## Typical EcoCline Profiles

Other EcoCline profiles are available to meet the stormwater and weight requirements for your project.

### EcoCline 2+2
- **System Thickness**: 4 inches (2” media + 2” water retention)
- **Dry Weight**: 28-31 lbs/sf
- **Max. Fully Saturated Wt.**: 47-50 lbs/sf
- **Water Holding Capacity**: 2.2 gallons/sf
- **Max. Rain Event Capacity**: 3.5 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 51% ASTM E-2397, -99
- **Bulk Density (dry)**: 51-54 lbs/cf
- **Bulk Density (wet)**: 82-85 lbs/cf

### EcoCline 3+1
- **System Thickness**: 4 inches (3” media + 1” water retention)
- **Dry Weight**: 20-22 lbs/sf
- **Max. Fully Saturated Wt.**: 28-30 lbs/sf
- **Water Holding Capacity**: 1.0 gallons/sf
- **Max. Rain Event Capacity**: 1.5 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 88
- **Maximum Water Retention**: 37% ASTM E-2397, -99
- **Bulk Density (dry)**: 66-68 lbs/cf
- **Bulk Density (wet)**: 89-91 lbs/cf

### EcoCline 4+2
- **System Thickness**: 6 inches (4” media + 2” water retention)
- **Dry Weight**: 28-30 lbs/sf
- **Max. Fully Saturated Wt.**: 32-44 lbs/sf
- **Water Holding Capacity**: 1.6 gallons/sf
- **Max. Rain Event Capacity**: 2.5 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 44% ASTM E-2397, -99
- **Bulk Density (dry)**: 59-62 lbs/cf
- **Bulk Density (wet)**: 85-88 lbs/cf

### EcoCline 3+2
- **System Thickness**: 5 inches (3” media + 2” water retention)
- **Dry Weight**: 22-24 lbs/sf
- **Max. Fully Saturated Wt.**: 34-36 lbs/sf
- **Water Holding Capacity**: 1.6 gallons/sf
- **Max. Rain Event Capacity**: 2.4 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 47% ASTM E-2397, -99
- **Bulk Density (dry)**: 56-59 lbs/cf
- **Bulk Density (wet)**: 86-89 lbs/cf

### EcoCline 2+3
- **System Thickness**: 5 inches (2” media + 3” water retention)
- **Dry Weight**: 16-17 lbs/sf
- **Max. Fully Saturated Wt.**: 33-34 lbs/sf
- **Water Holding Capacity**: 2.1 gallons/sf
- **Max. Rain Event Capacity**: 3.4 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 44% ASTM E-2397, -99
- **Bulk Density (dry)**: 60-61 lbs/cf
- **Bulk Density (wet)**: 86-88 lbs/cf

### EcoCline 2+1
- **System Thickness**: 3 inches (2” media + 1” water retention)
- **Dry Weight**: 13-15 lbs/sf
- **Max. Fully Saturated Wt.**: 21-22 lbs/sf
- **Water Holding Capacity**: 0.9 gallons/sf
- **Max. Rain Event Capacity**: 1.3 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 88
- **Maximum Water Retention**: 37% ASTM E-2397, -99
- **Bulk Density (dry)**: 66-68 lbs/cf
- **Bulk Density (wet)**: 89-91 lbs/cf

### EcoCline 4+3
- **System Thickness**: 6 inches (4” media + 3” water retention)
- **Dry Weight**: 23-24 lbs/sf
- **Max. Fully Saturated Wt.**: 40-41 lbs/sf
- **Water Holding Capacity**: 2.1 gallons/sf
- **Max. Rain Event Capacity**: 3.4 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 55% ASTM E-2397, -99
- **Bulk Density (dry)**: 54-48 lbs/cf
- **Bulk Density (wet)**: 80-83 lbs/cf

### EcoCline R+2
- **System Thickness**: 3.5 inches (1.5” media R + 2” water retention)
- **Dry Weight**: 13-14 lbs/sf
- **Max. Fully Saturated Wt.**: 22-23 lbs/sf
- **Water Holding Capacity**: 1.5 gallons/sf
- **Max. Rain Event Capacity**: 2.2 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 64% ASTM E-2397, -99
- **Bulk Density (dry)**: 45-48 lbs/cf
- **Bulk Density (wet)**: 77-80 lbs/cf

