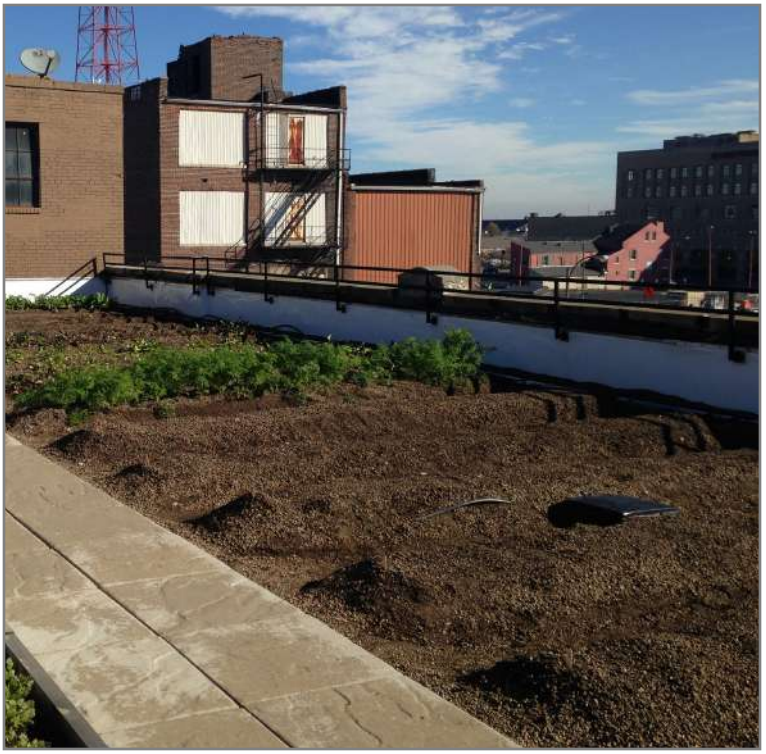
# BLU-GARDEN

System 1800: Agricultural Applications

**SUSTAINABLU**

**On Structure Stormwater Management Systems**



SUSTAINABLU
