

CCW 500R Green Roof Waterproofing System

PART I - GENERAL

1.01 SUMMARY

- A. The CCW 500R Green Roof Waterproofing System is a guideline and shall be adapted for each project. This specification utilizes the CCW-500R Waterproofing System that is fully adhered to an approved substrate. The thickness of the CCW-500R membrane system is 215 mils reinforced. Refer to Paragraph 1.03, Design Guidelines, for specific requirements.
- B. Various components including Drainage and/or Water Retention Boards, Water Retention Mats, Filter Fabrics, Root Barriers, Dow Extruded Polystyrene Rigid Board Insulation, CCW Tray system with Engineered Growth Media and Vegetation are installed above the membrane dependent on desired planting schedule, allowable loads and the climactic region of the project.

1. 2 RELATED SECTIONS

- A. Section 03150 – Expansion Joints
- B. Section 03300 – Concrete: Roof deck surface/substrate
- C. Section 061000 – Rough Carpentry: Wood blocking, cants and curbing
- D. Section 072216 – Insulation: Extruded polystyrene rigid insulation
- E. Section 073363 – Landscaping: Roof garden
- F. Section 076200 – Sheet Metal Flashing: Metal flashing, counter flashing and trim
- G. Section 077100 – Roof Specialties: Manufactured gravel stops, expansion joints, reglets and scuppers
- H. Section 077200 – Roof Accessories: Manufactured vents, hatches, and walkways
- I. Section 079200 – Joint Caulking: Caulking and sealants
- J. Section 221426 – Plumbing specialties: Roof drains

1. 3 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. Canadian General Standards Board, CGSB-37.50-M89, Standard for Asphalt, Rubberized, Hot Applied, for Roofing and Waterproofing.
- C. Underwriters Laboratories (UL) Class A.
- D. ASTM C518-[04]: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- E. FM Approvals – Approval Standard for Vegetative Roof Systems – Class Number 4477
- F. Declare Label- Voluntary disclosure of building material ingredient list in support of Living Building Challenge project certification. Web sites: www.declareproducts.com ; <http://living-future.org/lbc> The 'Red List' represents the "worst in class" materials, chemicals, and elements known to pose serious risks to human health and the greater ecosystem.
- G. German FFL Greenroof Guidelines: Guideline for the Planning, Execution and Upkeep of Green Roof Sites, Current Release. Worldwide acknowledged state-of-the-art technology as scientific foundation for successful and thriving green roofs.

1.4 QUALITY ASSURANCE

- A. This Green Roof Waterproofing System must be installed by a Carlisle Coatings & Waterproofing Inc. Authorized Applicator in compliance with shop drawings approved by Carlisle Coatings & Waterproofing Inc. There must be no deviations made from CCW's specifications or the approved drawings without the prior approval from Carlisle Coatings & Waterproofing Inc.
- B. Single Source Responsibility: Provide waterproofing materials and accessories, DOW insulation, interlocking plastic trays, plastic tray pins, growing media, plant materials, and metal edger as a single system by or under direction of vegetated manufacturer.
- C. A pre-installation meeting should be coordinated by the specifier and attended by the waterproofing applicator, membrane manufacturer's representative and other trades working on the Green Roof System both before and after installation. The purpose of this meeting is to discuss the necessity of ensuring proper waterproofing membrane protection during all phases of installation and to review other applicable requirements or unusual field conditions.
- D. Upon request by the authorized applicator, an inspection will be conducted by a Carlisle Coatings & Waterproofing Inc. representative to ensure that the waterproofing membrane has been installed according to Carlisle Coatings & Waterproofing Inc. specifications and details. This inspection shall be coordinated prior to installing the Green Roof components so that access to the membrane is not impaired.
- E. Use flood testing, electronic testing or other leak detection means approved by CCW to check the waterproof integrity of the membrane prior to installing any components above membrane. Waterproof integrity testing is required for system warranty.
- F. An in-progress inspection may be scheduled after the initial inspection (after the membrane installation is completed) to ensure proper protection procedures are being followed to prevent possible damage to the membrane during the installation of above membrane components.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01300.
- B. Product Data:
 - 1. Submit waterproofing manufacturer's product literature and installation instructions.
 - 2. Vegetated tray roof system, components, growing media type, and planting types with descriptive published data indicating characteristics and limitations.
 - 3. Include standard details, system components, and proposals for plant types and characteristics.
 - 4. Stormwater retention characteristics, including 24-storm hydrograph.
 - 5. FM Fire Approval.
 - 6. Complete disclosure of chemical components comprising the tray. Provide verification that the formulation is 'Red List Free'.
- C. Subcontractor's approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.
- D. Shop Drawings:
 - 1. Submit waterproofing shop drawings of critical detail areas including a location plan.
 - 2. Submit plan layout and details at critical terminations of vegetated tray roof system with adjacent building construction. Include flashing and metal edger connections to tray system, and building systems.
- E. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.6.

