

# ROOFGARDEN

## Carlisle Roof Garden GreenGrid® G3 System

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March 2011

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# Carlisle Roof Garden GreenGrid® G3 System

March 2011

## PART I - GENERAL

### 1.01 DESCRIPTION

The Carlisle Roof Garden GreenGrid® G3 System incorporates pre-planted “module trays” in lieu of traditional components used above an adhered roofing membrane (i.e., drainage boards, root barriers, moisture mats, and growth media). The roofing membrane consists of Sure-Seal® (black) non-reinforced or Sure-Tough™ reinforced EPDM, Sure-Weld® TPO, or Sure-Flex PVC membrane.

The “module trays” are lightweight, composed of recycled plastics (100% post industrial recycled high-density polyethylene - HDPE), and arrive at the building site ready for installation. Tray size is 24” X 24” with a depth of 4”

For information about the GreenGrid G3 modules, weights, planting types, and growth media, refer to Part 2, Products.

### 1.02 ROOF GARDEN DEFINITIONS

Ultra-Extensive (shallow) Garden System

A shallow planting system (using 4” deep GreenGrid G3 tray modules) pre-planted with 5 different types of sedum. The sedum types are chosen for the specific climate zone and the anticipated weight above the membrane assembly is approximately 26-30 pounds per square foot in a fully saturated state.

### 1.03 DESIGN GUIDELINES

- A. For 10 or 15-year warranties, the assembly requires the use of 60-mil EPDM, 60-mil TPO, 60-mil PVC, 100-mil FleeceBACK®, or any AFX FleeceBACK membranes installed in an adhered fashion. CCW 200V Protection Fabric is required as a slip sheet directly above the membrane before placing the trays.
- B. For 20-year warranties, the assembly requires the use of 75-mil Sure-Tough™ Reinforced EPDM, 72-mil Sure-Weld® TPO, 80-mil Sure-Flex PVC, 115-mil FleeceBACK, or any AFX FleeceBACK Plus membranes installed in an adhered fashion. CCW 300HV Protection Fabric is required as a slip sheet directly above the membrane before placing the trays.
- C. An EPDM, TPO or PVC membrane shall be fully adhered, typically to polyisocyanurate insulation, with layers of insulation set in adhesive. As an option, bottom layers of insulation can be mechanically fastened to the roof deck with the top layer set in adhesive.
- D. Refer to Carlisle's Roof Garden Waterproofing System specifications for specific requirements concerning membrane adhesion and splicing criteria, insulation type and securement methods, product delivery, storage and handling guidelines, and applicable installation of all materials and details.
- E. To facilitate drainage, a **minimum roof slope of ¼” in 12”** must be provided at the waterproofing membrane level. **Roof slope shall not exceed 1” in 12”**.
- F. Proper decking shall be provided by the building owner. The building owner or its designated representative must ensure the building structure is investigated by a registered engineer to ensure its ability to withstand the total weight of the specified roofing system, as well as construction loads and live loads, in accordance with all applicable codes. The specifier must also designate the maximum allowable weight and location for material loading and storage on the roof.
- G. Unless otherwise accepted by Carlisle, GreenGrid modules shall be installed between April 1<sup>st</sup> and October 15<sup>th</sup>. Installation must be after the last frost day in the spring or before the first frost day in the fall.
- H. Prior to installing the GreenGrid modules, a slip sheet of Carlisle CCW 200V or 300HV Protection Fabric shall be installed over the roofing membrane at all areas where the modules will be placed.
- I. When trays are to be installed in high wind areas, Carlisle should be contacted regarding appropriate methods to prevent tray movement and/or growth media wind erosion until there is complete plant coverage of the tray. The trays may be fastened together to increase stability.

## 1.04 QUALITY ASSURANCE

- A. A **pre-installation meeting** should be coordinated by the specifier and attended by the roofing applicator, membrane manufacturer's representative and other trades working on the roof system both before and after membrane installation. The purpose of this meeting is to discuss the necessity of ensuring proper membrane protection during all phases of installation and to review other applicable requirements or unusual field conditions.
- B. Upon request by the Authorized Applicator, an inspection will be conducted by a Field Service Representative of Carlisle to ascertain that the membrane roofing system has been installed according to Carlisle's specifications and details. This inspection shall be coordinated **prior to installing the GreenGrid G3 components** (Carlisle CCW 200V or 300HV Protection Fabric and the GreenGrid G3 modules) so that access to the membrane is not impaired.  
  
**Note:** The roofing applicator must notify Carlisle at least 3 weeks in advance of applicable inspection dates for coordination purposes.
- C. A final inspection will be conducted after application of the GreenGrid G3 modules to ensure proper installation.
- D. Flood testing, electronic testing, or other leak detection means are strongly advised to check the waterproof integrity of the membrane prior to installing the GreenGrid G3 components (Carlisle CCW 200V or 300HV Protection Fabric and the GreenGrid G3 modules).