### EcoCline 3+3
- **System Thickness**: 6 inches (3” media + 3” water retention)
- **Dry Weight**: 22-24 lbs/sf
- **Max. Fully Saturated Wt.**: 34-36 lbs/sf
- **Water Holding Capacity**: 1.6 gallons/sf
- **Max. Rain Event Capacity**: 2.4 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 65% ASTM E-2397, -99
- **Bulk Density (dry)**: 56-59 lbs/cf
- **Bulk Density (wet)**: 86-89 lbs/cf

### EcoCline R+3
- **System Thickness**: 4.5 inches (1.5” media R + 3” water retention)
- **Dry Weight**: 16-17 lbs/sf
- **Max. Fully Saturated Wt.**: 33-34 lbs/sf
- **Water Holding Capacity**: 2.0 gallons/sf
- **Max. Rain Event Capacity**: 3.2 inch storm
- **ANSI/SPRI RP-14 Class**: #2 ballast
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 64% ASTM E-2397, -99
- **Bulk Density (dry)**: 45-48 lbs/cf
- **Bulk Density (wet)**: 77-80 lbs/cf

### EcoCline 1+2
- **System Thickness**: 3 inches (1” media + 2” water retention)
- **Dry Weight**: 13-14 lbs/sf
- **Max. Fully Saturated Wt.**: 22-23 lbs/sf
- **Water Holding Capacity**: 1.5 gallons/sf
- **Max. Rain Event Capacity**: 2.1 inch storm
- **ANSI/SPRI RP-14 Class**: N/A
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 77
- **Maximum Water Retention**: 62% ASTM E-2397, -99
- **Bulk Density (dry)**: 39-43 lbs/cf
- **Bulk Density (wet)**: 78-81 lbs/cf

### EcoCline 1+1
- **System Thickness**: 2 inches (1” media + 1” water retention)
- **Dry Weight**: 13-14 lbs/sf
- **Max. Fully Saturated Wt.**: 22-23 lbs/sf
- **Water Holding Capacity**: 1.0 gallons/sf
- **Max. Rain Event Capacity**: 1.5 inch storm
- **ANSI/SPRI RP-14 Class**: N/A
- **ANSI VF-1 Rating**: Class A
- **MDE Runoff Curve Number**: 88
- **Maximum Water Retention**: 57% ASTM E-2397, -99
- **Bulk Density (dry)**: 46-48 lbs/cf
- **Bulk Density (wet)**: 81-83 lbs/cf

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ECOCLINE PROFILE TECHNICAL DATA

R+ Profiles
The R+ Profiles use the same components as the 1+, 2+, 3+ profiles, with the exception of Media R and Media B3 in lieu of Media B2.

MEDIA R and MEDIA B3 (weed suppression and nutrient layers)
Media R (rock) is used with the R+ assemblies, in combination with Media B3. Media B3 is placed as a 1/4-inch to 1/2-inch layer, then Media R is placed on top. In another method, the layers are placed together and allowed to striate into a distinct upper weed suppression layer and lower nutrient layer.

- **Media R Primary components**: Locally available rock, type varies, often re-used roof ballast
- **Media R Particle size**: #2-#4 ballast, ASTM D-7655
- **Media R Particle size**: 90% <= 2-1/2”
- **Media B3 Primary components**: Post-industrial pine fines <=40% per volume
- **Media B3 Primary components**: Post-industrial or demolition brick fines
- **Media B3 Particle size**: 90% <= 1/4”
- **Maximum water retention**: >=17% (ASTM E-2399)

Typical Profile Components

TEMPORARY SURFACE PROTECTION LAYER
- **Material**: Biodegradable tackifier
- **Primary components**: Post-industrial and/or demolition brick & granite
- **Particle size**: 90% <= 1/2”
- **Organic components**: Post-industrial pine fines <=20% per volume
- **Maximum water retention**: >=17% (ASTM E-2399)