1.6 WARRANTY

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 waterproofing system without additional cost to the owner.

- A. 5, 10, or 15-year System Warranty is available for a charge on commercial buildings and applies only to products manufactured or marketed by Carlisle Coatings & Waterproofing Inc. 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” The warranty covers all components above the membrane limited to the protection fabric, polystyrene, drainage products, moisture retention mat, and growth media. In the event of a failure, Carlisle is responsible for overburden removal of products supplied by CCW, roof repair, and replacement of the overburden products supplied by CCW up to the value of the components above the membrane.
- B. Access for warranty service - If a 5, 10, or 15-year Overburden Warranty is not obtained, it shall be the owner's responsibility to expose the waterproofing membrane assembly in the event service is required.
- 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.

1.7 JOB CONDITIONS

- A. Coordination between various trades is essential to avoid unnecessary traffic to prevent damage to the membrane or green roof system. Heavily traveled areas must be protected by placing temporary protection courses as necessary to prevent damage to the membrane.
- 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.
- 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. Wear applicable protective clothing and respiratory protection gear. Warn personnel against breathing of vapors and contact of material with skin or eyes.
- E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.
- F. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors has dissipated. Post “NO SMOKING” signs.
- G. Do not apply CCW-500 membrane if temperature is less than 0°F. Do not install waterproofing to a damp, frosty or contaminated surface.
- H. Ambient Air Temperature: Install plant materials in trays preferably between April 1 and November 1 (at northern latitudes) at temperatures between 40 degrees F and 95 degrees F , except as otherwise instructed by manufacturer. Do not install if extended freezing temperatures are expected or if ambient soil temperature is expected to remain below 50 degrees F.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. CCW-500R Membrane Materials
 - 1. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
 - a. Name of material
 - b. Manufacturer's stock number and date of manufacture
 - c. Material safety data sheet
 - 2. Store CCW-500, flashing, mastic, primer, CCW-500 Reinforcing Fabric, CCW Protection Board, CCW Root Barrier, and CCW MiraDRAIN drainage composite board in a protected area out of direct sunlight. Protect from rain and physical damage.
- B. Dow Insulation Materials
 - 1. Handle Products carefully, ensuring board corners are not broken and boards are not damaged
 - 2. Do not store Product exposed to direct sunlight. If stored outdoors, cover Product with light-colored opaque tarpaulins to protect from solar radiation.
 - 3. Store Products away from construction activity and sources of ignition.
 - 4. Protect Products from damage during handling, installation and at point of installation.
- C. CCW Vegetated Roof Tray Materials
 - 1. Delivery: Conduct roof top delivery, assembly, and storage of each component of vegetated roof system under direction of manufacturer's authorized installer.
 - 2. Storage:
 - a. Maintain health of plant media as recommended by nursery guidelines prior to rooftop installation.
 - b. Take measures to locate and spread loads in a manner not to exceed load bearing capacity of roof deck.
 - c. Store materials over plywood panels or protective sheeting and do not allow products, growing media, grit, debris, and pedestrian traffic on unprotected CCW-500R roof membrane.
 - d. Provide water source for irrigation of and maintenance of plants until permanent drip irrigation system is in place.
 - 3. Handling: Stabilize equipment for moving pallets to roof deck to account for decreasing load limits as cranes or forklifts are extended.

