

Section 07330

Vegetated Roofing Drainage Composites

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Drainage Composites for Vegetated Roof Systems.
- B. Drainage and Water Holding Composite for Vegetated Roof Systems.
- C. Root Reinforcing Composite Mat for Pre-Vegetated Roof System Mats.
- D. Drainage Composites for Plaza Deck Systems.
- E. Drainage Composites for Planter Drainage.

1.2 RELATED SECTIONS

- A. Section 02900 - Vegetation and Soil Medium.
- B. Section 02910 - Pre-Vegetated Plant Mats.
- C. Section 02630 - Storm Drainage: Connection to drainage system.
- D. Section 07130 - Membrane Waterproofing: Membrane waterproofing application.
- E. Section 07500 - Membrane Roofing: Membrane roofing application.
- F. Section 07900 - Joint Sealers.

1.3 REFERENCES

- A. ASTM D 737 - Standard Test Method for Air Permeability of Textile Fabrics.
- B. ASTM D 1621 - Standard Test Method for Bursting Strength of Paper.
- C. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- D. ASTM D 3776 – Standard Test Method for Mass Per Unit Area (Weight) of Fabric.
- E. ASTM D 3786 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics, Diaphragm Bursting Strength Method.
- F. ASTM D 4491 - Standard Test Method for Water Permeability of Geotextiles by Permittivity.

- G. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
- H. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- I. ASTM D 4716 - Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- J. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- K. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
- L. ASTM D 5199 - Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
- M. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

- A. Drainage Composites for Vegetated Roof System: Drainage composites for drainage and roof reinforcement in multilayer green roof configurations.
 - 1. Enkadrain Subsurface Drainage Composite is a drainage product used over the roof membrane to provide maximum strength and continuous flow under any load while protecting the waterproofing membrane.
 - 2. EnkaRetain & Drain Drainage and Water Holding Composite is a drainage product used over the roof membrane that provides continuous flow of excess water while retaining water for use by the vegetation and the reduction of stormwater runoff.
 - 3. Enkamat permanently anchors plant roots on sloped roofs or in high wind conditions. Its tough root reinforcing system anchors vegetation and provides a holding cavity for the growing medium.
 - 4. Enkaroo VM is an Enkamat core with a nonwoven fabric attached to the bottom side for pre-vegetated mat applications.
- B. Pre-Vegetation Mats for a Vegetated Roof System: Mats for growing pre-growing vegetation used in multilayer green roof configurations.
 - 1. Enkaroo VM is an Enkamat core with a nonwoven fabric attached to the bottom side for pre-vegetated mat applications.
- C. Drainage Composites for Plaza Deck System: Drainage composites for drainage under plaza deck.
 - 1. Enkadrain Subsurface Drainage Composite is a drainage product used over the waterproofing membrane to provide maximum strength and continuous flow under any load while protecting the waterproofing membrane.
- D. Drainage Composites for Planter Drainage System: Drainage composites for drainage in planters.
 - 1. Enkadrain Subsurface Drainage Composite is a drainage product used on planter bottoms to provide drainage with continuous flow under any load without clogging.

2. EnkaRetain & Drain Drainage and Water Holding Composite is a drainage product used on planter bottoms that provides continuous flow of excess water while retaining water for use by the planter vegetation.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Indicate dimensions, layout of membrane layers, high and low points of pipe inverts, and gradient of slope between corners and intersections.
- D. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
 1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
 2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificate: Certify specified products meet or exceed specified requirements.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in subsurface drainage composites with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section with minimum three years documented experience.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship, color, and sheen is approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Handle and store product according to manufacturers recommendations.

- C. Store products in a dry space at temperatures between 50 to 90 degrees F (10 to 32 degrees C). Do not store in direct sunlight.
- D. For cold weather applications, store products in a heated airspace at 50 degrees F (10 degrees C) or above for at least 2 days prior to application. Take out only the amount of material that can be applied within 2 hours.
- E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Colbond Inc.; P. O. Box 1057, 1301 Sand Hill Rd., Enka, NC 28728. ASD. Tel. Toll Free: (800) 365-7391. Tel: (828) 665-5000. Fax: (828) 665-5009. Email: enka-engineered@colbond.com. Web Site: www.colbond-usa.com.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MATERIALS

- A. Drainage Composite.
 - 1. Enkadrain 3811R:
 - a. Core: Recycled polypropylene with geotextile on two sides.
 - b. Thickness: 0.45 inches (11.4 mm).
 - c. Total Weight: 23.7 oz/sq yd (804 g/sm).
 - d. Core Weight: 16 oz/sq yd (543 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 18.1 gal/min/ft @ 500 psf; 16.8 gal/min/ft @ 2000 psf; At 0.2 Gradient - 7.3 gal/min/ft @ 500 psf; 7.0 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties: Gray Side.
 - 1) Polymer: PA6 and PET.
 - 2) Weight: 3.54 oz/sq yd (120 g/sm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 125 lbs (556 N) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 40 percent when tested in accordance with ASTM D 4632.