## 1.05 SUBMITTALS

- A. To ensure compliance with Carlisle's warranty requirements, **all projects should be forwarded to Carlisle for review** prior to installation.
- B. **A dimensioned layout of GreenGrid G3 modules and all field splices shall be included** along with the project submittals (shop drawing and Request for Warranty).
- C. For all projects, prior to project inspection by Carlisle, a final shop drawing must be approved by Carlisle.

## 1.06 WARRANTY

- A. A **10, 15 or 20-year** System Warranty is available for a charge on commercial buildings and applies only to **products manufactured or marketed by Carlisle SynTec Incorporated**. The membrane system is defined as membrane, flashings, adhesives, sealants, and other Carlisle brand products utilized in this installation. For a complete description of these products, refer to the "Products Section" or the applicable "Attachment" in the Carlisle specifications.
- B. The 10, 15 or 20-year System Warranty includes overburden replacement or removal of the GreenGrid G3 system in the event of a claim.
- C. The formation or presence of mold or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Carlisle and Carlisle shall not be responsible for any claims, repairs, restoration or damages relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

## 1.07 JOB CONDITIONS

- A. Coordination between various trades is essential to avoid unnecessary rooftop traffic over sections of the roof and to prevent damage to the membrane. Heavily traveled areas must be protected by placing temporary protection courses to prevent damage to the membrane.
- B. The use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly should be investigated by the specifier. Consult the latest publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) for specific information.

## PART II - PRODUCTS

### 2.01 GENERAL

The components of this roofing system are to be products of Carlisle. The installation, performance, or integrity of products by others is not the responsibility of Carlisle and is expressly disclaimed by the Carlisle Warranty.

## 2.02 CARLISLE GreenGrid® G3 MODULE SPECIFICATIONS

GreenGrid G3 modules are black in color, made from recycled material and contain a drainage layer already placed in the module. Modules are pre-planted with growth media and plant species of the color and type desired by the building owner. Physical properties are as follows:

Element	Description
Depth of Modules	4"
Module Size	24" X 24"
Weight of Planted Modules (fully saturated weights)	26-30 pounds per square foot
Module Material	150-mils HDPE (100% of material derived from recycled post industrial HDPE)
Module Clearance above Roofing Surface	0.5"
Color of Modules	Black
Drainage/Root Resistance Layer	3 oz. Spunbonded Polypropylene Geotextile
Growth Media	Proprietary rooftop blend consisting of organic and inorganic components.
Required underlayment for modules	Carlisle CCW 200V Protection Fabric (12 oz/yd <sup>2</sup> polypropylene fabric) or CCW 300HV (16 oz/yd <sup>2</sup> polypropylene fabric)
Plants	Sedums or perennial species specifically selected for climate, hardiness zone, color, and size.
Edge Treatment	Aluminum, pavers, recycled composite wood, or other specialty materials

## 2.03 RELATED CARLISLE MATERIALS

- A. For use with **Sure-Seal EPDM and AFX-Plus FleeceBACK membrane** – Sure-Seal Bonding Adhesive (used with Sure-Seal membrane only), FAST™ Adhesive (used with FleeceBACK membrane only), SecurTAPE™, Primer, Lap Sealant, Cured EPDM Flashing, Pressure-Sensitive Flashing, T-Joint Covers, Elastoform Flashing®, Fasteners/Plates, Water Cut-Off Mastic, Pourable Sealer, Pre-Molded Pipe Seals, Pressure-Sensitive Inside/Outside Corner, Pourable Sealer Pockets, and Termination Bars.
- B. For use with **Sure-Weld TPO membrane** – Sure-Weld Bonding Adhesive (used with Sure-Weld TPO membrane only), FAST Adhesive (used with FleeceBACK membrane only), Cut-Edge Sealant, reinforced and non-reinforced Sure-Weld Flashing, Water Cut-Off Mastic, PT 304 Sealant, Molded Pocket Sealant, Weathered Membrane Cleaner, Pre-Molded Pipe Seals, Split Pipe Boots, Curb Wrap Corners, and Termination Bars.
- C. **Protection Fabric (Carlisle CCW 200V or 300HV)** - A 12 oz/yd<sup>2</sup> or 16 oz/yd<sup>2</sup> polypropylene non-woven needle-punched fabric which is stabilized to resist soil chemicals, mildew and insects, and is non-biodegradable. It is used as a protection sheet beneath the GreenGrid planting modules. Available in rolls 12.59 wide by 2009 long and 40" wide by 200' long. The 16 oz/yd<sup>2</sup> CCW 300HV protection fabric is required for a 20-year warranty.
- D. **Other Carlisle products**, such as insulation and edgings/copings, are also required when such components are to be included as part of the System Warranty.