PART II PRODUCTS

2.1 GENERAL

- A. Provide waterproofing membrane and vegetated roof system products manufactured and supplied by Carlisle Coatings & Waterproofing Incorporated, 900 Hensley Lane, Wylie Texas 75098, phone (800) 527-7098, fax (972) 442-0076. www.carlisleccw.com
- B. Provide rigid polystyrene insulation by The Dow Chemical Company.

2.2 MATERIALS

A. Membrane

1. 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. Membrane Accessories

1. Reinforcing fabric: Shall be CCW-500 Reinforcing Fabric which is a 1.18 oz/square yard spun-bonded polyester fabric.
2. Surface Primer: Shall be CCW-550 Primer, CCW-550 Low VOC Primer, or CCW-702, CCW-702LV or CCW-AWP Contact Adhesives.
3. Flashings: Shall be CCW-711-90 a 90-Mil Sheet Membrane Flashing for non-exposed areas. Any exposed flashing area shall be covered with CCW 570 Resin or CCW Protection Cap 190FR.
4. Sealants: Shall be CCW-703 Vertical Grade Liquiseal™ Membrane or CCW-201 two-component Polyurethane Sealant.
5. Mastic: Shall be CCW-704 Mastic.
6. Backer Rod: Shall be closed-cell polyethylene foam rod.
7. Expansion Joints: Shall be the EJ-500
8. Protection Course: Shall be CCW Protection Board-HS.
9. Root Barrier: Shall be CCW-Root Barrier a 16-mil tightly woven HDPE scrim with 2-mil polymeric coating on both sides.
10. Drainage and/or Water Retention Composite: Shall be CCW MiraDRAIN and CCW 300HV as recommended by the manufacturer for each condition.
11. Pavers/Ballast: Where required, shall be as recommended and supplied by the membrane manufacturer.
12. Filter fabric shall be applied over insulation when required.

C. Insulation

1. Insulation: Shall be extruded polystyrene board to ASTM C578, Type VII, rigid, closed cell type, with integral high density skin.
 - a. Thermal Resistance (ASTM C518): typical 5 year aged value of R-5 per 1 inch of thickness.
 - b. Board Size: 24" x 96", [1"] [1.5"] [2"] [2.5"] [3"] [3.5"] [4"] thick.] [as indicated on Drawings.]
 - c. Compressive Strength (ASTM D1621): Minimum 60 psi.
 - d. 4. Water Absorption (ASTM D2842): 0.7% by volume maximum.
 - e. 5. Edges: Square.
 - f. 6. Water Vapor Permeance (ASTM E96/E96M): maximum 0.8 perms.
 - g. 7. Manufacturer and Product Name: STYROFOAM™ PLAZAMATE™ by the Dow Chemical Company.

D. Vegetated Roof System– CCW Vegetated Roof System: Plastic trays, plastic tray pins, growing medium, and plant materials for installation over roofing system, including metal edger and irrigation as required for complete installation.

1. Performance / Design Criteria: Engineered to:
 - a. Retain, detain and meter rain and drip irrigation water.
 - b. Allow hydration of plants and prevent root rot.
 - c. Interlock to prevent shifting and/or wind uplift.
 - d. Integrated drip irrigation system to provide efficient irrigation to the root zone.
 - e. Metal edging at perimeter to conceal tray edges.
 - f. Eliminate need for additional drainage material, root barriers, and filter fabric.

