4) Minimum Foliage Cover: Planted materials shall grow to achieve and maintain at least:
 - (a) 50 percent foliage cover over planting area commencing 12 months after planting, through the duration of this warranty.
 - (b) 80 percent foliage cover over planting area commencing 24 months after planting, through the duration of this warranty.
- 5) Include the following remedial actions as a minimum:
 - (a) Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - (b) Installation time of replacement planting(s) to be completed by installer, at their discretion in relation to weather, by no longer than 12 months from removal of dead vegetation.
 - (c) If the death of 25 percent or greater of plant materials installed occurs at a single time that is not related to an act of God or owner negligence, Sustainablu is to provide owner and installer a remediation plan to remedy the situation.
 - (d) Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - (i) A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

XI) BIDDING REQUIREMENTS

- A) Pre-Bid Meeting: A pre-bid meeting shall be held with the Owner's Representative and involved trades to discuss all aspects of the project. The Applicator's field representative or roofing foreman for the work shall be in attendance. Procedures to avoid rooftop damage by other trades shall be determined.
- B) Site Visit: Bidders shall visit the site and carefully examine the areas in question as to conditions that may affect proper execution of the work. All dimensions and quantities shall be determined or verified by the contractor. No claims for extra costs will be allowed because of lack of full knowledge of the existing conditions unless agreed to in advance with the Owner or Owner's Representative.

XII) MAINTENANCE SERVICE

- A) Initial Maintenance Service: Provide maintenance by skilled employees of Blu-Garden Vegetated Roof Assembly Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but not for less than the following maintenance period:
 - 1) Initial maintenance period: [30][60][90] days from date of Planting Completion.

**SPEC NOTE: Choose time based on project schedule. The length of time should be as minimal as possible to ensure project has a committed maintenance team working on project. For greater times than 90 days, please contact Sustainablu.*
- B) Continuing Maintenance Proposal: From Blu-Garden Vegetated Roof Assembly Installer to Owner, provide a minimum of 24-month maintenance plan meeting Sustainablu's maintenance requirements.
 - 1) Maintenance Period: 24 months from date of Planting Completion.

PART 2 PRODUCTS

I) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Basis of Design: Sustainablu, <http://www.sustainablu.us>

- B) All products and services shall be approved/procured through the system provider, Sustainability, in order to ensure integrity of the system and maintain system warranty.

II) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Root Barrier: To prevent root penetration into the waterproof membrane. **(AS REQUIRED BY ROOFING/WATERPROOFING TYPE)**
- 1) Type: 20 Mil LDPE Root Barrier [421-RBR-20]
 - (a) Properties: 20 MIL LLDPE Root Barrier
 - (b) Weight: 10 lbs/100 ft²
- B) Protective / Retention Fleece: To protect membrane from paver pedestals and Blu-Garden Vegetated Roof Assembly.
- 1) Type: Extensive Protective Fleece [422-PFC-300]
 - (a) Properties: 9 oz Polypropylene, Polyester and Recycled Acrylic Thread
 - (b) Water Holding Capacity: 11.52 in³/ft²
 - (c) Total Saturated Weight: 0.47 lbs/ft²
- C) Drainage / Retention Board: To provide stormwater retention while simultaneously allowing for continuous drainage.
- 1) Type: Extensive 1" Drainage/Retention Board [434-DRB-25]
 - (a) Properties: High-density polyethylene, double sided form of interlocking cups with depth 1". Perforated holes on top surface for continuous aeration. High load bearing capacity, excellent water retention, passive distribution and drainage properties.
 - (b) Water Holding Capacity: 28.8 in³/ft²
 - (c) Compressive Strength: 23.35 lbs/in² (unfilled), 25.38 lbs/in² (filled)
- D) Granular Drainage Material:
- 1) Type: TerraPor DR - Drainage Aggregate [465-GDA]
 - (a) Granular drainage medium designed for use as a filler substrate beneath multi-layer green roof systems capable of enhancing the compressive strength of the drainage/ water retention panel, a bedding material for pavers as a maintenance path/ patio, and embedded drainage channels may be used to transfer excess water quickly to roof drains or scuppers.
- E) Filter Fleece: Filter separation layer between drainage and substrate layers.
- 1) Type: Extensive Filter Fleece [424-FFC-105]
 - (a) Properties: 4.5 oz system filter, rot and pathogen resistant, non-woven, polymeric, geotextile fabric.
 - (b) Tensile Strength: 1.08 lbs/in²
 - (c) Total Saturated Weight: 0.02 lbs/ft²
- F) Edge Elements: Self-supporting vertical separation between paver and growing media.
- 1) Type: 6" Extensive Edge Element [443-EDG-06O]
 - (a) Properties: L-shaped self-supporting 18 GA Aluminum with perforations along the manifold for continuous drainage. Male & female pieces allow for ease in installation and minimize cutting. Inside and outside corners also manufactured to create seamless corners.
 - (b) Size: 6" height x 4 1/2" flange x 8'-2" sections.
- G) Inspection Chamber: Control shaft for use as roof outlet inspection units.
- 1) Type: Standard Inspection Chamber [431-ISC-FUA]
 - (a) Properties: UV Resistant ABS Plastic with inlet slots in shaft walls and cover.
 - (b) Size: 14 1/2" x 14 1/2" x 4"
 - (c) Components: Includes a lockable lid and stainless-steel filter to prevent debris from entering the drainage system.
 - (d) Extenders available in increments of 4" to achieve desired height.