## 2.04 GROWTH MEDIA PROPERTIES

The Growth Media mix provides stable soil structure, high porosity, and high moisture holding properties. The growth media also provides excellent drainage while remaining lightweight.

Properties	Unit	GreenGrid G3 Growth Media
<b>Granulometric Distribution</b>		
• d<0.063 mm	mass %	10
• d>2.0 mm	mass %	63.3
<b>Volume Weight</b>		
• When dry	g/cc	0.5
• At max. water capacity	G/cc	1.2
<b>Water &amp; Air Management</b>		
• Total pore space	vol %	77
• Max water capacity	vol %	65
• Air content at max water capacity	vol %	12
• Air content at 1/3 atm	vol %	53
• Water permeability	cm/sec	0.021
<b>Organic Content</b>		
<b>C/N ratio</b>		
<b>Nutrient Absorptive Capacity</b>		
<b>Carbonate Content</b>		
<b>Salt Content</b>		

**Notes:**

1. Formulations are based on German FLL (The Landscaping and Landscape Development Research Society), "Guidelines for the Planning, Execution and Upkeep of Green-Roof Sites."
2. Nutrients & pH adjusted and buffered to meet specifications or the FLL standards.

## 2.05 PLANTS

A. GreenGrid recommended design mix of groundcovers and perennials that can thrive in a non-irrigated, ultra-extensive/shallow environment based on the project location. Plants to be selected according to the USDA hardiness zone classification.

1. The standard GreenGrid system comes with 5 different types of sedum as follows (Sedums are chosen for the specific climate zone).

USDA Hardiness Zones 4 through 7a - selected plant species:

- a. Sedum floriferum 'Weienstaphaner Gold'
- b. Sedum kamtshaticum
- c. Sedum reflexum
- d. Sedum sexangular
- e. Sedum spurium 'Fuldaglut'

2. Planting density: 2 plants per square foot (8 plants per 24" x 24" tray), pre-grown to achieve a minimum of 80% vegetative coverage.
3. Special Order: Specific plantings that meet the climate zone and the desired look the roof garden is to achieve. This is accomplished by coordinating a specific design with the owner/architect. Special plants can be pre-grown in the trays.

B. Minimum planting density – Plants are supplied in minimum 3" deep by 1.5" wide "plugs" and planted in the modules at a rate of not less than 2 plants per square foot. GreenGrid G3 modules are pre-grown for a minimum of 80% vegetative coverage upon delivery.

C. Special patterns may be accomplished with various plant species to give a pattern look for color, plant height, etc. This is classified under Special Order.

## 2.06 EDGE ELEMENTS (optional)

Edge elements consist of Aluminum edging, pavers, high density polyethylene (HDPE), concrete or other desired

landscape products for placement at exposed edges of the modules.

## 2.07 "HARDSCAPE" ITEMS (optional)

- A. **Individual concrete plaza pavers** – 2' x 2' x 2' thick precast concrete pavers weighing a minimum of 18 psf with a minimum compressive strength of 6500 psi.
- B. **Paver Pedestals** – Rubber paver pedestals to elevate the surface of the pavers above the roof membrane and promote positive drainage and protection from freeze/thaw.
- C. **Sure-Seal Rubber Paver** – A 2' by 2' by 2" thick rubber paver weighing approximately 24 pounds per unit (6 pounds per square foot) manufactured from recycled rubber which provides a resilient, shock absorbing, weather resistant surface. Available in colors of terre cotta (red) and black. Optional sizes and colors are also available.
- D. **Stone Ballast** – Nominal 1-1/2" diameter rounded water worn gravel which conforms with ASTM D448, gradation size #4, applied at a minimum of 10 pounds per square foot. Used around roof drains **and along walls as a transition from the modules and to promote drainage.**

## PART III - EXECUTION

### 3.01 GENERAL

- A. Refer to Carlisle's Roof Garden Waterproofing System specifications for specific requirements concerning membrane adhesion and splicing criteria, insulation type and securement methods, product delivery, storage and handling guidelines, and applicable installation of all materials and details.

**Note:** Overlayment of field membrane splices will not be required when splices are shingled to avoid bucking of water. If field splices will buck water or if they are located in areas of ponded water, they shall be overlaid. Use 6" wide Sure-Seal Pressure-Sensitive Cured Cover Strip for Sure-Seal EPDM and FleeceBACK membranes and 6" wide Sure-Weld Pressure-Sensitive Cover Strip for Sure-Weld TPO membrane.