2. Tray Size: 2'x2'
3. Weight
 - a. Fully Saturated Tray Loaded with Mature Plants: System weights vary with planting option and by region due to variances in growing media weight.
 - 1) 2'x2'x2.75" Ultra-Extensive – 10-15 lbs/sq ft.
 - 2) 2'x2'x4" Extensive – 26-30 lbs/sq ft
 - 3) 2'x2'x6" Semi-Intensive – 39-44 lbs/sq ft.
 - 4) 2'x2'x8" Intensive – 50-60 lbs/sq ft.
4. Growing Media: Based on German FFL Greenroof Guidelines.
5. Planting Method
 - a. Plugs:
 - 1) Size: [24 cell plug], [72 cell plug], [128 cell plug], [4" plug]
 - 2) Spacing: As shown on drawings or [12"oc (4" pot plug)] [10"oc (24 cell)] [8"oc (72 cell)] [6"oc (128 cell)]
 - 3) Distribute differing plant species evenly and uniformly within each tray for overall uniform appearance of in-place installation
 - b. [Sedum Tiles]: Plant following installation of irrigation system and growing medium.
 - c. [Sedum Mats]: Plant following installation of irrigation system and growing medium.
 - d. Un-Rooted Cuttings: Distribute plant cuttings by evenly broadcasting over growth medium at a rate of [250] lbs. /1000 sf. following installation of irrigation system and growing medium.
6. Metal Edger
 - a. Standard Metal Edger: Manufacturer's standard 26 gauge [stainless steel] or [18-gauge mill finished aluminum] metal edger at trays and walkways to frame, connect, and tie tray and walkway systems into each other and adjacent building components.
 - 1) Prefabricated plastic tray pin receiving slot on outside face of metal edger at 12 inch on center spacing.
 - 2) Prefabricated notches to allow for irrigation access.
 - b. Irrigation Metal Edger: Manufacturer's standard 26 gauge [stainless steel] or [18-gauge mill finished aluminum] metal edger for use with the optional drip irrigation system to conceal the irrigation supply line.
 - 1) Prefabricated plastic tray pin receiving slot on outside face of metal edger at 12 inch on center spacing.
 - 2) Prefabricated notches to allow for irrigation access.

PART III EXECUTION

3.1 GENERAL

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.

3.2 ROOF DECK CRITERIA

The building owner or its designated representative must ensure that the building structure is investigated by a registered engineer to assure its ability to withstand the total weight of the specified Green Roof system, as well as construction loads and live loads, in accordance with all applicable codes. The specifier must also designate the maximum allowable weight.

3.3 SUBSTRATE REQUIREMENTS

The substrate must be relatively even without noticeable high spots or depressions and shall be dry, relatively smooth, free of protrusions, debris, sharp edges or foreign materials and must be free of accumulated water, ice and snow. Cracks or voids in the substrate greater than 1/16" must be filled with a suitable material.

- 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, 3000 psi minimum, and shall have a wood float or fine broom finish with a concrete surface profile between CSP 2 to 5 according to ICRI and be 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 and be approved by the CCW representative.
 - 3. Concrete shall be cured at least 14 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 three 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.
 - 7. The concrete surface must be thoroughly clean, dry and free from any surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.

3.4 INSTALLATION

Refer to the applicable Material Safety Data Sheets and Technical Data Bulletins for cautions and warnings.

- A. Flashing and Detail Installation - Follow Carlisle Coatings & Waterproofing Inc. applicable waterproofing system specifications for specific surface preparation procedures, membrane positioning and adhesive application requirements.
 - 1. Detail expansion joints per manufacturer's recommendation using the CCW-EJ-500.
 - 2. Apply a thin film of CCW-550, CCW-550 Low VOC, or CCW Contact Adhesive primer 16" wide, centered over sealed 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.
 - 3. Preferred Flashing Method: Apply CCW-550, CCW-550 Low VOC, or CCW Contact Adhesive at the juncture of all horizontal surfaces and vertical surfaces to the height indicated on the drawings (8-inches min. recommended), such as parapet walls, curbs, columns and all penetrations through the deck at a rate of 400-600 sq. ft. per gallon. Avoid puddles. Allow primer to dry for 1 hour minimum, 8 hours maximum. **Membrane will not properly adhere to wet primer.** Apply 60-90 mils of CCW-500 membrane to cover primed areas. Install CCW- 711-90 mil sheet membrane flashing into this first course of CCW-500 to cover the vertical section and extend six 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 during installation of the subsequent layers of CCW-500 membrane.

