
MANUFACTURER'S GUIDE SPECIFICATIONS

SECTION 075563

VEGETATED PROTECTED MEMBRANE ROOFING



SECTION 07 55 63

VEGETATED PROTECTED MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

Carlisle's GreenGrid® vegetative roofing system allows flat and low slope roofing systems to support a sedum vegetative layer. The preloaded trays are used to reduce heat island effects, retain rain water, and increase the aesthetic value of the roof. The roof allows pedestrian traffic. The roof is designed over a Carlisle hot-applied membrane waterproofing. The system may be installed on surfaces as indicated on drawings, consisting of preparation of existing, and repaired concrete surfaces.

1.2 RELATED SECTIONS

- A. Section 03 15 00 – Concrete Accessories/Expansion Joints
- B. Section 03 30 00 - Cast-In-Place Concrete
- C. Section 07 90 00 - Caulking and Sealants
- D. Division 04 - Masonry
- E. Division 20 – Mechanical/Floor Drains and Standpipes
- F. Division 25 – Electrical/Conduit and other Electrical

1.3 REFERENCES

- A. CGSB-37.50-M89 Canadian Specification for Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing.
- B. ASTM applicable standards and test methods.

1.4 SYSTEM DESCRIPTION

A vegetative roofing system applied over a 215 mil thick, reinforced, hot-applied rubberized asphalt membrane system, consisting of two layers of rubberized asphalt membrane reinforced with polyester fabric.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 30 00.
- B. Product Data: Submit manufacturer's product literature and installation instructions.
- C. Subcontractor's approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.
- D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.7.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: Applicator shall be experienced in applying the same or similar materials and shall be specifically approved in writing by the membrane manufacturer.
- B. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).
- C. Pre-Application Conference: Prior to beginning work, convene a conference to review project-specific conditions, installation procedures, schedules and coordination with other work. 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.

1.7 WARRANTY

- A. Provide a written, single source warranty for all system components agreeing that during the warranty period to promptly make repairs or replacement of defective materials of the roofing/waterproofing system without additional cost to the owner.
- 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
 - 1. Name of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Material safety data sheet.
- B. Store membrane, reinforcing fabric, flashing, mastic and primer in a protected area out of direct sunlight. Protect from rain and physical damage.
- C. Off load GreenGrid[®] trays with in 24 hours of delivery to assure proper breathing of vegetation.

1.9 PROJECT CONDITIONS

- A. Do not apply membrane if temperature is less than 0 degrees F or to a damp, frosty, snow covered or contaminated surface.
- B. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the application. Coordination between various trades is essential to avoid unnecessary traffic over

sections of the waterproofing system and to prevent damage to the membrane. Heavily traveled areas must be protected by placing temporary protection courses to prevent damage to the membrane.

- C. Protect adjoining surfaces not to be waterproofed against damage or soiling. Protect plants, vegetation and animals which might be affected by waterproofing operations.
- D. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.
- E. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application until all vapors have dissipated. Post "NO SMOKING" signs.
- F. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.
- 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

Provide products manufactured and supplied by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie Texas 75098, phone (800) 338-8701, fax (972) 442-0076.

2.2 PRODUCTS

- A. Hot applied liquid membrane: Shall be CCW-500 Hot Applied Membrane, rubberized asphalt compound, and shall meet or exceed the requirements of CGSB-37.50-M89.
- B. Reinforcing fabric: Shall be CCW-500 Reinforcing Fabric which is a 1.18 oz/square yard spunbonded polyester fabric.
- C. Overburden is to be Carlisle's GreenGrid trays used to contain soil and vegetation.

2.3 ACCESSORY PRODUCTS

- A. Flashings: Shall be CCW-711-90 90 Mil Sheet Membrane and Flashing or CCW 60 mil uncured neoprene for non-exposed areas and Sure-Weld AFX TPO, Sure-Seal AFX EPDM, FleeceBACK EPDM or UV-stable Granulated Cap Sheet for exposed areas.
- B. Surface Primer: Shall be CCW-550 Primer or CCW Contact Adhesive
- C. Mastic: Shall be CCW-704 Mastic.
- D. Sealants: Shall be CCW-703 Vertical Grade LIQUISEAL™ Membrane or CCW-201 two- component Polyurethane Sealant.
- E. Backer Rod: Shall be closed-cell polyethylene foam rod.
- F. Expansion Joints: Shall be the EJ-500
- G. Protection Course: Shall be CCW Protection Board-HS
- H. Drainage Composite: Shall be CCW MiraDRAIN 9000, 9800 or 9900.
- I. Pavers: Where required, shall be as recommended and supplied by the membrane manufacturer.

- K. Perimeter Drainage System: When required, shall be Carlisle' Ballasted Termination Bar with an 18" gravel bed adjacent to the termination.