- H) Growth Media: Vegetated roof assembly supplier's lightweight, custom manufactured soil mixture designed for project location, stormwater retention and/or detention requirements and plant pallet.
- 1) Type: TerraPor EX - Extensive Growth Media [461-GEX]
 - (a) Properties: Formulated growth media to meet European FLL Guidelines for particle size gradation, dry vs saturated bulk density, porosity, water retention hydraulic conductivity, pH balance and organic matter content and all requirements for stormwater retention and/or detention.
 - I) Vegetation
 - 1) Vegetated Roof Seeds
 - (a) Type: Vegetated Roof Seed [471-VSE]
 - (i) Seeds are mixed with sand for an even sowing.
 - (i) Product comes in 25lb bags
 - (ii) Product may be stored for up to ninety (90) days in a temperate environment
 1. 55° – 75° F
 - (ii) Seed Mix Varieties:
 - (i) Basic Sedum Mix [471-VSE-BSC]
 - (ii) Premium Sedum Mix [471-VSE-PRM]
 - (iii) Extensive Perennial Mix [471-VSE-CSM]
 - (iv) Ornamental Grass & Perennial Mix [471-VSE-LGM]
 - 2) Mixed Sedum Cuttings
 - (a) Type: Sedum Cuttings [472-CUT]
 - (i) Sedum Cuttings shall be harvested from healthy, vigorous plants while in a vegetative growth mode and shall range in length from ½" to 3" and possess enough rooting nodes to allow for rapid root development once sown.
 - (ii) Sedum Cuttings shall be harvested, cooled and dried for 24 hours prior to boxing for shipment and delivered in an insulated box with enclosed ice packs to ensure the cuttings remain cool until they are delivered.
 - (iii) Storage of cuttings on project site shall be no longer than 2 days and temperatures shall not exceed 70° F where cuttings are stored.
 - (iv) Available cutting varieties (subject to availability, please contact Sustainable for availabilities):
 - (i) Sedum acre 'Aurea'
 - (ii) Sedum album 'Coral Carpet' & 'Green Ice'
 - (iii) Sedum caucolicum
 - (iv) Sedum divergens
 - (v) Sedum hispanicum 'Purple Form'
 - (vi) Sedum hybridum 'Immergrunchen'
 - (vii) Sedum kamtschaticum 'Variegatum', & 'Weihenstephaner Gold'
 - (viii) Sedum middendorffianum diffusum
 - (ix) Sedum pachyclados
 - (x) Sedum reflexum 'Blue Spruce' & 'Green Spruce'
 - (xi) Sedum rupestre 'Angelina'
 - (xii) Sedum sexangulare
 - (xiii) Sedum spurium 'Album Superbum', 'Dragon's Blood', 'Fuldaglut', 'John Creech', 'Red Carpet', 'Summer Glory', 'Tricolor', & 'Voodoo'
 - (xiv) Sedum stefco
 - (xv) Sedum takesimensis 'Golden Carpet'
 - (xvi) Sedum tetractinum 'Coral Reef'
 - (v) Sedum Cuttings shall be provided in the aforementioned varieties and pounds.