4. Exposed Flashings: Install CCW 570 System or CCW Protection Cap 190FR as flashings in exposed areas per CCW recommendations. CCW 570 System includes CCW 570 Primer, CCW 570 Catalyst, CCW 570 Fleece, and CCW 570 Resin. CCW Protection Cap 190FR requires a CCW Contact Adhesive and torch application to substrate.
 5. Apply a thin film of CCW-550, CCW-550 Low VOC, or CCW Contact Adhesive Primer in a 4-foot square area around drains. Allow primer to dry, 1 hour minimum, eight hours maximum. Apply 90 mils of CCW-500 membrane to cover primed areas. Install a 3-foot square section of CCW-711-90 flashing centered over the drain and onto the deck. No splices or seams are allowed within twelve inches of the drain flange. Terminate the flashing under the clamping ring of the drain and cut away the inner portion of the flashing; opening shall be as large as pipe diameter of drain pipe. Use firm pressure to press the flashing into the warm CCW-500 surface and ensure good adhesion. Do not interfere with drain weep holes.
- B. Membrane Installation - Follow Carlisle Coatings & Waterproofing applicable waterproofing system specifications for specific surface preparation procedures, membrane positioning and adhesive application requirements.
1. Apply CCW-550, CCW-550 Low VOC, or CCW Contact Adhesive primer to all surfaces and at the juncture of all horizontal surfaces and vertical surfaces, to the height indicated on the drawings (eight inches min. recommended), such as parapet walls, curbs, columns and all penetrations through the deck, to receive CCW-500 Waterproofing Membrane, including over flashings, at published sq. ft. per gallon rate. Avoid puddles. Allow primer to dry for one hour minimum or until the primer will not transfer to touch, eight hours maximum. Membrane will not properly adhere to wet primer.
 2. Heat CCW-500 Membrane blocks in a twin wall kettle with continuous agitation and apply at temperatures between 330°F to 375°F. (**Caution: Do not exceed maximum safe operating temperature of 400°F.**)
 3. Apply heated CCW-500 Hot Applied Membrane to primed area and any pre-installed flashings at a rate of 17.8 sq. ft. per gallon or as required to obtain an average thickness of 90 mils.
 4. Apply CCW-500 Reinforcing Fabric and any required flashings while membrane is still hot and tacky with proper bleed in. Cut and trim off any wrinkles or overlap sections of the reinforcing fabric or hot the fabric splices together with CCW-500. Cut out any reinforcing fabric that is not adhered to the 90 mil layer of CCW-500 and reinstall as required.
 5. Apply a second coat of CCW-500 Hot Applied Membrane at a rate of 12.8 sq. ft. per gallon or as required to obtain an average thickness of 125 mils. Total thickness of the CCW-500R System shall be 215 mils.
 6. Apply CCW-Protection Board-HS into the last course of CCW-500 while warm and splice the protection board seams together with CCW-500.
- B. Water tightness integrity testing of membrane
1. A water test is required to ensure the waterproof integrity of the membrane system and is required for system warranty.
 - a. Allow CCW-500 Membrane to cool overnight. Plug drains and provide barriers necessary to contain flood water.
 - b. Flood surface with two inch head of water for 24 hours. Inspect for leaks and repair membrane if leaks are found.
 - c. Retest after repairs have been made.
 - d. **Note:** electronic testing (Electric Field Vector Mapping – EFVM) is the preferred test method test membrane/flashing for defects as long as the testing wires remain in place after the installation of the Green Roof media and plants.