- B. Flashing/detailing at walls, curbs, skylights and all other penetrations through the membrane must be flashed in accordance with Carlisle's published specifications/details for the applicable membrane specified.

### 3.02 INSTALLATION OF CARLISLE CCW 200V or 300HV PROTECTION FABRIC

**Installed prior to installation of the GreenGrid modules and after Carlisle's inspection of the membrane system.**

- A. **Sweep** all debris, foreign material, etc. from the membrane surface.
- B. **Unroll CCW 200V or 300HV Protection Fabric** directly over the membrane and provide a minimum 2" side and end overlap.
- C. **Extend** protection fabric up walls, curbs, etc. to the height of the top of the growth media layer.
- D. Under windy conditions, provide temporary ballast to prevent wind disturbance. It is recommended to install the additional GreenGrid modules over the protection fabric soon after its placement to prevent disturbance.

### 3.03 APPLICATION OF GreenGrid MODULES

Unless otherwise accepted by Carlisle, GreenGrid modules shall be installed between April 1<sup>st</sup> and October 15<sup>th</sup>, but not when the temperature is below 50°F.

- A. **Remove** all debris from the slip sheet surface.
- B. **Place** modules over the slip sheet in the desired locations as indicated on the shop drawings.

**Note:** Care must be exercised when placing modules to avoid damaging the slip sheet or underlying membrane. **Do not drag** modules into position. Modules must be **lifted** and gently positioned.

- C. After installing modules in designated locations, all modules shall be sufficiently watered with a fine spray to ensure growth. Water must be free of contaminants or substances harmful to plant growth. Hoses or other methods of transporting water to the roof shall be furnished by the applicator.
- D. Do not install modules over saturated roof surfaces or under freezing conditions without prior approval from Carlisle.

- E. For connecting trays together, drill a hole through the middle of the outer lip at the top of the tray continuing through the inner wall of tray. Using a 150 pound black "zip tie," put the tie through the hole and cinch up tight. The hole/zip tie shall be on maximum 2-foot centers. GreenGrid G3 modules must use a minimum 4 zip ties per tray.

### 3.04 MAINTENANCE

Maintenance is the responsibility of the building owner. There are maintenance services that can be arranged by Carlisle, or the owner may choose to use an outside firm or their own staff. In all cases, the requirements outlined below must be followed:

#### A. General Maintenance

1. After installation, keep traffic over the modules to a minimum. If a high traffic area develops that was not expected, replace trays in this area with pavers to offer a sturdy walking surface.
2. Check drains at each visit for debris, root, and plant intrusion to assure there are no obstructions to prevent water flow to the drain.
3. **Maintenance recommendations for a 14-day period after completion of module installation**
  - a. Utilize nursery-recommended maintenance procedures depending on plant type.
  - b. Each Module should be watered for 30 to 60 seconds, 2 to 3 times a week after initial installation to establish a good root system.
  - c. Care should be used in watering and weeding to avoid washing growth media out of the modules or the removal of significant amounts of media during weeding activities. If care is not taken, supplemental growth media may need to be added to fill in all areas that have been washed out or disturbed during weeding activities. This procedure shall also be followed during long-term maintenance activities.

#### B. Long-Term Maintenance – GreenGrid G3 Modules:

1. Clear out dead material in early spring.
2. Maintain modules by:
  - a. Watering during extended drought periods
  - b. Spot weeding – do not use herbicides
  - c. If necessary, replacing dead or bare areas until a full, uniform stand of plants is achieved.

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and Elastoform Flashing  
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GreenGrid is a Registered Trademark of Weston Solutions, Inc.

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# Carlisle Roof Garden GreenGrid® G3 Maintenance

March 2011

## Immediately After Installation

1. Water/irrigate the roof to the point of run-off.
2. The GreenGrid G3 modules must be irrigated for a minimum of 30 days after installation. Watering events should occur once per day in the mid-morning during this period.
3. If irrigation is an option for the duration of the first growing season, Roof Garden plants will thrive and faster vegetative coverage will be obtained.

## First Season

1. Six to eight weeks after installation, all weeds and non-specified plant material must be pulled from the growth media and removed from the rooftop.
2. During weed removal events, all drains must be inspected. If Carlisle Roof Garden Drain Boxes are utilized, remove the four Phillips head screws on the lid and remove to visually inspect the drain internals.
3. After the local trees have dropped their leaves, a final Autumn inspection must be performed. All debris must be removed from the Roof Garden and drains must be given a final inspection for the season.