FILTER FABRIC
- **Minimum Average Values**:
  - **Unit Weight**: 4 oz/SY (ASTM D-3776)
  - **Grab Tensile Strength**: 100 lbs (ASTM D-4632)
  - **Grab Elongation**: 50% (ASTM D-4632)
  - **CBR Puncture Strength**: 300 lbs (ASTM D-6241)
  - **Mullen Burst Strength**: 200 psi (ASTM D-3786)
  - **Trapezoidal Tear**: 30 lbs (ASTM D-4533)
  - **Apparent Opening Size (AOS)**: 0.212mm (ASTM D-4751)
  - **Permittivity**: 1.7 sec^-1 (ASTM D-4491)
  - **Water Flow Rate**: 100 gpm/ft² (ASTM D-4491)
  - **UV Resistance @ 500 hrs**: 70% retained (ASTM D-4491)

WATER RETENTION AND DRAINAGE LAYER
- **Water retention and drainage layer is delivered in 2’x4’ rigid boards of 1-inch, 2-inch or 3-inch thickness.**
- **Primary Component**: Mineral wool
- **Recycled Content**: >=70% per volume
- **In-Plane Flow per 1” thickness**: 0.05 g/min/ft (ASTM D-4716)
- **Maximum water retention**: 94% (ASTM E-2397)

Accessory Technical Data

EDGING
- **Material**: Aluminum
- **Configuration**: L-shaped, perforated
- **Height**: >= green roof profile thickness
- **Width**: >= green roof profile thickness
- **Wall thickness**: 16 gauge (0.050 inches)

DRAIN ACCESS CHAMBERS
- **Material**: Aluminum
- **Configuration**: 15”x15”x5” tall, perforated
- **Hinged top lid, self-ballasted
- **Wall thickness**: 16 gauge (0.050 inches)

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**Membrane Protection Layers**

Between the lowest layer of the EcoCline profile (the water retention and drainage layer) and the roofing or waterproofing membrane, a protection layer should be used. The type of protection layer will vary per membrane.

**STANDARD DUTY GEOTEXTILE PROTECTION LAYER**

Most common for root-resistant waterproofing membranes such as PVC, KEE and TPO.

Needlepunched nonwoven polypropylene fiber geotextile.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (oz/sq yd)</td>
<td>8</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>205 lbs (ASTM D 4632)</td>
</tr>
<tr>
<td>Grab Tensile Elongation</td>
<td>50% (ASTM D 4632)</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>80 lbs (ASTM D 4533)</td>
</tr>
<tr>
<td>CBR Puncture Strength</td>
<td>500 lbs (ASTM D 6241)</td>
</tr>
<tr>
<td>UV Resistance at 500 hours</td>
<td>&gt;70% retained (ASTM D 4355)</td>
</tr>
</tbody>
</table>

**HEAVY DUTY GEOTEXTILE PROTECTION LAYER**

Upgrade to above, if project requires additional protection.

Needlepunched nonwoven polypropylene fiber geotextile.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (oz/sq yd)</td>
<td>15</td>
</tr>
<tr>
<td>Thickness (mils)</td>
<td>125</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>380 lbs (ASTM D 4632)</td>
</tr>
<tr>
<td>Grab Tensile Elongation</td>
<td>50% (ASTM D 4632)</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>140 lbs (ASTM D 4533)</td>
</tr>
<tr>
<td>CBR Puncture Strength</td>
<td>1000 lbs (ASTM D 6241)</td>
</tr>
<tr>
<td>UV Resistance at 500 hours</td>
<td>&gt;70% retained (ASTM D 4355)</td>
</tr>
</tbody>
</table>

**AIR LAYER**

An air layer is not typically required over waterproofing membranes such as PVC, KEE, TPO or HRA. An air layer creates an air gap between the green roof and the membrane so that the membrane is not in constant contact with moisture.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness (inches)</td>
<td>&gt;=0.40</td>
</tr>
<tr>
<td>Flow Rate (g/min/ft)</td>
<td>21</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>15,000 psf (ASTM D-1621)</td>
</tr>
</tbody>
</table>