C. Root Barrier installation.

1. Sweep the surface of the membrane to remove all debris and loose or foreign material.
2. CCW Root Barrier (16-mil tightly woven HDPE scrim with 2-mil polymeric coating sheet)
 - a. Overlap the adjacent CCW Root Barrier sheets a minimum of 4' in preparation for splicing. **The membrane must be spliced together as outlined below.**
 - b. Splicing surfaces shall be clean. Dirt/contaminants can be removed from splice areas with Carlisle Weathered Membrane Cleaner. Weathered Membrane Cleaner must be used to remove surface oxidation on the root barrier surface when the material has been exposed to the elements for 7 days. Apply Weathered Membrane Cleaner with a clean HP Splice Wipe or other white rag.
 - c. Secure laps in place with by installing Carlisle's Pressure Sensitive SecurTAPETM inside the lap.
 - d. Extend CCW Root Barrier up walls, curbs, etc. to the height of the top of the growth media layer.

D. CCW MiraDRAIN 9000, 9800 or 9900 Drainage Boards when insulation is used

1. Install the CCW MiraDRAIN 9000, 9800 or 9900 drainage panels with the fabric side facing upward. The first panels should be positioned with the flanged edge facing uphill.
 - a. Place Drainage Board panels so water flows with the overlap.
 - b. Cut the fabric along the flanged edge and remove to expose the edge of the drainage board core and flange.
 - c. Place the dimpled edge over the preceding flanged edge to join adjacent panels.
 - d. Fabric on the drainage board panels extends beyond the edges of the polyethylene core to provide an overlap to adjacent panels. When placing panels adjacent each other, overlap fabric in the direction of water flow.

E. Application of DOW Insulation

1. Apply insulation only when surfaces and ambient temperatures are within manufacturer's prescribed limits.
 - a. Install insulation loose laid directly over MiraDRAIN.
 - b. Install insulation boards parallel to roof perimeter long edges. Stagger end joints.
 - c. Lay insulation boards with edges in moderate contact without forcing.
 - d. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
 - e. (Optional: If more than one layer is required) Lay second layer of insulation with joints staggered from first layer.
 - f. Cut boards to slope for 24-inches back from roof drains for positive drainage.
 - g. Apply no more insulation than can be covered with [aggregate ballast] [concrete roof pavers] in same day.
 - h. Keep insulation minimum 3-inches from heat emitting devices, and minimum 2-inches from sidewalls of Type A chimneys and Type B and L vents.

F. CCW MiraDRAIN GR9400 Drainage/Water Retention Boards

1. Install CCW MiraDRAIN GR9400 Drainage/Water Retention Board over insulation.
2. Install the CCW MiraDRAIN GR9400 Drainage/Water Retention Board with the fabric side facing upward. The first panels should be positioned with the flanged edge facing uphill.
 - a. Place Drainage/Water Retention Board panels so water flows with the overlap.
 - b. Cut the fabric along the flanged edge and remove to expose the edge of the drainage board core and flange.