**SPEC NOTE: Sustainable recommends 12 lbs/100 SF for application to attain 85% coverage in 3 years.*

- (vi) Contact System Provider for available and/or In-Season varieties.
- 3) Perennial Plugs
 - (a) Type: Perennial Plugs [473-PPP]
 - (i) Perennial Plugs shall be healthy vigorous plants that will provide rapid root development.
 - (ii) Perennial Plugs shall be delivered in the following means to ensure plants are healthy at receipt of materials:
 - (i) For air shipment, an insulated box with enclosed ice packs to ensure the perennial plugs remain cool and temperate until they are delivered.
 - (ii) For local shipment, all trucks need to be vented and/or plants must be in protected conditions that moderates temperatures from 40°F-85°F during shipment. Shipments of greater than four hours shall require air shipping standards.
 - (iii) Contact System Provider for available and/or In-Season varieties. Reference Sustainable's website for commonly available plantings.
- 4) Fully Vegetated Sedum Mat
 - (a) Type: Fully Vegetated Sedum Mat [474-SMT]
 - (i) Sedum Mats are planted with 5 to 8 different species of Sedum, each mix compiled to suit every particular climate.
 - (ii) Sedum Mats shall consist of 5-8 of the following:
 - (i) Sedum spurium 'Fuldaglut'
 - (ii) Sedum spurium 'John Creech'
 - (iii) Sedum spurium 'Red Carpet'
 - (iv) Sedum kamtschaticum
 - (v) Sedum kamtschaticum 'Variegatum'
 - (vi) Sedum takesimensis 'Golden Carpet'
 - (vii) Sedum acre 'Aureum'
 - (viii) Sedum acre 'Gold Moss'
 - (ix) Sedum album 'Coral Carpet'
 - (x) Sedum album 'Murale'
 - (xi) Sedum stefco
 - (xii) Sedum floriferum 'Weihenstephaner Gold'
 - (xiii) Sedum hispanicum
 - (xiv) Sedum reflexum 'Blue Spruce'
 - (xv) Sedum rupestre 'Angelina'
 - (xvi) Sedum sexangulare
 - (xvii) Sedum x immergrunchen
 - (iii) Properties: Made up of coconut fiber base filled with a planting substrate, and pre-cultivated with a layer of low-profile, drought-tolerant vegetation adapted to rooftop conditions.
 - (iv) Size: Mats come in rolls of 4' x 6'-3" (25 ft² per roll)
- 5) Fully Vegetated Sedum Sod
 - (a) Type: Fully Vegetated Sedum Sod
 - (i) Four Season Mix [475-SMM-FOU]
 - (i) Properties: A blend of Sedums that provide flowers throughout the growing season. Winter interest and seasonal foliage color changes are also found in this group. This is a good, general purpose mix that provides year-round roof top beauty.
 - (ii) Four Season Mix Sedum Sod shall consist of at least 12 of the following:
 - 1. Sedum Kamtschaticum
 - 2. Sedum Spurium 'Dragons Blood'
 - 3. Sedum Acre 'Oktoberfest'