* Hydraulic gradient = 1

**ROOT BARRIER**

HDPE is the most common type of root barrier. The ability to heat weld seams makes it well suited for use under intensive assemblies.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>HDPE</td>
</tr>
<tr>
<td>Thickness (mils)</td>
<td>30</td>
</tr>
<tr>
<td>Density (g/cc)</td>
<td>&gt;= 0.94</td>
</tr>
<tr>
<td>Tensile Strength at break</td>
<td>122 lbs/in</td>
</tr>
<tr>
<td>Tensile Strength at yield</td>
<td>63 lbs/in</td>
</tr>
<tr>
<td>Elongation at break</td>
<td>700%</td>
</tr>
<tr>
<td>Elongation at yield</td>
<td>13%</td>
</tr>
<tr>
<td>Tear resistance</td>
<td>21 lbs</td>
</tr>
<tr>
<td>Puncture resistance</td>
<td>48 lbs</td>
</tr>
<tr>
<td>Carbon black</td>
<td>&gt;= 2%</td>
</tr>
<tr>
<td>Oxidative Induction Time</td>
<td>&gt;100 minutes</td>
</tr>
</tbody>
</table>

Seams heat welded or overlapped 12 inches per roofing manufacturer’s requirements.

**ROOT BARRIER AND PROTECTION LAYER**

EPDM is a root-resistant material with excellent puncture resistance. EPDM is very workable in cold weather. This may be a good choice of protection layer/root barrier for extensive green roofs over HRA or mod-bit assemblies.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>EPDM</td>
</tr>
<tr>
<td>Thickness (mils)</td>
<td>45</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>1300 psi (ASTM D-412)</td>
</tr>
<tr>
<td>Elongation ultimate min.</td>
<td>&gt;300% (ASTM D-412)</td>
</tr>
<tr>
<td>Tear resistance</td>
<td>200 lbf/in (ASTM D-624)</td>
</tr>
<tr>
<td>Water absorption, % mass</td>
<td>+ 2% (ASTM D-471)</td>
</tr>
<tr>
<td>UV Resistance</td>
<td>Pass ASTM G-155</td>
</tr>
</tbody>
</table>

Seams overlapped 12 inches or glued and taped per roofing manufacturer’s requirements.
METHOD OF ESTABLISHMENT: CUTTINGS AND PLUGS

The preferred and most economical method of planting EcoCline is with a combination of cuttings (pictured below left), plugs (pictured below right). Plug planting will occur immediately upon installation. Supplemental planting with cuttings will occur during post-installation stewardship as soon as seasonally appropriate. Bulbs or seed may be added. Allow one full growing season for the roof to reach at least 80% vegetative cover. Planting may occur any time other than during freezing conditions.

METHOD OF ESTABLISHMENT: PRE-VEGETATED MATS

Pre-grown Sedum mats (pictured below) are an optional method to propagate the roof with Sedum species. Sedum mats planting will occur immediately upon installation. Planting may occur any time other than during freezing conditions. Sedum mats must be installed on the same day that they are delivered to the jobsite. The installer is required to thoroughly water pre-grown Sedum mats immediately upon installation and for several weeks following installation until Furbish’s post-installation Stewardship commences. Supplemental planting with cuttings, bulbs or seed may occur during post-installation stewardship as seasonally appropriate. Allow one full growing season for plants to fully root into growth media.

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**INTENSIVE PROFILE TECHNICAL DATA**

**EcoCline**

**Intensive Profiles**

Intensive profiles are generally used for green roofs or planters that are deeper than 8 inches. Whereas EcoCline’s typical extensive profiles serve primarily as thin-profile stormwater management, intensive profiles are most commonly used to cultivate trees and shrubs on structure.

**MEDIA D1 (deep profile growth media)**

- **Primary components**: Locally sourced aggregates, post-industrial and post-consumer compost, expanded slate.
- **Particle size**: 90% <= 3/8”
- **FLL-compliant for intensive sites**
- **Maximum Water Retention**: 40-45% ASTM E-2399
- **Bulk Density (dry)**: 70-72 lbs/cf
- **Bulk Density (wet)**: 92-97 lbs/cf
- **Water permeability**: 0.08 in/min
- **Organic matter**: 5-10% mass
- **pH**: 6-8.5
- **Soluble salts**: <= 0.07 mmhos/cm

**MEDIA D7 (drainage media)**

- **Material**: Locally sourced #57 stone

**MEDIA D9 (drainage media)**

- **Material**: Locally sourced crushed concrete
- **Particle size**: 90% 1/2” - 1”

**FILTER FABRIC**

Same as EcoCline extensive profiles

**MEMBRANE PROTECTION LAYERS**

Same as EcoCline extensive profiles. Note than an air layer is not typically needed in combination with drainage Media D7 or D9.

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