2.4 CARLISLE GreenGrid® PRODUCT 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
Module Size	2' x 4', 2' x 2', 2' x 2' Δ, 40" x 40" 8" only available in 2' x 4'
Depth of Modules	4" (Nominal); 8" (special order)
Weight of Planted Modules (fully saturated weights)	4 in. depth - Approx. 15 lb. per sq. ft. 8 in. depth (special order) - Approx. 28 lb. per sq. ft.
Module Material	HDPE (60% of material derived from recycled post industrial HDPE) • 4" modules - formed of 150 mil HDPE • 8" 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 extensive system (4"). Usually required for intensive system (8") 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

2.5 Irrigation System (optional)

- A. Tubular soaker hoses attached to an interior water system is commonly installed to offset drought periods. These systems are not required nor covered by Carlisle warranties
- B. Tubular drip hoses attached to an interior water system is commonly installed to offset drought periods. These systems are not required nor covered by Carlisle warranties

2.6 Pavers and Walk Ways

- A. Walk ways can be constructed by installing (river washed) round ballast over the CCW MiraDRAIN between GreenGrid[®] trays.
- B. Pavers maybe installed directly on the CCW MiraDRAIN or CCW Protection Fabric or over gravel which is placed on the top of the CCW MiraDRAIN or CCW Protection Fabric

2.7 Trim

- A. Treated Lumber of various sizes when installed for trim is usually attached trim to trim, on top of the CCW MiraDRAIN or CCW Protection Fabric, to increase wind resistance. Do not spike (fasten) the trim through the waterproofing.
- B. Metal trim can be installed by attaching metal flashing to additional strips of metal flashing laid under the GreenGrid[®] trays to increase stability of the trim. Trim can also be pinned or screwed to GreenGrid[®] trays.

2.8 Plants

- A. GreenGrid recommended design mix of grasses, perennials and groundcovers that can thrive in a non-irrigated, extensive/shallow environment based on the project location. Plants to be selected according to the USDA hardiness zone classification.
 - 1. Standard System: The standard Green Grid 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.
- A. 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 painted in the modules 8" on center.

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

2.9 Soils

Properties	Units	Soil
Granulometric Distributions		
d < 0.063 mm	mass %	10%
d > 2.000 mm	mass %	10%
Volume Weight		
dry Weight	lb@1"/sqft	1.2
saturated weight	lb@1"/sqft	5
Water & Air Management		
total pore space	volume %	77
max. water capacity	volume %	65
air content @ max water capacity	volume %	12
air content @ 1/3 atm	volume %	53
water permeability	cm/s	0.021
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

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.
- B. Condition of Concrete Surfaces:
 1. The concrete surfaces shall be of sound structural grade, 3500 psi minimum, and shall have a fine broom finish or achieve a concrete surface profile (CSP) between 2-5 per ICRI published standards, free of fins, ridges, voids or entrained air holes.
 2. Concrete shall be cured by water curing method. Curing compounds must be of the pure sodium silicate type or see Carlisle Technical Bulletin.
 3. Concrete shall be cured at least 14-21 days and shall be sloped for proper drainage.
 4. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non-shrink grout or ground to match the un-repaired areas.

5. Two-stage drains shall have a minimum 3 inch flange and be installed with the flange flush and level with the concrete surface.
6. Surfaces at cold joints shall be on the same plane.

3.2 SURFACE PREPARATION

- A. The concrete surface must be thoroughly clean, dry and free from any surface contaminants or cleaning residue that may harmfully affect the adhesion of the membrane.
- B. Detail expansion joints per manufacturer's recommendation using the EJ-500.
- C. Apply a thin film of CCW-550 primer or CCW Contact Adhesive 16" wide, centered over cracks and joints. Apply 60-90 mils of CCW-500 membrane to cover primed areas. Install a 12" wide strip of CCW-711-90 centered over joints and cracks greater than 1/16" in width.
- D. Preferred Flashing Method (500-4B): Apply CCW-550 primer or CCW Contact Adhesive at the juncture of all horizontal surfaces and vertical surfaces to the height indicated on the drawings (8" min. recommended), such as parapet walls, curbs, columns and all penetrations through the deck. Avoid puddles. Allow primer to dry until it will not transfer to touch. Membrane will not properly adhere to wet primer/contact adhesive. Apply 60-90 mils of CCW-500 membrane to cover primed/prepared areas. Install CCW-711-90 mil sheet membrane or uncured neoprene flashing into this first course of CCW-500 to cover the vertical section and extend 6-inches onto deck surface. Flashing installation may be done during crack and joint treatment or during installation of the first layer of CCW-500 membrane. Completely cover all flashing material with CCW-500 during installation of the subsequent layers of CCW-500 membrane.
- E. If leading edges are present that contain a drip edge or gravel stop, install 18" strip of CCW-711-90 membrane from 16" on the deck to at least 2" under the drip edge or gravel stop. Install a Carlisle Sure Seal Ballasted Termination bar.
- F. Install Sure-Seal, Sure-Weld or UV-stable Granulated Cap flashings in exposed areas per Carlisle recommendations (500-4A).
- G. Apply a thin film of CCW-550 Primer or CCW Contact Adhesive in a 4 foot square area around drains. Allow primer/contact adhesive to dry to touch without transfer. Apply 60-90 mils of CCW-500 membrane to cover primed/prepared areas. Install a 3 foot square section of CCW-711-90 or uncured neoprene flashing over the drain and onto the deck while CCW-500 is still hot. No splices or seams are allowed within 3" of the drain flange. Terminate the flashing under the clamping ring of the drain and cut away the inner portion of the flashing. Use firm pressure to press the flashing against the CCW-500 surface and ensure good adhesion. Do not interfere with weep holes.