4. Sedum Album
 5. Sedum Stoloniferum
 6. Sedum Ellacombanium
 7. Sedum Floriferum 'Weihenstephaner Gold'
 8. Sedum Spurium 'Voodoo'
 9. Sedum Foresterianum 'Silver Stone'
 10. Sedum Hybridum 'Czar's Gold'
 11. Sedum Spurium 'Summer Glory'
 12. Sedum Sexangulare
 13. Sedum Reflexum 'Blue Spruce'
 14. Sedum Spurium 'Fuldaglut'
 15. Sedum Sediforme
 16. Sedum Spurium 'Coccineum'
 17. Sedum Spurium 'Red Carpet'
- (ii) Color Blast Mix [475-SMM-COL]
- (i) Properties: A blend of Sedums for the roof where maximum color is desired. Comes in the form of brightly colored foliage, flowers in abundance, and colors that blend and go together well.
 - (ii) Color Blast Mix Sedum Sod shall consist of the following:
 1. Sedum Acre 'Aureum'
 2. Sedum Rupestre 'Angelina'
 3. Sedum Reflexum 'Blue Spruce'
 4. Sedum Hybridum 'Immergrunchen'
 5. Sedum Kamtschaticum 'Variegatum'
 6. Sedum Sexangulare
 7. Sedum Spurium 'Summer Glory'
 8. Sedum Spurium 'Voodoo'
 9. Sedum Spurium 'Fuldaglut'
 10. Sedum Dasphyllum 'Blue Cadet'
 11. Sedum Spurium 'Tricolor'
- (iii) Growers Choice Mix [475-SMM-GRO]
- (i) Growers Choice Mix Sedum Sod shall consist of at least 12 of the following:
 1. Sedum Acre
 2. Sedum Acre 'Oktoberfest'
 3. Sedum Album
 4. Sedum Floriferum 'Weihenstephaner Gold'
 5. Sedum Stoloniferum
 6. Sedum Foresterianum 'Silver Stone'
 7. Sedum Kamtschaticum
 8. Sedum Kamtschaticum 'Variegatum'
 9. Sedum Reflexum 'Blue Spruce'
 10. Sedum Rupestre 'Angelina'
 11. Sedum Spurium 'Fuldaglut'
 12. Sedum Spurium 'Coccineum'
 13. Sedum Spurium 'Summer Glory'
 14. Sedum Hybridum 'Czar's Gold'
 15. Sedum Ellacombanium
 16. Sedum Spurium 'Voodoo'
 17. Sedum Spurium 'Tricolor'
 18. Sedum Hybridum 'Immergrunchen'
 19. Sedum Sexangulare
 - (iv) For a Custom Mix, contact System Provider for available varieties.

**SPEC NOTE: For custom sedum sod, please choose from [472-CUT] Sedum Cuttings; Subject to availability. Please allow 120 days for procurement for custom sedum tiles.*

- (b) Properties: Made up of coconut fiber base filled with a planting substrate, and pre-cultivated with a layer of low-profile, drought-tolerant vegetation adapted to rooftop conditions.
 - (c) Size: 12" x 24" and range in height from 2" - 4". The fiber/soil base is approximately 1" thick. Max weight of 3-4 lbs/ft² fully saturated.
- J) Drainage Stone (**NOT PROVIDED BY SUSTAINABLU**)
- 1) Material: Smooth landscape stone
 - 2) Size: 1"-3" diameter
 - 3) Shape: Round / elliptical. Any stone with sharp edges will be rejected.

PART 3 EXECUTION

I) EXAMINATION

- A) Verify that the surfaces and site conditions are ready to receive work.
- B) Verify that the roof surfaces are dry and free of ice or snow.
- C) Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.
- D) Applicator shall verify that the work done under related sections meets the following conditions:
 - 1) Roof drains and/or scuppers have been reconditioned and/or replaced and installed properly.
 - 2) Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured.
 - 3) All surfaces are free of dirt, debris and incompatible materials.

II) PREPARATION

- A) Remove trash and debris from the roof.

III) BLU-GARDEN VEGETATED ROOF ASSEMBLY

- A) Root Barrier (**AS REQUIRED BY ROOFING/WATERPROOFING TYPE**)
 - 1) The primary root barrier shall be installed in accordance with manufacturer's recommendations over the protection course. Install primary root barrier with a minimum of 12-inch side and end laps of root barrier. Run root barrier past full height at all base flashings, drain access boxes, vent pipe access boxes and perimeters.
- B) Protection Fleece/Water Retention Mat(s)
 - 1) Roll out protective fleece on top of waterproof membrane roofing. Overlap seams a minimum of 4 inches along sides and 12 inches along ends. Wet fabric as necessary to provide short-term ballast. For long term ballast use sandbags or paver slabs. Never cut near the roofing membrane when cutting fabric for installation. Only cut fabric using industrial shears, and never with a utility knife.
- C) Drainage/Retention Board
 - 1) Type: Extensive 1" Drainage/Retention Board [434-DRB-25]
 - (a) Be sure to orient drainage board with large knobs up..
 - (b) Install boards starting at roof drains and work towards high elevations. Overlap boards similar to shingles to ensure continuous drainage to outlets. Overlap edges by interlocking 1-2 rows of cups. Overlap area should total approximately 8% of roof area and be uniform throughout.
 - (c) When cutting boards use only a circular saw for efficient use of all material and to ensure crisp edges upon cutting. Cut along valley between cups. Never use a utility knife.

