CARLISLE'S CCW-500R AND VAPOR-LOCK™ SYSTEMS
ATTACHMENT RP-TYPE III ROOFTOP PLANTING SYSTEM

Note: Roofmeadow® system components are available only in conjunction with a complete Roofmeadow system installation.

TYPE III EXTENSIVE VEGETATED ROOF COVER IN CONJUNCTION WITH CCW-500R REINFORCED HOT APPLIED LIQUID MEMBRANE WATERPROOFING SYSTEM

1.01 SUMMARY

A. Scope of work: Provide all labor, materials, transportation, equipment and services necessary to furnish and install a complete Roofmeadow vegetated roof cover, provided by Roofscapes, Inc., as shown on the drawings and described herein.

B. The vegetated cover shall be a two-layer system, consisting of a _____ inch (not to exceed 4") growth media layer installed over a 2" granular drainage media layer. The weight of this System at Maximum Water Capacity1 and with rainfall runoff occurring, shall be less than or equal to _____ (25 psf is the lowest practical weight) pounds per square foot.

C. Where thermal insulation is included in the roofing specification, it must have a compressive strength of no less than 25 psi and be adhered to the upper surface of the waterproofing system to prevent flotation according to the recommendations of the roofing manufacturer.

D. The Type III vegetated roof cover is optimized for the integrated Roofmeadow concealed irrigation system. This system delivers water at a slow rate to the roots of the plants.

2.01 MATERIALS

A. CCW-ROOT BARRIER

1. CCW-Root Barrier subsystem shall be installed immediately above the completed waterproofing.
2. This subsystem consists of a choice of 15 or 20-mil low density polyethylene membrane.
3. The CCW-Root Barrier shall be continuously hot-air welded at the seams according to the recommendations of Roofscapes, Inc., or overlapped four to five feet and secured with Carlisle's SecurTape™ double sided adhesive tape.
4. The completions at terminations shall be according to the recommendations of Carlisle and Roofscapes, Inc.

B. MOISTURE RETENTION FABRIC

1. Carlisle's Moisture Mat is a 26 ounce per square yard needle-punched polypropylene non-woven fabric.

C. DRAIN CONDUIT

1. Roofmeadow low profile drain conduit will be completely concealed below the top of the growth media when properly installed. The conduit shall be installed to insure that the maximum flow path within the system does not exceed the recommendations of Roofscapes, Inc., for the project. Factors influencing flow path include climate, roof drain configuration and roof slope. This component should satisfy the following specifications:

Height	2.25"
Open Area (perforations)	5% of conduit surface
Deflection and Impact Resistance (ASTM-F891)	Type PS25
Hydraulic Conveyance (K)[2]	0.75 ft^3/sec

D. GRANULAR DRAINAGE MEDIA

1. Roofmeadow Type A Granular Drainage Media is a heat-treated mineral product that satisfies the following specifications:

Density at Maximum Water Capacity[3]	50 lb/ft^3
Sat. Hydraulic Conductivity[3]	75"/min.
Volatile Fraction (organic matter)[4]	2% (dry wt.)
Abrasion Resistance (ASTM-C131-96)	25% loss
Soundness (ASTM–C88)	0.50% loss
Grain-size distribution:	
Pct. Passing US#18 sieve	1%
Pct. Passing 1/4 " sieve	20-30%
Pct. Passing 3/8 " sieve	80-90%

E. GROWTH MEDIA LAYER

1. Roofmeadow Type II Extensive Growth Media is a mixture of mineral and organic components that satisfies the following specifications:

Pore Space at Field Capacity (0.333 bar)[5]	15% (vol)
Moisture Content at Field Capacity[5](0.333 bar)	15% (vol)
Maximum Water Capacity[3]	45% (vol)
Density at Maximum Water Capacity[3]	75 lb/ft³
Sat. Hydraulic Conductivity[3]	0.75 in/hr, and 8 in/hr
Volatile Fraction (organic matter)[4]	12% (dry wt.)
Grain-size distribution of the mineral fraction:	
Pct. Passing US#200 sieve	1%
Pct. Passing US#60 sieve	2-25%
Pct. Passing US#18 sieve	20-50%
Pct. Passing1/8 " sieve	55-95%
Pct. Passing3/8 " sieve	90-100%
pH[4]	5.5-7.9
Soluble salts[5]	0.30 mmhos/cm (1:20 dilution)

2. Macro and micro nutrients shall be incorporated in the formulation in initial proportions suitable for supporting the specified planting.
3. Thoroughly blended at a batch facility. Moistened, as required, to prevent separation and excess 'dusting' during installation.
4. Quality control samples collected and submitted for testing for each 100 CY prepared.

