



CARLISLE'S **ROOFGARDEN**

Carlisle Roof Garden GreenGrid® System

Table of Contents

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	Page
Part I - General	
1.01 Description	3
1.02 Roof Garden Definitions	3
1.03 Design Guidelines	3
1.04 Quality Assurance	4
1.05 Submittals	5
1.06 Warranty	5
1.07 Job Conditions	5
Part II - Products	
2.01 General	5
2.02 Carlisle GreenGrid Module Specifications	5
2.03 Related Carlisle Materials	6
2.04 Growth Media Properties	7
2.05 Plants	7
2.06 Edge Elements (Optional)	8
2.07 Drip Irrigation System (Optional)	8
2.08 "Hardscape" Items (Optional)	8
Part III - Execution	
3.01 General	8
3.02 Installation of Carlisle CCW 200V Protection Fabric	9
3.03 Application of GreenGrid Modules	9
3.04 Maintenance	9

Details



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PART 1 GENERAL

1.01 DESCRIPTION

The Carlisle Roof Garden GreenGrid® 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 may consist of Sure-Seal® (black) non-reinforced or Sure-Tough™ reinforced EPDM membrane, Sure-Seal FleeceBACK® 100, 115 or AFX membrane, or Sure-Weld® TPO membrane. The type of membrane is dependent upon the length of warranty selected. Refer to Paragraph 1.03, Design Guidelines, for specific requirements.

The “module trays” are lightweight, composed of recycled plastics (60% post industrial recycled high-density polyethylene - HDPE), and arrive at the building site ready for installation. Tray sizes are 2' x 4', 2' x 2', 2' x 2' triangle, or 40" x 40".

- A. For ultra-extensive/shallow garden systems, 4" deep modules are utilized.
- B. For extensive/medium garden systems, 8" deep modules are utilized.

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

1.02 ROOF GARDEN DEFINITIONS

- A. Ultra-Extensive (shallow) Garden System

A shallow planting system (using 4" deep GreenGrid 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 15 pounds per square foot.

- B. Extensive (medium depth) Garden System

A medium depth planting system (using 8" deep GreenGrid tray modules) that uses plants selected on a job-by-job basis in accordance with the project location. The anticipated weight above the membrane assembly is generally less than 25 pounds per square foot.

1.03 DESIGN GUIDELINES

- A. For 10 or 15-year warranties, the assembly requires the use of 60-mil EPDM, 60-mil TPO, FleeceBACK® 100, or AFX FleeceBACK membrane installed in an adhered fashion.

- B. For 20-year warranties, the assembly requires the use of 75-mil Sure-Tough™ Reinforced EPDM, 72-mil Sure-Weld® TPO, or FleeceBACK 115 or AFX FleeceBACK Plus membrane installed in an adhered fashion.
- C. An EPDM or TPO 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 1/4" in 12"** must be provided at the waterproofing membrane level.
- 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 1st and October 15th. For specific plants, 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 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 soil 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 components** (Carlisle CCW 200V Protection Fabric and the GreenGrid modules) so 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 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 components (Carlisle CCW 200V Protection Fabric and the GreenGrid 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 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 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 2 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® MODULE SPECIFICATIONS