On Structure Stormwater Management Systems

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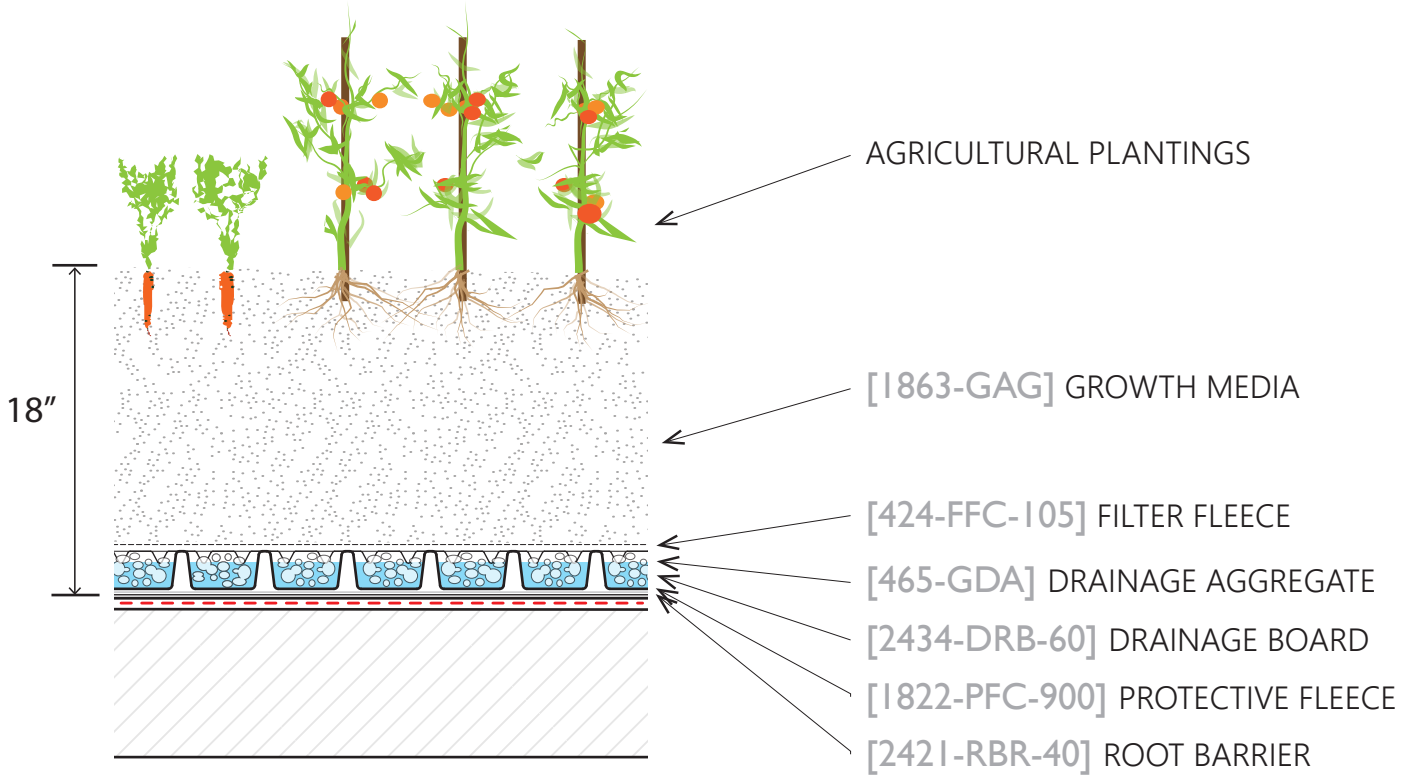
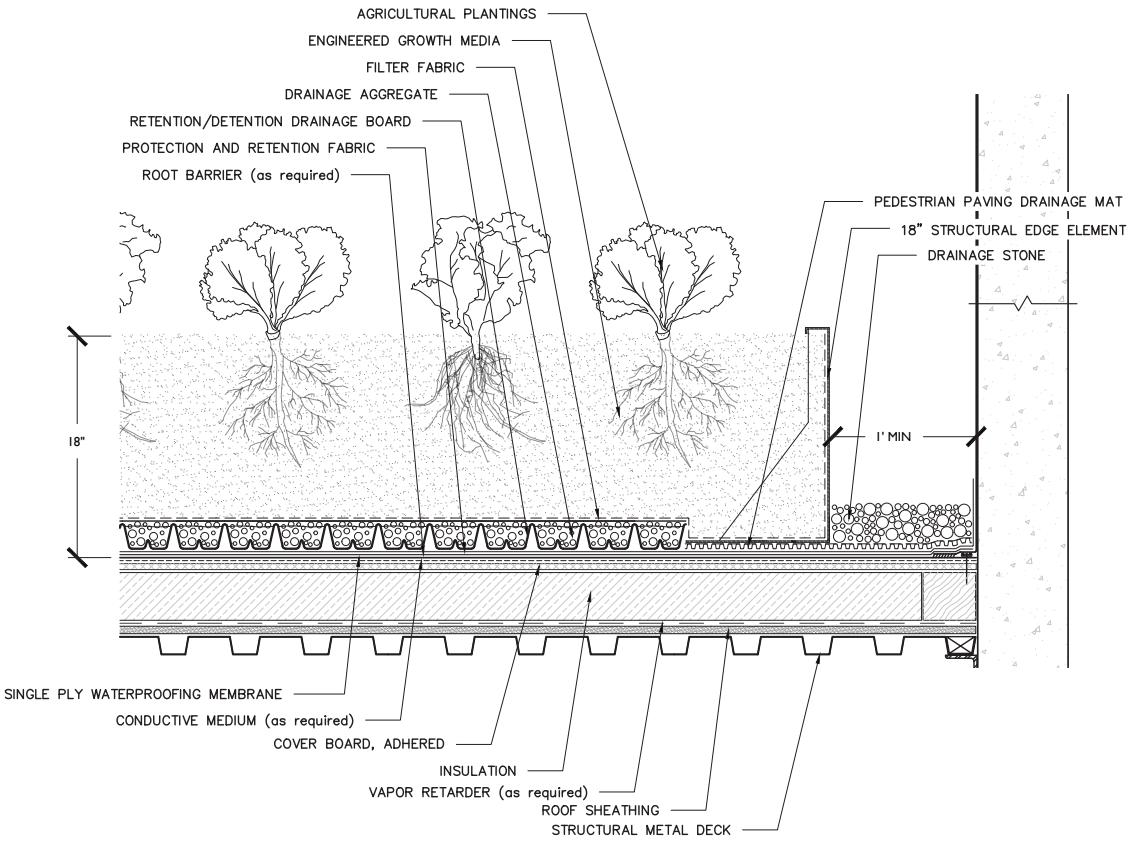
# Blu-Garden Assembly - Agricultural