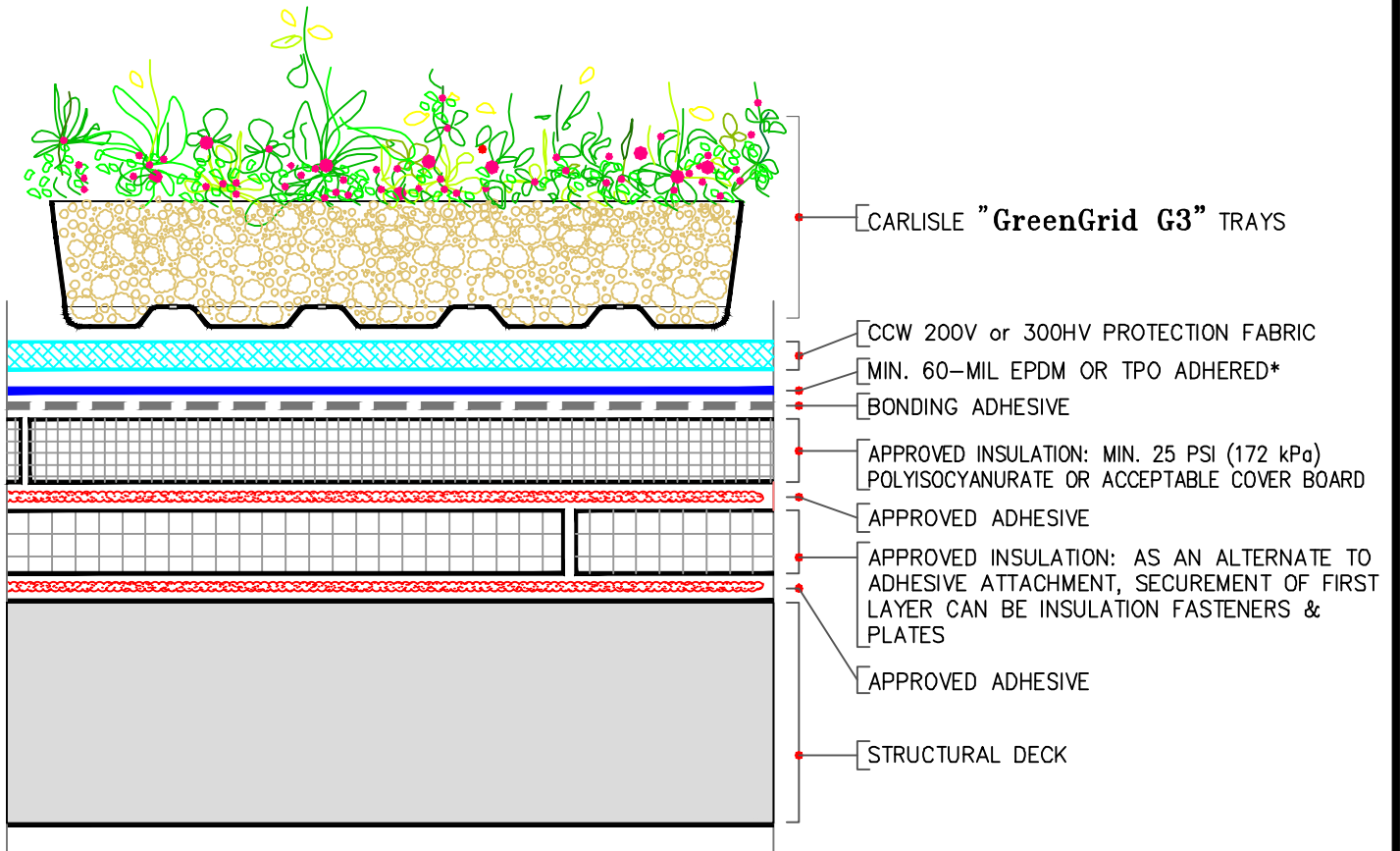
## Second Season

1. If in USDA climate 7 or above, a Spring fertilizer application may be given. Granular **organic** fertilizer can be used at the full rate recommended on the packaging. Petrochemical-based time-release fertilizer (Osmocote, Miracle-Gro, etc.) can be used at **half** the rate recommended on the packaging. Organic fertilization will result in a lower water requirement for the plants. On all-sedum roofs, fertilization should not be needed.
2. A mid-Spring weed removal and drain inspection event must occur. A total of two weed removal and drain inspection events should occur during the second season.
3. If irrigation is available during the second season, it will serve to enhance the growth of your Carlisle Roof Garden. If Carlisle's Sedum Tiles or Mats are used, neither watering nor weeding should be required.
4. After the local trees have dropped their leaves, a final Autumn inspection must be performed. All debris must be removed from the Roof Garden and drains must be given a final inspection for the season.