- D) Granular Drainage Material
- 1) Granular drainage material to be placed carefully to avoid damage or displacement of other materials such as edge elements and drainage components.
 - 2) Fill drainage boards cups to depth specified on the roofing, landscaping and/or green roofing plans with a variation of no more than 1/2".
- E) Filter Fleece
- 1) Roll out filter fleece on top of drainage/retention board or granular drainage material. Overlap seams a minimum of 4 inches along sides and 12 inches along ends. Wet fabric as necessary to provide short-term ballast. For long term ballast use sandbags or paver slabs. Only cut fabric using industrial shears, and never with a utility knife. Never cut near the roofing membrane when cutting fabric for installation.
- F) Edge Elements
- 1) Type: Extensive Edge Element [443-EDG-06O]
 - (a) Lay edge profile sections end to end on top of the protective fleece layer.
 - (b) Corner pieces to be used for 90-degree corners. Corners of any angle may be formed by cutting the edging on site
 - (c) Follow the submitted edge installation plan to ensure correct mix of male and female pieces are used. This includes all corners and radiuses. Adjustments to be expected as growing media is being installed that edging remains in the indicated areas on the submitted edge installation plan.
 - (d) Connect edge pieces and corners with provided connectors
 - (e) Make sure edging does not come in direct contact with base waterproofing membrane.
 - (f) Tools: Rubber or rawhide hammer.
- G) Inspection Chamber
- 1) In the case that drainage board is installed adjacent to the drains then the inspection chambers are to be placed directly over top of the board.
 - 2) In the case that a drainage stone is used the inspection chambers should be placed directly on the protective fleece with the drainage stone abutting the outside walls.
 - 3) In the case of inverted roofs, the inspection chambers are placed on the thermal insulation. Following this, a separation ring is installed, which is filled with gravel thus forming the gravel strip surrounding the inspection chamber.
- H) Growth Media
- 1) Growth media to be placed carefully to avoid damage or displacement of other materials such as edge elements, filter fleece and drainage components.
 - 2) Spread growth media to the depths as specified on the roofing, landscaping and/or green roofing plans with a variation of no more than 1/2". Ensure that growth media does not get under the layers of filter fleece, between filter fleece overlap, or into drainage/retention board cups. Finish depth of media to be verified by manufacturer prior to vegetation installation.
 - (a) Apply Bio-Stimulant and Bio-Fertilizer soil amendments over approved growth media depth.
 - 3) Growth media can be shipped in a variety of forms depending on logistics.
 - (a) Supersacks: 2 Cubic Yards. Ideal for larger vegetated roofs. The load bearing capacity of the roof must be considered before unloading bags on top of roof. Access and operation of a crane must also be considered for this application.
 - (b) Blowing Trucks: The granulometric distribution may change depending on the source material. A watering arrangement may be used to keep the growing media moist and prevent erosion.