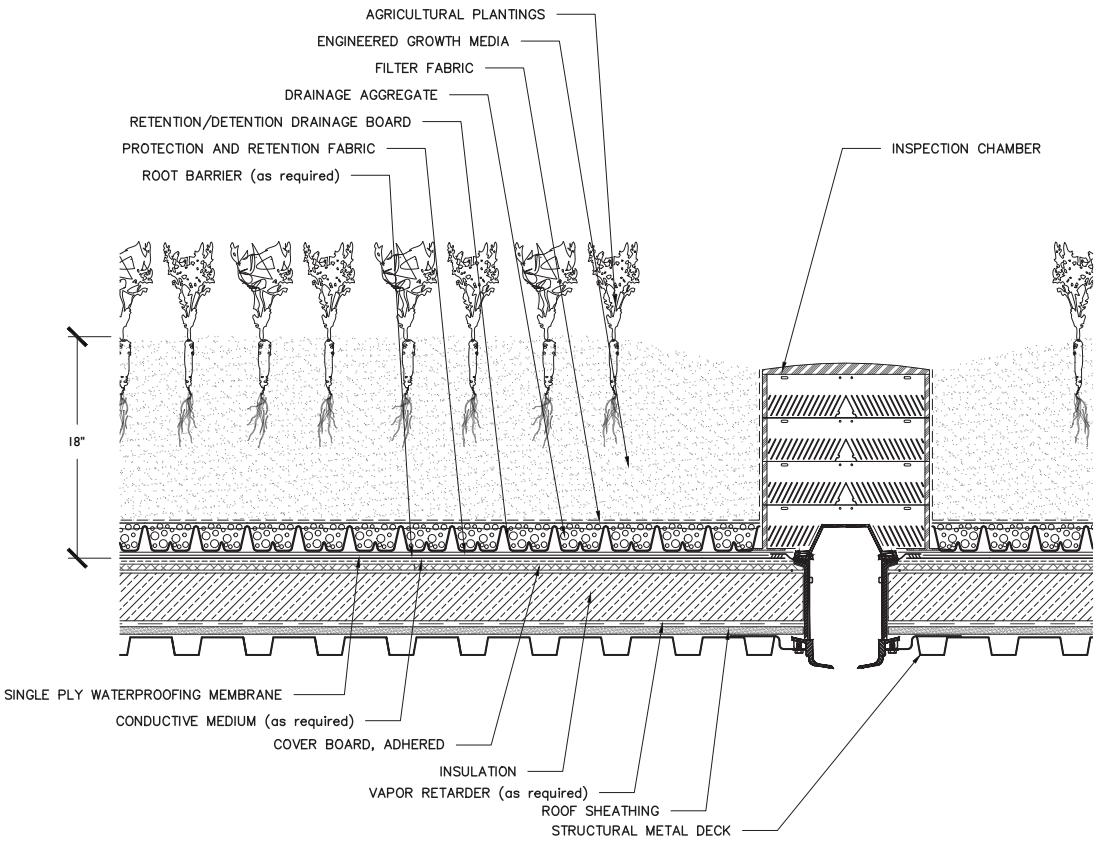
**Stormwater Retention**
- 4.80 - 5.67 gallons / $ft^2$

**Saturated Weight**
- 90 - 118 pounds / $ft^2$



# Typical Wall & Drain Details



# SUSTAINABLU

**On Structure Stormwater Management Systems**

*Product #* **2421**

## 40 Mil HDPE Root Barrier

Our 40 Mil Root Barrier is a heavy duty, high density polyethylene (HDPE) 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 heavy 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
- has the strength to be able to **protect the membrane from tree roots**

• Special order product

• Individual Roll
• Full Pallet

• 1,017 ft² per Roll
• 12 Rolls per Pallet (12,204 ft²)