F. WIND BLANKET

1. Roofmeadow photo-degradable wind blanket, satisfying the following specifications:

Aperture Size	0.125", and .04"
Tensile Strength (ASTM D4632)	20 lb
Satisfies Smolder Resistance Criteria	(FTMA-CCC-5-191B)

2. The Roofmeadow wind blanket incorporates a method for firmly securing the protective fabric from disruption caused by high winds.

G. EDGE ELEMENTS

1. Roofmeadow cantilever ('L-shaped') perforated edge elements (These are available in stainless steel, or aluminum) satisfy the following requirements:

Perforations	25% of surface area
Height	0.5" higher than the top of the growth media layer
Base Length	Greater than 7", or height of element

3.01 EXECUTION

A. PREPARATION

1. The surface of the waterproofing system shall be swept and cleaned.
2. Until the growth media layer is installed, traffic over the working area shall be strictly controlled and limited to essential personnel only.
3. Heavily traveled areas (e.g., corridors for transporting media to the working areas) must be protected by using 1/2 " plywood or similar sheathing material.

B. INSTALL ROOT BARRIER SUBSYSTEM

1. Roll out CCW-Root Barrier on top of the completed waterproofing system.
2. Layout root-barrier membrane. The layout should minimize the aggregate seam length. Overlap adjoining sheets by a minimum of 6" and tack seams using a hot-air welding machine. Allow slack to accommodate contraction during cold weather.
3. Or overlap seams four to five feet and splice together using Carlisle's SecurTape.
4. One-hundred percent of all seams shall be tested by one of the following methods:
    a) Electrical field vector mapping (available through Roofscapes, Inc.)
    b) Air lance
    c) Hand scribe

C. INSTALL EDGE ELEMENTS

1. Install edge elements as specified in the drawings.
2. As required, make the edge elements flush with adjacent pavers.

B. INSTALL GRANULAR DRAINAGE MEDIA

1. Roll out the moisture retention fabric. Overlap seams a minimum of 6" and tack seams using a
2. hot-air welding gun (Lester or equivalent).
3. Install drain conduit according to the recommendations of Roofscapes, Inc.
4. Install emitter manifolds for the integrated Roofmeadow concealed irrigation system (optional).
5. Place the granular drain media layer. The media shall be dispensed at the roof level in a manner
6. that will not suddenly increase the load to the roof. It shall be immediately spread to the specified
7. thickness.
8. Immediately cover with separation fabric. As necessary, protect from wind using temporary ballast.

E. GROWTH MEDIA LAYER

1. Place the growth media layer. The media shall be dispensed at the roof level in a manner that will not suddenly increase the load to the roof. It shall be immediately spread to the specified thickness, plus 15%.
2. Unless direct seeding is specified, immediately cover with the wind blanket and secure.
3. Thoroughly soak with water using a sprinkler or hand sprayer.

F. PLANTING (Direct Seeding Method)

1. The planting mixture should include species that will generate a continuous ground cover.
2. Maximum mature plant heights shall be less than 24". Large drifts of single species should be avoided.
3. All extensive planting schemes must incorporate Sedum species. These should be established from fresh cuttings. The plant mixture should include a minimum of four species of Sedum in approximately equal quantities. Cuttings should be distributed over the surface of the media at a minimum rate of 25 lbs/1,000 square feet. Planting using Sedum cutting can be undertaken from April through October.
4. Seed mixtures (optional) should include a minimum of five perennial varieties. Grasses should generally be avoided. Consult with Roofscapes, Inc., for recommendations concerning the incorporation of grasses in planting mixtures. Seeding rates shall be as recommended by the seed provider. However, in no case shall the seeding rate be less than 250 seeds/square yard (all species combined).
5. Follow seeding recommendation of the seed provider. However, seeding should not be attempted during the summer months, July through August. Prepared Roofmeadow seed mixtures tailored to different climactic zones are available.
6. Thoroughly soak the growth media prior to commencing the broadcast distribution of seed or cuttings.
7. After seeding, spread compost evenly over the surface. Apply at the rate of 0.25 ft^3/yd^2 (approximately 3/8 " deep). Immediately cover with the wind blanket and secure. Soak the prepared seed bed at the completion of planting operations.