- (c) Only use flat-edge plastic shovels & landscaping rakes for placement, movement, and leveling of growth media, all other tools must be approved by manufacturer for use.
- 4) If there is spillage of growth media into drainage/retention board or subsequent layers beneath, use a portable shop vacuum to ensure that debris is removed and placed appropriately.
- I) Vegetated Roof Seed Sowing
 - 1) Apply when Growth Media is between 35° F (2°C) and 89° F (32°C).
 - 2) 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 vegetated roof seeds.
 - 3) Calibrate spreader.
 - 4) Apply with a spreader at a rate of 0.1 lbs/square foot.
 - 5) Seeds to be covered thinly with sand base (Sand will be seen on soils)
 - 6) Do not cover with compost, only press them in gently. Irrigate with a hand-sprayer or spray heads, so that the seeds will not be washed away.
 - 7) Seeds are rapidly germinating, keep seed in constant moisture (not saturated, moist),
 - 8) Irrigation settings for establishment
 - (a) Integrated moisture or rain gauge module to be included with irrigation system to prevent overwatering.
 - (b) Irrigation schedule:
 - (i) Once an hour for 5 minutes through the end of the 2nd week (14 days) after initial sowing
 - (ii) Once every other hour for 5 minutes for the 3rd through 5th week after initial sowing.
 - (iii) In the morning at 5am for 20 minutes and at 7pm for 20 minutes from the 6th week through the 13th week.
- J) Sedum Cuttings
 - 1) Apply when Growth Media is between 35° F (2°C) and 89° F (32°C).
 - 2) 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.
 - 3) Consult drawings for sedum cuttings layout and distribution rate. Unless otherwise noted the distribution rate shall be 12 lbs/100 SF
 - 4) Irrigation settings for establishment
 - (a) Integrated moisture or rain gauge module to be included with irrigation system to prevent overwatering.
 - (b) Irrigation schedule:
 - (i) Once an hour for 5 minutes through the end of the 2nd week (14 days) after initial sowing > 1" week
 - (ii) Once every other hour for 5 minutes for the 3rd through 5th week after initial sowing. > 0.75" week
 - (iii) In the morning at 5am for 20 minutes and at 7pm for 20 minutes from the 6th week through the 13th week. > 0.5" week
- K) Perennial Plugs
 - 1) Plant all specified nursery stock plantings in accordance with approved landscape design.
 - 2) If more than 24 hours has elapsed since installing and soaking the growth media, thoroughly re-soak growth media prior to commencing planting the plugs.
 - 3) Consult drawings for plug planting layout and rate.

[400-600] BLU-GARDEN INSTALLATION GUIDELINES

1 PREPARATION

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

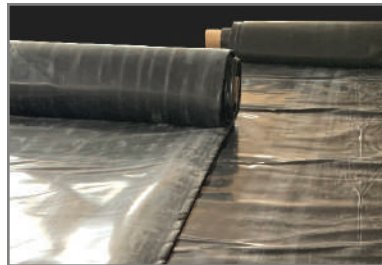
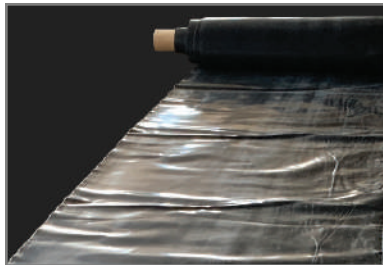


2 ROOT BARRIER

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.



[400-600] BLU-GARDEN INSTALLATION GUIDELINES

4 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.



5 DRAINAGE BOARDS

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.

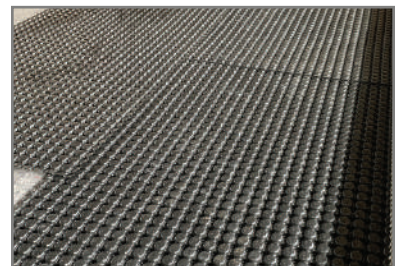
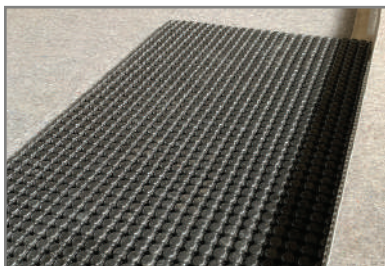
Wide corrugation peak must be facing upwards (FKD 25 must be visible from above).

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.



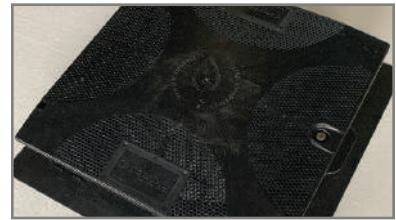
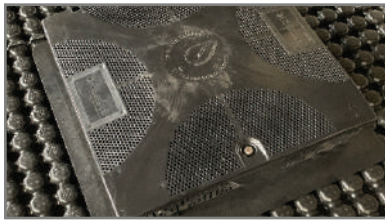
[400-600] BLU-GARDEN INSTALLATION GUIDELINES

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.

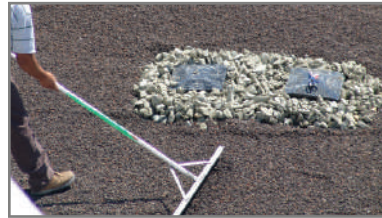


7 GRANULAR DRAINAGE MATERIAL

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.