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

## Technical Data

**Materials:**
• Recycled HDPE

**Material Thickness (ASTM D 751):**
• 0.04" (40 mils)

**Roll Dimensions (W x L):**
• 10.167' x 100'

**Roll Weight (ASTM D 461):**
• 192 lbs. / Roll (0.189 lbs. / ft²)

**Tensile Strength (ASTM D 6693):**
• 154 lbf / in. width

**Mullen Burst (ASTM D 751):**
• 220 lbs. / in²

**Elongation (ASTM D 882):**
• 800%

**Tear Resistance (ASTM D 1004):**
• 22 lbf

**Hydrostatic Resistance (ASTM D 751):**
• 250 lbs. / in²

**Vegetated Roofing Use:**
• Intensive vegetated roofs with semi-aggressive root systems

**Installation Requirements:**
• Overlap seams by 6"
• Tape joints with HG 3210 Seam Tape if not utilizing Leak Detection

# SUSTAINABLU

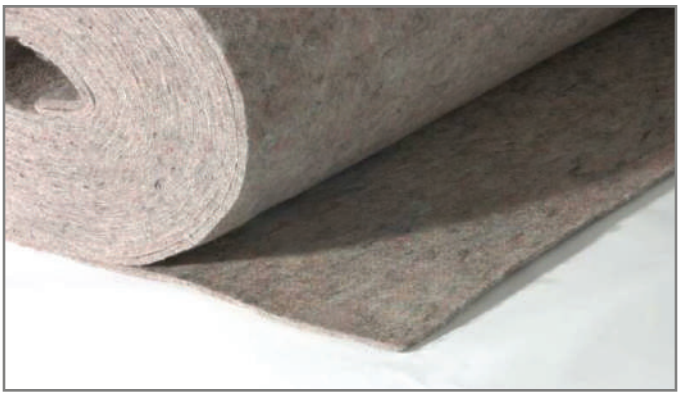
**On Structure Stormwater Management Systems**

*Product #* **1822**

## Intensive Protective / Storage Fleece - 27 oz

Our Intensive Protective / Storage Fleece is designed specifically for use within Intensive green roofing systems or for additional stormwater retention. Specific to this product, it:

- **amplifies stormwater retention** of Blu-Garden and Blu-Vault systems
- **protects the roof membrane** and/or root barrier against damage from high mechanical demands
- **separates materials** of incompatible substrates from one another
- **stores water** & nutrients, depending on its function
- allows for the **even distribution of water** when a drip irrigation system is installed on a lightweight roof
- has a mass/structure and water holding capacity designed with the dead load weight and plant palettes of the Intensive roof system in mind to give the perfect **balance of water holding capacity and protection**



Protection and Storage Fleece RMS 900 by OPTIGRÜN® ROOF GREENING

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

- Special order product

- Individual Roll
- Full Pallet

- 538 ft² per Roll
- 6 Rolls per Pallet (3,228 ft²)

## Technical Data

**Materials:**
- Polypropylene, Polyester & Recycled Acrylic Thread

**Material Thickness:**
- 0.24", 27 oz.

**Roll Dimensions (W x L):**
- 6' 6 3/4" x 82' 1/4"

**Roll Diameter:**
- 1' 4 1/2"

**Roll Weight:**
- 99 lbs.

**Total Saturated Weight:**
- 1.41 lbs. / ft²

**Water Holding Capacity:**
- 0.24 in³ / in² (0.147 gal / ft²)

**Rot & Pathogen Resistant:**
- Yes

**Puncture Resistant:**
- Yes

**Vegetated Roofing Use:**
- Intensive / Modular vegetative roofs

**Installation Requirements:**
- Overlap fabric by 6"

# SUSTAINABLU

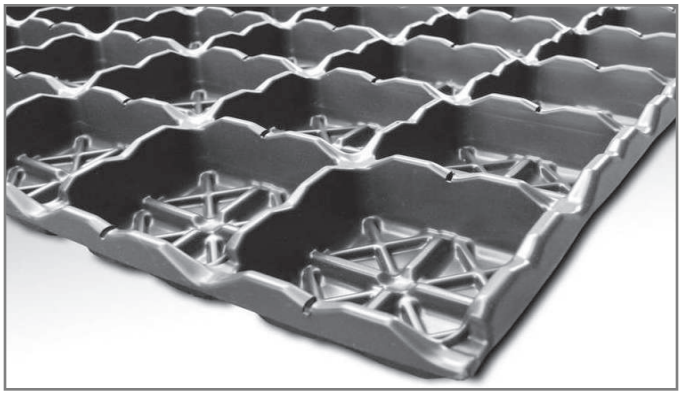
**On Structure Stormwater Management Systems**