3.3 APPLICATION

- A. Apply CCW-550 Primer or CCW Contact Adhesive at the juncture of all horizontal surfaces and vertical surfaces, to the height indicated on the drawings (8" min. recommended), such as parapet walls, curbs, columns and all penetrations through the deck, to receive CCW-500 Waterproofing Membrane, including over flashings. Avoid puddles. Allow primer to dry until it will not transfer to touch. Membrane will not properly adhere to wet primer/contact adhesive.

- B. Heat CCW-500 Membrane blocks in a twin wall kettle with continuous agitation and apply at temperatures between 330° to 375°. (*Caution: Do not exceed maximum safe operating temperature of 400°F.*)
- C. Apply heated CCW-500 Hot Applied Membrane to primed areas and any pre-installed flashings at a rate of 18 sq. ft. per gallon or as required to obtain an average thickness of 90 mils.
- D. Apply CCW-500 Reinforcing Fabric and any required flashings while membrane is still warm and tacky. Cut and trim off any wrinkles or overlap sections of the reinforcing fabric or adhere the fabric splices together with CCW-500.
- E. Apply a second coat of CCW-500 Hot Applied Membrane at a rate of 13 sq. ft. per gallon or as required to obtain an average thickness of 125 mils. Total thickness of the CCW-500-R System shall be 215 mils.
- F. Apply CCW Protection Board HS into the last course of CCW-500 while hot and adhere splices together with CCW-500.
- G. Place a layer of CCW MiraDRAIN over the Protection Board HS. The installation is fabric side up.
- H. Install the Carlisle GreenGrid® trays tightly butting each tray to other trays.
- I. Install ballast 18" back from Ballast Termination Bars and penetrations and fill opening around drains with gravel.

3.4 INTEGRITY TESTING

- A. Testing is required for all warranties beyond the standard material warranty of horizontal applications.
- B. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires 2" minimum head of water in place for a period of 24 hours.

3.5 PROTECTION COURSE

- A. Install CCW Protection Board HS over CCW-500 while hot.
- B. Install CCW MiraDRAIN over CCW Protection Board immediately after EFVM/flood testing on horizontal surfaces. If EFVM/flood testing is delayed, install a temporary covering to protect the CCW-500 membrane from damage by other trades.
- C. Install GreenGrid® trays over CCW MiraDRAIN tightly butting each tray to other trays.
 1. 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.

2. Remove all debris from the Drainage board.
3. Place modules over the CCW Drainage/Protection Board in the desired locations as indicated on the shop drawings.

Note: Care must be exercised when placing modules to avoid damaging the Drainage/Protection Board or underlying membrane. Do not drag modules into position. Modules must be lifted and gently positioned.

4. 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.

5. Do not install modules over saturated roof surfaces or under freezing conditions without prior approval from Carlisle.
 6. 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:
 - i. 2' x 2' trays - 4 ties per tray
 - ii. 2' x 4' trays - 6 ties per tray
 - iii. 40" x 40" trays - 8 ties per tray
- D. Install various other overburdens over CCW MiraDRAIN. Examples concrete castings, pavers, gravel paths, etc.

3.60 MAINTENANCE

Maintenance is the responsibility of the building owner. There are maintenance services that can be arranged for by Carlisle that will follow the recommendations listed below. The owner may choose to use an outside firm or their own staff. In either case, 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 planned for, 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 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.
 - a. 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.
 - b. Care should be used in watering and weeding to avoid washing growing media out of the modules or the removal of significant amounts of media during weeding activities. If care is not taken, supplemental growing 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 - Extensive (4" deep) modules:
1. In the first year, typically, 1 to 2 maintenance events is sufficient.

2. In the second year, typically 1 maintenance event per month will suffice.
 3. In the third year and thereafter, typically 1 maintenance event in the spring will be necessary.
 4. Clear out dead material in early spring.
 5. Maintain modules by:
 - a. Watering during extended drought periods
 - a. Spot weeding – do not use herbicides
 - b. If necessary, replacing dead or bare areas until a full, uniform stand of plants is achieved.
- C. Long-Term Maintenance - Intensive (8") Modules (with or without an Irrigation System):
1. An intensive 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 intensive 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.

Note: All fluid applied product application rates are based on theoretical coverage relative to the percentage of solids in the material. These are minimum application rates to achieve the required dry film thickness for the system and do not account for substrate condition or porosity. A thicker application of the product may be necessary to achieve the required dry film thickness for system relative to the substrate.

End of Section