G. PLANTING (Plug Installation)

1. All extensive planting schemes must incorporate Sedum species. Sedum must represent at least 50% of all installed plants. Additionally, the plant mixture should include a minimum of four different species of Sedum in approximately equal quantities.
2. Non-Sedum varieties should be selected that are adapted to the specific growing conditions. A sample species list for temperate climates and suitable for unirrigated 4" deep Type II systems is attached.
3. Plant installation should occur May through June or September through October unless an active irrigation system is included. Surface drip, mist or spray irrigation systems are suitable with Type II vegetated roof covers.
4. Plants should be established from two- to three-inch plugs propagated in sterile nursery medium, according to the plant providers recommendations. Plugs larger than 3" can be used. However, the establishment rate is typically much better with the smaller plants. The recommended minimum planting rate is 650 plants per 1,000 square feet.
5. Thoroughly soak the growth media prior to commencing planting,
6. The plugs should be set into the media to their full depth and the media pressed firmly around the installed plug. At the end of each day, soak those areas that have been newly planted.
7. Do not mulch.

H. TWO-YEAR MAINTENANCE SERVICE—The green roof installer shall offer a two-year maintenance service. This service will include:

1. Hand weeding and/or chemical weeding and fertilization, as required. Note that mature plants and weeds generally cannot be removed by pulling, since this will disrupt the layered structure of the green roof. Rather, these plants can be removed with herbicides or cut off at the top of the substrate layer with pruning shears.
2. The installer shall guarantee an 80% cover rate at the end of 24 months. As necessary, plants shall be replanted to achieve this requirement.

Sample Temperate Climate Plant List

Sedum album	*Campanula* rotundifolia	*Salvia* plumosa
Sedum acre	*Cerastium* tomentosum	*Salvia* nemarosa
Sedum sexangulare	*Dianthus* deltoides	*Salvia* praetensis
Sedum spurium	*Hieracium* sp.	*Thymus* serpyllum
Sedum reflexum	*Linaria* aeruginea	*Aster* amellus
Sedum floriferum	*Petrohagia* (Tunica) saxifraga	*Aster* alpinus
Achillea millifolium	*Potentilla* verna (neumanniania)	*Liatris* punctata
Allium schoenoprasum	*Prunella* grandifora	*Saxigifraga* sp
Arabis caucasica	*Salvia* lyrata	*Veronic*a incana
Veronica teucrinum		

1. According to (FLL) Richlinien für die Planung, Ausführung und Pflege von Dachbegrünung, Forshungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (1995). pp.56. Laboratory testing services available through Roofscapes, Inc., 7114 McCallum St., Philadelphia, PA 19119 www.roofmeadow.com
2. Conveyance determined according to Manning formula: K = (1.49 x A x R (2/3))/n; A=area, R=hydraulic radius, n=Manning's roughness coefficient
3. According to (FLL) Richlinien für die Planung, Ausführung und Pflege von Dachbegrünung, Forshungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (1995). pp.56. Laboratory testing services available through Roofscapes, Inc., 7114 McCallum St., Philadelphia, PA 19119 www.roofmeadow.com
4. According to (RSTP) Recommended Soil Testing Procedures for Northeastern United States, Northeast Regional Bulletin #493, Agricultural Experiment station, University of Delaware (1995) - Mehlich 3. Laboratory testing services available through Roofscapes, Inc, 7114 McCallum St., Philadelphia, PA 19119 www.roofmeadow.com
5. According to (MSA) Methods of Soil Analysis, American Society of Agronomy (1965), Part 1, pp. 273. Laboratory testing services available through Roofscapes, Inc, 7114 McCallum St., Philadelphia, PA 19119 www.roofmeadow.com

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