*Product #* **2434**

## Intensive 2.4" Drainage / Retention Board

Our Intensive 2.4" Drainage / Retention (DR) Board provides water storage for intensive roofs with large plant palettes. Specific to this product, it:

- is a plastic panel 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 **plantings, including shrubs & trees**; in a greater than 12" depth assembly
- **transfers loads uniformly** to the substructure via large contact areas



Protection and Drainage Board FKD 60BO by OPTIGRÜN® ROOF GREENING

- Special order product

- Individual Unit
- Full Section
- Full Pallet

- 24.75 $ft^2$ per Unit
- 30 Units per Section (742.5 $ft^2$)
- 6 Sections per Pallet (4,455 $ft^2$)

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

## Technical Data

**Materials:**
- Recycled HDPE

**Material Thickness:**
- 2.36"

**Board Dimensions (W x L):**
- 3' 3 1/2" x 7' 8 1/8"

**Board Area:**
- 24.75 $ft^2$

**Board Weight:**
- 0.47 lbs. / $ft^2$

**Compressive Strength:**
- 94.27 lbs. / $in^2$ (filled)

**Water Holding Capacity:**
- 0.91 $in^3$ / $in^2$ (0.564 gal / $ft^2$) (filled)

**Drainage Performance (fully saturated):**
- at 1% Slope = 29.38 $in^3$ / ft / sec
- at 2% Slope = 42.59 $in^3$ / ft / sec

**Vegetated Roofing Use:**
- High load capacity systems that harvest stormwater and cool buildings

**Installation Requirements:**
- Butt boards tight together
- Cover boards with overburden immediately to protect from UV rays & wind uplift

# SUSTAINABLU

**On Structure Stormwater Management Systems**

*Product #* **424**

## Standard Filter Fleece

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

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

Filter Fleece FIL 105 by

OPTIGRÜN® ROOF GREENING

- Individual Roll
- Full Pallet

- 2,153 $ft^2$ per Roll
- 11 Rolls per Pallet (23,683 $ft^2$)

## 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. / $ft^2$

**Tensile Strength (CBR Test):**
- 1.08 lbs. / $in^2$

**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

# SUSTAINABLU

**On Structure Stormwater Management Systems**

## TerraPor AG - Agricultural Growth Media

Our Agricultural Blend is mixed for vegetated roofs with numerous varieties of crop palettes. We custom blend per a project's crop palette. Agricultural Blend growth media offers many advantages:


- a precisely blended growth media designed for agricultural green roof systems with a **media depth of 6-18 inches**
- designed to be **lightweight**, Agricultural Blend growth media uses porous materials designed to **retain maximum amounts of water** while simultaneously **promoting drainage**
- optimized for farming and the production of **agricultural crops**
- blended to strict **FLL-compliant** guidelines

• Special order product

• 2 $yd^3$ Supersack
• Bulk

• 2 $yd^3$ Supersack
• Bulk

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

## Quick Reference & Shipping Data

**Vegetated Roofing Use:**
- Standard agricultural vegetated roofs

**Coverage (1 $yd^3$):**
- at 9" = 36 $ft^2$
- at 12" = 27 $ft^2$
- at 18" = 18 $ft^2$

**Dry Weight (approximate):**
- 43 lbs. / $ft^3$

**Saturated Weight (approximate):**
- 74 lbs. / $ft^3$
  - at 9" = 55.5 lbs. / $ft^2$
  - at 12" = 74.0 lbs. / $ft^2$
  - at 18" = 111.0 lbs. / $ft^2$

**Bulk Shipping Data:**
- Bulk material weighs approximately 1,425 lbs. / $yd^3$
- 32 - 34 $yd^3$ in dump trailer, 22 - 24 $yd^3$ in a tri-axle

**2 $yd^3$ Super Sacks:**
- 2 $yd^3$ Super Sacks weigh approximately 2,850 lbs.
- 15 - 16 2 $yd^3$ Super Sacks / flatbed trailer