## Third season

1. A Spring fertilizer application may be given, if needed.
2. One weed removal event must occur, in the mid-Spring
3. During the Autumn maintenance event, all foreign debris must be removed from the roof

If possible, monitor your Carlisle Roof Garden by visual examination at least once a month to make sure that the plants appear healthy. Should your GreenGrid G3 modules experience any health-related issues, contact Carlisle SynTec Inc. for support. Once established, your Carlisle Roof Garden should provide you with decades of beautiful and trouble-free service.



\*NOTE:  
MEMBRANE THICKNESS IS DEPENDENT UPON WARRANTY LENGTH.  
REFER TO "ROOF GARDEN ATTACHMENT" FOR SPECIFIC REQUIREMENTS.

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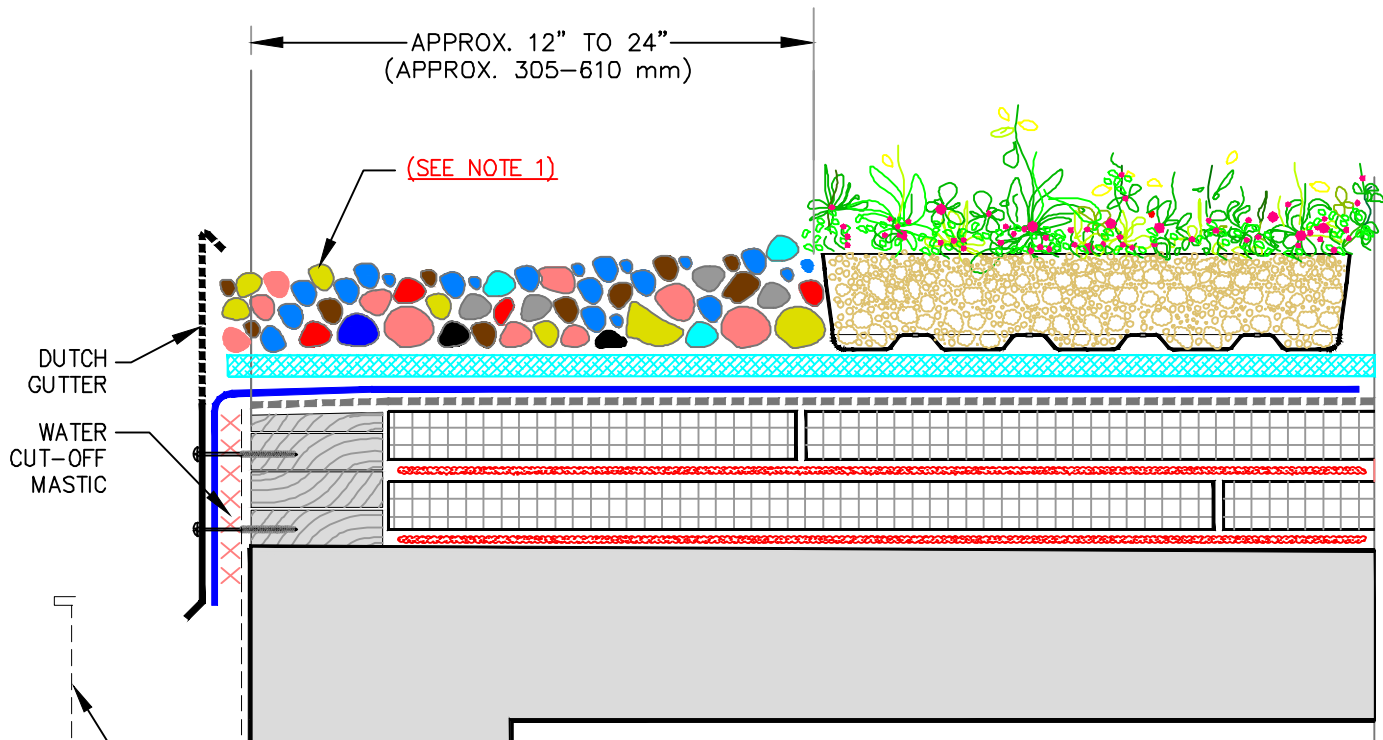
GREEN-GRID® PRE-PLANTED  
TRAY OPTION

DETAIL(S) NOT TO SCALE  
APRIL 20, 2010

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Incorporated



SHEET NO.  
1



NOTE 1:  
NOMINAL 1-1/2" (38mm) DIAMETER STONE BALLAST, 10-15 LBS PER SQUARE FOOT (48.8-73.2 KILOGRAMS PER SQUARE METER).