GreenGrid modules are black in color, made from recycled material and contain a drainage/root barrier 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" (standard); 8" (special order)
Module Size	4" depth - 2' x 4', 2' x 2', 2' x 2' Δ, 40" x 40" 8" depth - only available in 2' x 4'
Weight of Planted Modules (fully saturated weights)	4" depth - Approx. 15 lb. per sq. ft. 8" depth (special order) - Approx. 28 lb. per sq. ft.
Module Material	HDPE (60% of material derived from recycled post industrial HDPE) • 4" deep modules - formed of 150 mil HDPE • 8" deep modules (special order) - formed of 175 mil 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 ² polypropylene fabric)
Drip Irrigation System	Black polystyrene tubing. Typically not required for ultra-extensive system (4" deep). Usually required for extensive system (8" deep) but dependent on the selected plant species.
Plants	Perennial, grass, or shrub species specifically selected for climate, hardiness zone, color, and size.
Edge Treatment	Wood, recycled composite wood, aluminum, pavers 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)** - A 12 oz/yd² 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 12.5' wide by 200' long.
- 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 Growth Media
Granulometric Distribution		
• d<0.063 mm	mass %	10
• d>2.0 mm	mass %	63.3
Volume Weight		
• When dry	g/cc	0.5
• At max. water capacity	G/cc	1.2
Water & Air Management		
• 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	0.02 1
Organic Content	mass %	6
C/N ratio		11.6
Nutrient Absorptive Capacity	Mmols/Z/l	177
Carbonate Content	g/l	8
Salt Content	g/l	3.2

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 grasses, perennials and groundcovers 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. Standard System (4" deep module): 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: 1.4 plants per square foot (11 plants per 2' x 4' tray)
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 installed in both the 4" and 8" trays.

B. Minimum planting density – Plants should be supplied in minimum 3" deep by 1.5" wide "plugs" and planted in the modules at a rate of not less than 1 plant per square foot.

Recommended planting density – Plants should be supplied in minimum 3" deep by 1.5" wide "plugs" and planted in the modules 8" on center.

- C. When 8" deep modules are to be used (a special order product for extensive/medium garden assemblies), plants will be selected on a job-by-job basis based on project location and installed in accordance with a landscape design.
- D. 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)

Consisting of wood, aluminum, high density polyethylene (HDPE), concrete or other desired landscape products for placement at exposed edges of the modules.

2.07 DRIP IRRIGATION SYSTEM (optional)

Consists of black polystyrene tubing and flow control emitters. Not typically required for 4" deep modules but may be required for 8" deep modules depending on project location and plant species selected. Available in various shapes to be determined upon submittal of the landscape design. A water hook up will be required when used.

2.08 "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 3 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 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 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 1st and October 15th, 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 at 2 foot centers:
 - 1. 2' x 2' trays - 4 ties per tray
 - 2. 2' x 4' trays - 6 ties per tray
 - 3. 40" x 40" trays - 8 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 – Ultra-Extensive (4" deep) Modules:

1. **For the 1st year** – Typically **1 to 2 maintenance events per month** is sufficient.
2. **For the 2nd year** – Typically **1 maintenance event per month** will suffice.
3. **For the 3rd year and thereafter** – Typically **1 maintenance event in the spring** will be adequate.
4. Clear out dead material in early spring.
5. 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.

C. Long-Term Maintenance - Extensive (8" deep) Modules (with or without an Irrigation System):

1. An extensive green roof requires essentially the same care as a garden on the ground due to the demands of ornamental plants. Typically **2 to 4 maintenance events per month** will suffice for an extensive garden with no supplemental irrigation. Maintain modules by:
 - a. Watering during drought periods
 - b. Spot weeding
 - c. Replacing dead plants or bare areas until a full, uniform stand of plants is achieved.
 - d. In early spring of each year, cutting back of applicable vegetation to ensure proper growth shall be completed in accordance with the nursery recommendations for the specific types of plants utilized.

2. Maintenance for Irrigation System

- a. In areas with freezing climates, the irrigation system shall be winterized by removing the end caps on the manifolds to allow the system to drain. Spring activities include flushing the system before reinstalling the end caps.
- b. Pressure test the system with normal operating pressures after initial installation and after each winter to ensure no leaks are present.
- c. Watering intervals shall be set depending on plant types based on the nursery recommendations and adjusted as needed to promote healthy growth.
- d. The irrigation ring emitters connected to the manifolds should be checked periodically to make sure they are connected and dispensing water evenly to all modules within the system.

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Carlisle SynTec Incorporated
P. O. Box 7000
Carlisle, PA 17013-0925
800-479-6832
<http://www.carlisle-syntec.com>