Product # 1863

## 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 | 50 - 85 |
| Passing #18 Sieve | 1.00 | 0.039 | 30 - 55 |
| Passing #60 Sieve | 0.25 | 0.010 | 20 - 35 |
| Passing #230 Sieve | 0.06 | 0.002 | 10 - 25 |
| Silt & Clay Fraction | < 0.06 | < 0.002 | < 10 |

| Density: | g / cm³ | lbs. / ft³ |
|---|---|---|
| Application Density | 0.61 - 0.78 | 38 - 49 |
| Saturated Density | 1.01 - 1.25 | 63 - 78 |
| | | % of Total Weight |
| Dry Media | | 31 - 62 |

| Water & Air Management: | % by Volume | in³ / ft³ |
|---|---|---|
| Saturated Water Capacity | 40 - 70 | 690 - 1205 |
| Saturated Air Capacity | > 10 | > 173 |
| | cm / hour | inches / hour |
| Saturated Hydraulic Conductivity | > 5.0 | > 1.7 |

| pH, Lime, & Salt Content: | units | % as $CaCO_3$ | mmhos / cm |
|---|---|---|---|
| pH (saturated paste) | 6.0 - 7.5 | - | - |
| Carbonate Content | - | < 2.5 | - |
| Electrical Conductivity | - | - | < 2.5 |

| Organics: | % of Dry Weight |
|---|---|
| Organic Matter | 8.0 - 10.0 |
| 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) | 351 - 417 | 12 - 14 | 3 - 15 |
| Phosphorous (as $P_2O_5$) | 135 - 189 | 6 - 7 | 1 - 7 |
| Potassium ($K_2O$) | 324 - 340 | 14 - 15 | 6 - 15 |
| Calcium (Ca) | 702 - 1134 | 27 - 44 | 19 - 65 |
| Magnesium (Mg) | 162 - 216 | 6 - 9 | 3 - 15 |
| Sulfur (as $SO_4$-S) | 81 - 97 | 3.0 - 3.5 | 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 - 54 | 1 - 2.5 | 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 |
|---|---|
| $CE_{cap}$ | > 6 |

# SUSTAINABLU

**On Structure Stormwater Management Systems**

## 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 $yd^3$ Supersack
- Bulk

- 2 $yd^3$ Supersack
- Bulk

## Quick Reference & Shipping Data

**Vegetated Roofing Use:**
- Granular drainage layer

**Coverage (1 $yd^3$):**
- at 3" = 108 $ft^2$
- at 4" = 81 $ft^2$
- at 6" = 54 $ft^2$

**Dry Weight (approximate):**
- 40 lbs. / $ft^3$

**Saturated Weight (approximate):**
- 52 lbs. / $ft^3$
  - at 3" = 14.0 lbs. / $ft^2$
  - at 4" = 17.33 lbs. / $ft^2$
  - at 6" = 26.0 lbs. / $ft^2$

**Bulk Shipping Data:**
- Bulk material weighs approximately 1,080 lbs. / $yd^3$
- 32 - 34 $yd^3$ in dump trailer, 22 - 24 $yd^3$ in a tri-axle

**2 $yd^3$ Super Sacks:**
- 2 $yd^3$ Super Sacks weigh approximately 2,160 lbs.
- 15 - 16 2 $yd^3$ 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: | $g / cm^3$ | $lbs. / ft^3$ |
|---|---|---|
| Application Density | 0.55 - 0.72 | 35 - 45 |
| Saturated Density | 0.70 - 0.95 | 44 - 60 |

| Water & Air Management: | % by Volume | $in^3 / ft^3$ |
|---|---|---|
| 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 $CaCO_3$ | mmhos / cm |
|---|---|---|---|
| pH (in $CaCl_2$) | 6.0 - 8.5 | - | - |
| Carbonate Content | - | < 2.5 | - |
| Electrical Conductivity | - | - | < 2.5 |

# SUSTAINABLU

**On Structure Stormwater Management Systems**

*Product #* **431**

## 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

# SUSTAINABLU

**On Structure Stormwater Management Systems**

*Product #* **433**

## 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.

**Vegetated Roofing Use:**
• 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

# [1800] 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.

# [1800] Blu-Garden Installation Guidelines

## 4 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 a corner of the roof.

The serrated edge overlaps on the long and short sides, with the short side pointing towards the roof edge.