20100420



GreenGRID® DUTCH GUTTER

DETAIL(S) NOT TO SCALE  
APRIL 20, 2010  
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GREEN GRID SYSTEM  
GG | SHEET NO. 2

SEE CARLISLE UNIVERSAL  
DETAILS U-9 OR SW-9

APPROX. 12" TO 24"  
(APPROX. 305-610 mm)

6" (152mm)  
PRESSURE-SENSITIVE  
RUSS (CARLISLE DETAIL  
PS-12-D OR SW-12)

(SEE NOTE 1)

NOTE 1:  
NOMINAL 1-1/2" (38mm) DIAMETER STONE BALLAST, 10-15  
LBS PER SQUARE FOOT (48.8-73.2 KILOGRAMS PER SUARE  
METER).

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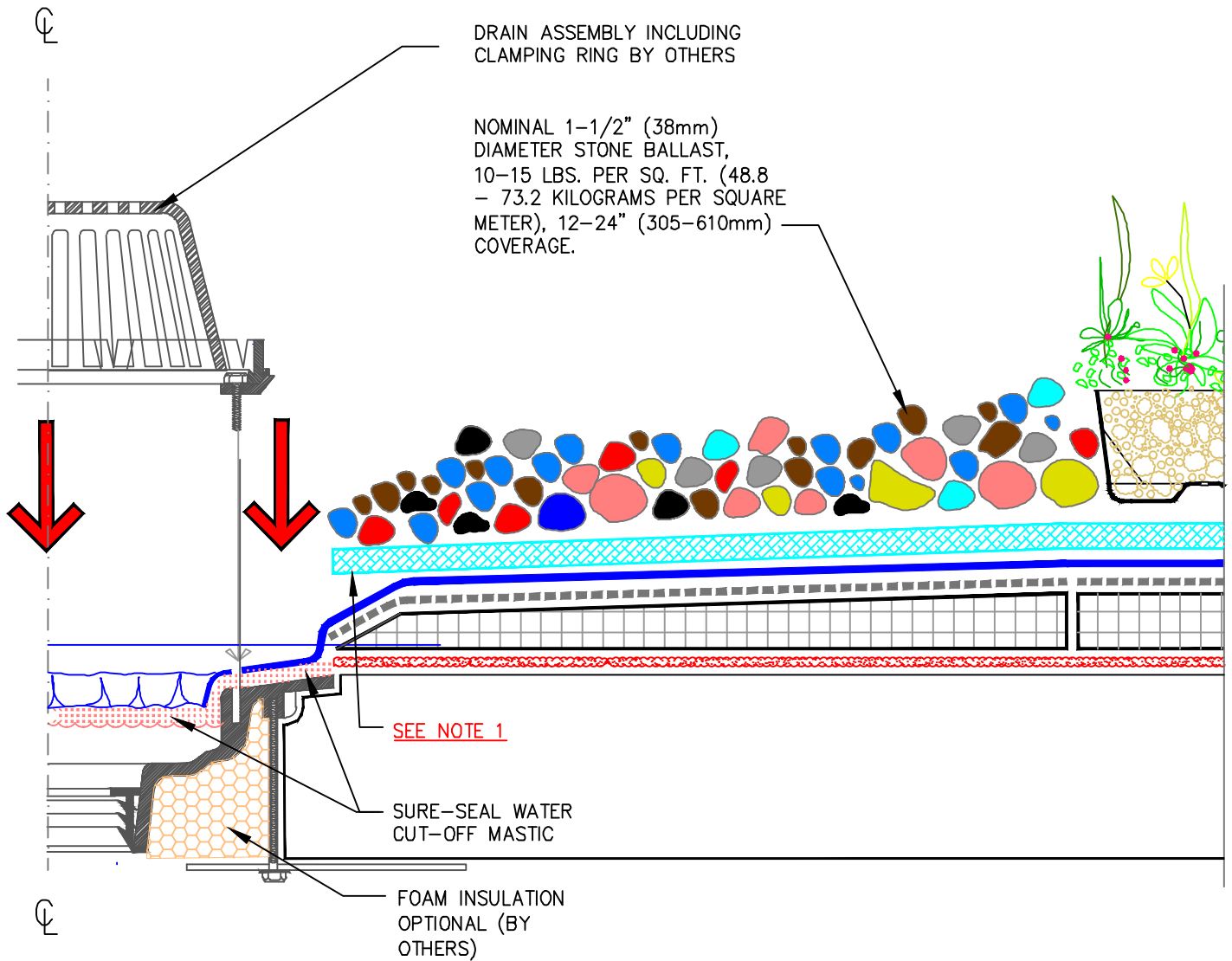
GreenGRID® PARAPET / CURB  
FLASHING

DETAIL(S) NOT TO SCALE  
APRIL 20, 2010

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SHEET NO.  
3



NOTES:

1. STOP CCW 200V PROTECTION FABRIC MAT BASE OF DRAIN.
2. ALL BOLTS OR CLAMPS MUST BE IN PLACE TO PROVIDE CONSTANT COMPRESSION ON WATER CUT-OFF MASTIC.
3. CUT THE MEMBRANE SO IT EXTENDS A MIN. OF 1/2" (13mm) FROM THE ATTACHMENT POINTS OF THE DRAIN CLAMPING RING.
4. HOLE IN MEMBRANE MUST EXCEED THE SIZE OF DRAIN PIPE.
5. ROOF DRAIN SIZE AND NUMBER OF DRAINS SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL CODES.
6. REMOVE ALL LEAD AND OTHER FLASHING, WHERE EXISTING DRAINS ARE FLASHED.