- c. Place the dimpled edge over the preceding flanged edge to join adjacent panels.
 - d. Fabric on the drainage board panels extends beyond the edges of the polyethylene core to provide an overlap to adjacent panels. When placing panels adjacent each other, overlap fabric in the direction of water flow.
 - e. Cover drainage board within 7 days of installation to prevent UV exposure.
 - f. Extend drainage boards up walls, curbs, etc. to the height of the top of the growth media layer.
3. Moisture Retention Mat -
 - a. Unroll CCW 300HV Water Retention Mat and loose lay Drainage/Water Retention Mat overlapping side and end laps a minimum of 2-inches.
 - b. Under windy conditions, provide temporary ballast to prevent wind disturbance. It is recommended to install the growth media over the moisture retention mat soon after its placement to prevent disturbance.
 - c. Extend the moisture retention mat up walls, curbs, etc. to the height of the top of the growth media layer.
- G. Application of CCW Green Roof Components
1. Limit traffic over completed roof membrane sections to essential personnel only. Heavily traveled areas (staging areas, corridors used to transport green roof components) must be protected using expanded or extruded insulation covered with ¾-inch thick plywood or other sheathing.
 2. Conform to manufacturer's instructions and provisions of Contract Documents. Where in conflict verify with Architect before beginning.
 3. Tray Placement
 - a. Place trays directly over protection cover provided under roofing work of Section [075000].
 - b. Positioned bottom troughs of trays perpendicular to roof slope, except minor crickets.
 - c. Orient and overlap edges to interlock and hold trays in place.
 - d. Attach trays in place with manufacturer's standard plastic tray pin through aligned holes in tray sidewalls.
 - e. Secure trays together with plastic tray pin fasteners and install metal edger in place. If integral irrigation is being used, place hooks concurrently with the tray pin in parallel direction of drip tube.
 - f. Promptly after placing trays on roof, install growth medium or ballast as necessary to prevent movement of trays due to weather and construction activities.
- H. (Optional) Metal Edger Placement
1. Coordinate to install an additional layer of roofing membrane or protection course under each flashing joint as accepted by roofing manufacturer if required.
 2. Conform to manufacturer's details for interconnections of edge systems
 3. Install metal edge to conceal tray sides.
 4. (Optional, specify when using irrigation) Place irrigation poly-header within irrigation edger.
 5. Install interlocking metal edger at openings between trays and perimeter roof edges to anchor trays, building perimeter flashings and counter flashings together.
 6. Sheet Metal Fasteners:
 - a. Concrete Walls: Fasten at 12-inch on center using a ¼-inch lead drive pin.
 - b. Wood Parapet Walls: Install interlocking metal anchor flashing fastened with minimum 12 stainless steel fasteners at 12-inch on center.
 - c. Gypsum Sheathing and Other Low Strength Materials: Install 18-gauge by 4-inch galvanized steel strip installed at structural framing at fastener locations. Fasten with minimum 12 stainless steel fasteners at 12-inch on center.

I. Growing Media Placement

1. Transport growing media to roof using stabilized hoisting equipment, blower truck or cranes.
2. Remove any and all debris within tray.
3. Distribute growing media evenly throughout tray system to a depth [3.6] inch, removing any temporary ballast measures. Maintain a consistent finish grade. Place media at required depth or as directed by a manufacturer's representative.

J. Plant Material Placement

1. Thoroughly saturate growing media prior to placing sedum tiles or sedum mats.
2. Install (plugs) (tiles) (mats) (un-rooted cuttings) conforming to landscape design and other specified requirements.
3. Distribute differing plant species evenly and uniformly within each tray for overall uniform appearance of overall in-place installation.
4. Following installation of plant material, irrigate using potable water free of substances harmful to plant growth. Provide hoses in lengths reaching from water supply source to planting trays.
5. Distribute growing media evenly throughout tray system to a depth [3.6] inch, removing any temporary ballast measures. Maintain a consistent finish grade. Place media at required depth or as directed by a manufacturer's representative.

K. Green Roof Maintenance

1. Maintain a uniform stand of succulent plants by watering and maintaining vegetated roof trays for a minimum period of 90 days following installation and through Substantial Completion and occupancy by Owner.
 - a. Include watering, spot weeding, fertilization, and other measures as necessary to maintain health and propagation of plant materials and as necessary for stabilization.
 - b. Instruct Owner and furnish written maintenance instructions, following maintenance period, as necessary for planting materials to develop complete root structure and to become stabilized.
 - c. Provide periodic hydration as needed, depending on precipitation.
 - d. Follow horticultural / nursery recommended plant maintenance procedures.
 - e. Long Term Maintenance for CCW Green Roof Trays:
 - a. **1st Year:** Inspect and weed the roof one month after installation. If installed in the spring, four visits during the first season, with weeding as needed.
 - b. **2nd Year:** Typically, once maintenance event involving weeding and watering as needed every two months during the growing season.
 - c. **3rd Year and thereafter:** Typically, one maintenance event involving weeding in the spring will be adequate.
 - d. Clear out dead material in early Spring.
 - e. Maintain modules by:
 - i. Watering during extended drought periods
 - ii. Spot weeding – do not use herbicides

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. CCW Green Roof Tray sizes and weights vary by region and regional growth media.

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End of Section