Place the following panel on the short side of the first panel. Ensure that the panels are aligned identically. Hook the serrated edge overlap of the second panel into the first panel. Complete the first row in this pattern.

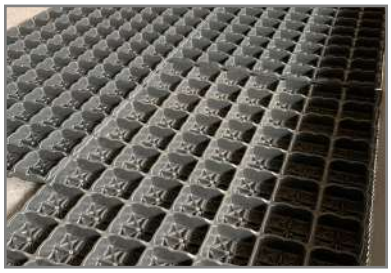
Start the second row on the long side of the first panel. Hook the serrated edge overlap into the previous row. Repeat installation pattern for subsequent rows.

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.





## 5 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 place 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.



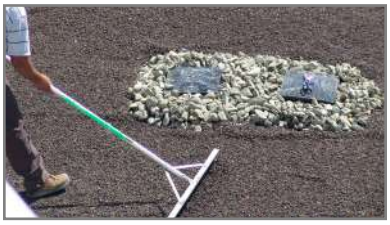
# [1800] Blu-Garden Installation Guidelines

## 6 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.



## 7 Filter Fleece

To separate drainage from substrate layers, roll out filter fleece on top of drainage aggregate.

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.

## 8 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.

# 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.

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# 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.

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# 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 REPESENTATIONS 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 attempt mediation facilitated by a mutually agreed upon neutral mediator before conducting formal discovery. At mediation, Sustainablu, LLC and Claimant shall each have a designated representative attend who has full authority to settle the civil action. Sustainablu, LLC and Claimant shall be responsible for their own attorney fees and any other expense associated with mediation as well as paying for an equal share of the mediator's fee. To obtain installation or maintenance recommendations, request information on extended warranties or make a warranty claim contact: Sustainablu, LLC, c/o Chief Financial Officer, by mail at 531 S. Water Street, Milwaukee, WI 53204.

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

# SUSTAINABLU

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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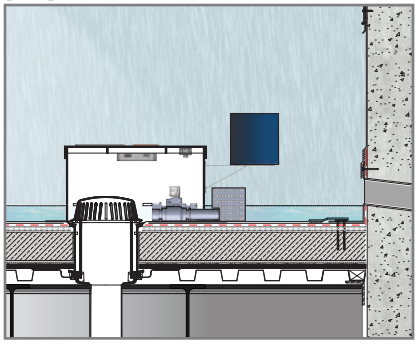
BLU-SMART

**[180]** - BLU-SMART SYSTEMS



BLU-TERRACE

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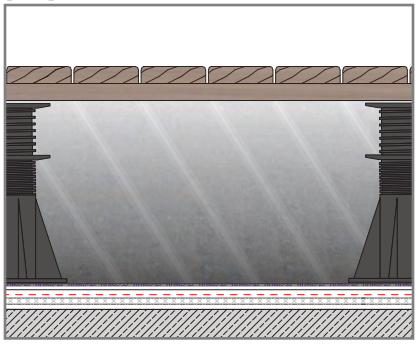

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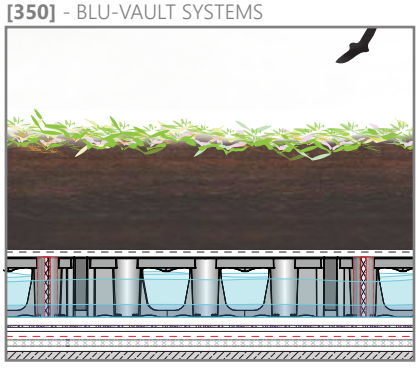

BLU-GARDEN

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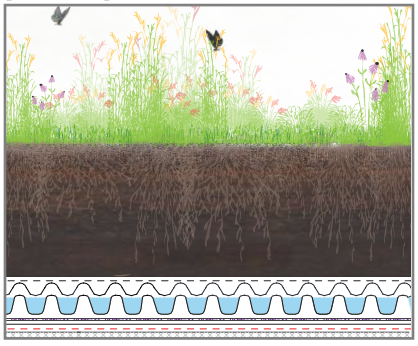

BLU-SOLAR

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