8 FILTER FLEECE

To separate drainage from substrate layers, roll out filter fleece on top of drainage board or granular drainage material.

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.



[400-600] BLU-GARDEN INSTALLATION GUIDELINES

9 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.



10A 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.



[400-600] BLU-GARDEN INSTALLATION GUIDELINES

10B 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.



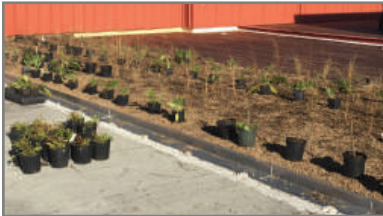
10C PERENNIAL PLUGS

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.



10D 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.



BLU-GARDEN MAINTENANCE GUIDELINES

BLU-GARDEN DEFINITION AND STANDARD DISCLAIMER:

Sustainablu' Blu-Garden Roofing System 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-Garden Systems to qualify for specified warranties, the system specifications and design must completely follow Sustainablu's Blu-Garden 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-GARDEN OPERATIONS:

Sustainablu's Blu-Garden Systems on their 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-Garden Systems, 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-Garden Systems. 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-Garden Systems until they check in with Owner. Prior to access to the Blu-Garden Systems, owner should note in writing, the date and time that personnel access the roof.

MAINTENANCE ACTIVITIES

WEEDING:

Blu-Garden Systems always require weeding. 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. Left unattended, weeds will 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.

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-Garden Systems 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-GARDEN 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-GARDEN 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-GARDEN 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-Garden 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 7xx Slope Stabilization products 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 xx4x Edge Systems are warranted for (20) twenty years if properly installed according to project specifications.

Blu-Garden 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-Garden 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 attend 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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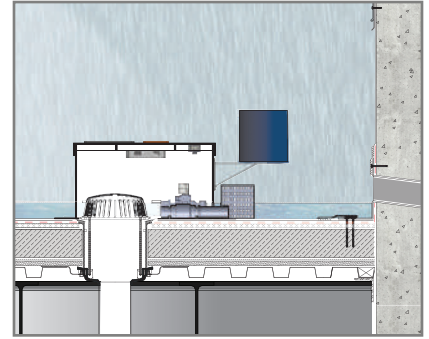
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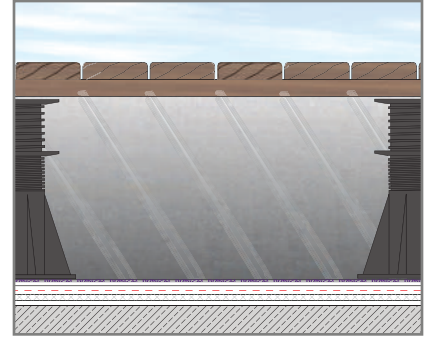
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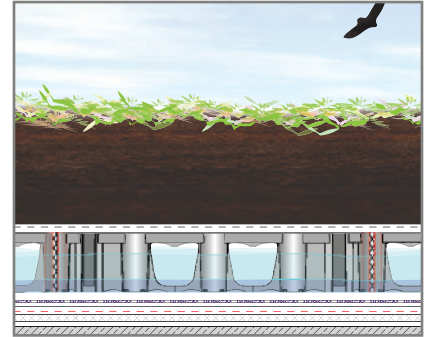
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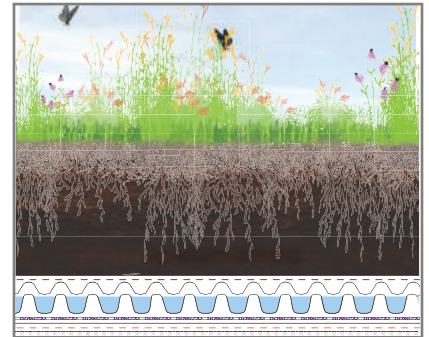
BLU-VAULT

[350] - BLU-VAULT SYSTEMS



BLU-GARDEN

[400-2400] - BLU-GARDEN SYSTEMS



BLU-SOLAR

[5000] - BLU-SOLAR SYSTEMS