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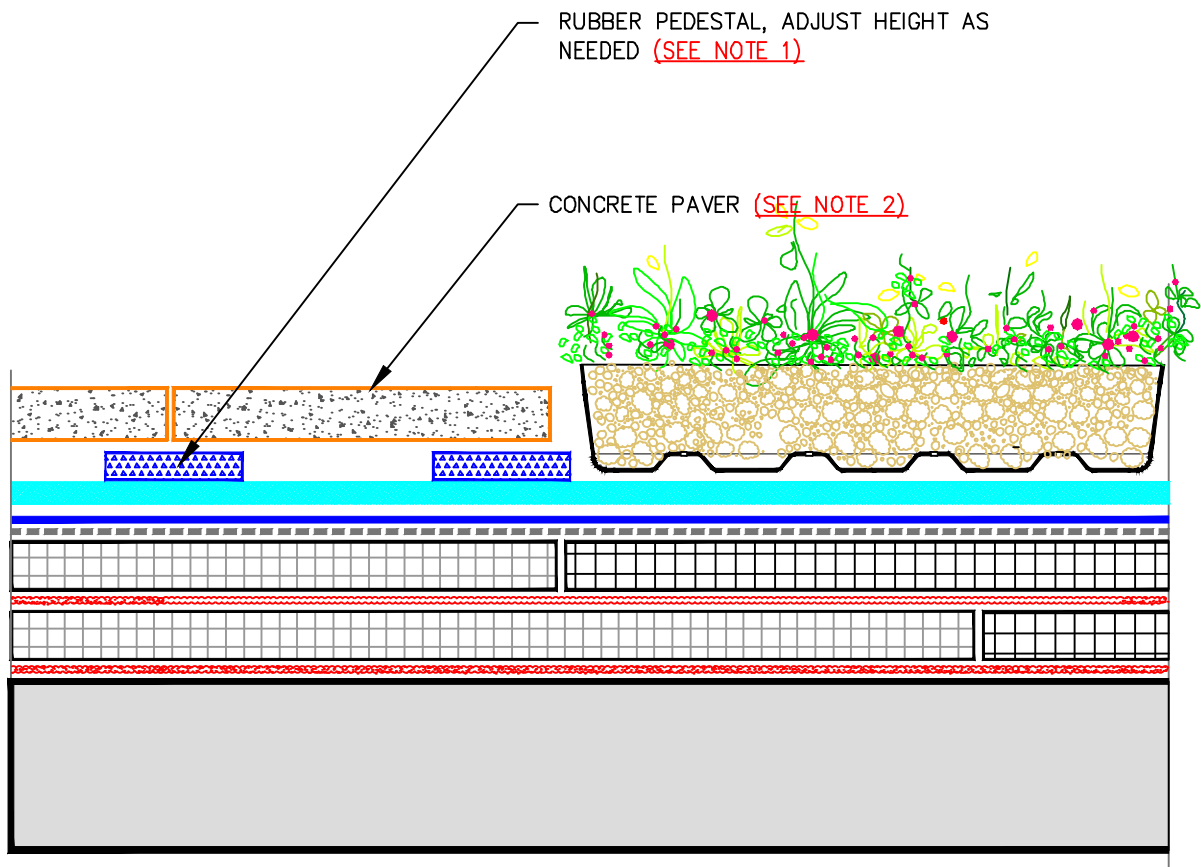
GreenGRID<sup>®</sup> ROOF DRAIN

DETAIL(S) NOT TO SCALE  
APRIL 20, 2010

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SHEET NO.  
4



NOTES:

1. ALTERNATE: EXPANDED OR EXTRUDED POLYSTYRENE BOARDS WITH MINIMUM DENSITY OF 1.25 POUNDS PER CUBIC FOOT (20 KILOGRAMS PER CUBIC METER).
2. ALTERNATE: STONE BALLAST, 10-15 POUNDS PER SQUARE FOOT (48.8 - 73.2 KILOGRAMS PER SQUARE METER)

20100420



GreenGRID® TRANSITION TO WALKWAY

DETAIL(S) NOT TO SCALE  
APRIL 20, 2010

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SHEET NO. 5