- 5) Trapezoidal Tear: 40 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 35 lbs (155 N) when tested in accordance with ASTM D 4833.
 - 7) Mullen Burst: 160 psi (1102 kPa) when tested in accordance with ASTM D 3786.
 - 8) AOS: 0.357 mm, maximum average when tested in accordance with ASTM D 4751.
 - 9) Flow Rate: 185 gal/m/sf (7536 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 10) Permittivity: 2.5 seconds⁻¹ when tested in accordance with ASTM D 4491.
- h. Fabric Properties: Black side.
- 1) Polymer: Polypropylene.
 - 2) Weight: 4.5 oz/sq yd (152.6 glsm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 120 lbs (0.54 kN) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 50 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 50 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 70 lbs (310 N) when tested in accordance with ASTM D 4833.
 - 7) AOS: 0.212 mm, maximum average when tested in accordance with ASTM D 4751.
 - 8) Flow Rate: 120 gal/m/sf (4887 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 9) Permittivity: 1.8 seconds⁻¹ when tested in accordance with ASTM D 4491.
2. Enkadrain 3611R (Medium Duty):
- a. Core: Recycled polypropylene with geotextile on one side.
 - b. Thickness: 0.45 inches (11.4 mm).
 - c. Total Weight: 20.5 oz/sq yd (695 glsm).
 - d. Core Weight: 16 oz/sq yd (543 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 22.0 gal/min/ft @ 500 psf; 19.0 gal/min/ft @ 2000 psf; At 0.2 Gradient - 8.7 gal/min/ft @ 500 psf; 8.3 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties: Black side.
 - 1) Polymer: Polypropylene.
 - 2) Weight: 4.5 oz/sq yd (152.6 glsm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 120 lbs (0.54 kN) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 50 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 50 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 70 lbs (310 N) when tested in accordance with ASTM D 4833.
 - 7) AOS: 0.212 mm, maximum average when tested in accordance with ASTM D 4751.

- 8) Flow Rate: 120 gal/m/sf (4887 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 9) Permittivity: 1.8 seconds⁻¹ when tested in accordance with ASTM D 4491.
3. Enkadrain 3615R (Heavy Duty):
- a. Core: Recycled polypropylene with geotextile on one side.
 - b. Thickness: 0.45 inches (11.4 mm).
 - c. Total Weight: 28.5 oz/sq yd (966 glsm).
 - d. Core Weight: 24 oz/sq yd (814 g/sm).
 - e. Fabric Weight: 4.5 oz/sq yd (153 g/sm).
 - f. Flow Rate: Flow Rate: At 1.0 Gradient- 21.0 gal/min/ft @ 500 psf; 19.0 gal/min/ft @ 2000 psf; At 0.2 Gradient- 8.2 gal/min/ft @ 500 psf; 8.0 gal/min/ft @ 2000 psf.
 - g. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - h. Fabric Properties: Black.
 - 1) Polymer: Polypropylene.
 - 2) Weight: 4.5 oz/sq yd (152.6 glsm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 120 lbs (0.54 kN) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 50 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 50 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 70 lbs (310 N) when tested in accordance with ASTM D 4833.
 - 7) AOS: 0.212 mm, maximum average when tested in accordance with ASTM D 4751.
 - 8) Flow Rate: 120 gal/m/sf (4887 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 9) Permittivity: 1.8 seconds⁻¹ when tested in accordance with ASTM D 4491.
4. Enkadrain 9120:
- a. Core: Nylon 6 with geotextile on one side.
 - b. Thickness: 0.8 inches (20.3 mm).
 - c. Total Weight: 25.6 oz/sq yd (868 glsm).
 - d. Core Weight: 21.3 oz/sq yd (722 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 17.5 gal/min/ft @ 500 psf; 3.0 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties:
 - 1) Polymer: PA6 and PET.
 - 2) Weight: 3.54 oz/sq yd (120 g/sm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 125 lbs (556 N) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 40 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 40 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 35 lbs (155 N) when tested in accordance with ASTM D 4833.

- 7) Mullen Burst: 160 psi (1102 kPa) when tested in accordance with ASTM D 3786.
- 8) AOS: 0.357 mm, maximum average when tested in accordance with ASTM D 4751.
- 9) Flow Rate: 185 gal/m/sf (7536 l/sec/sm) when tested in accordance with ASTM D 4491.
- 10) Permittivity: 2.5 seconds⁻¹ when tested in accordance with ASTM D 4491.

B. Drainage and Water Holding Composite:

1. EnkaRetain & Drain 3111.
 - a. Core: Recycled Polypropylene.
 - b. Total Thickness: 0.60 inch (15 mm).
 - c. Total Weight: 36.0 oz/SY (g/sm) (average).
 - d. Core Weight: 16.0 oz/SY (g/sm) (average).
 - e. Core Thickness 0.40 inch (10 mm)
 - f. Flow Rate: At 1.0 Gradient - 23.0 gal/min/ft @ 1000 psf.
 - g. Fabric Properties:
 - 1) Polymer: Polypropylene and PET.
 - 2) Weight: 20.0 oz/sq yd when tested in accordance with ASTM D 5261.
 - 3) Grab Strength: 135 lbs (61 k) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 70 percent when tested in accordance with ASTM D 4632.
 - 5) Puncture Resistance: 70 lbs (31 k) when tested in accordance with ASTM D 4833.
 - 6) Mullen Burst: 300 psi (1102 kPa) when tested in accordance with ASTM D 3786.
 - 7) Water Holding Capacity: 1000-2000 percent when tested in accordance with ASTM D 4250.
 - 8) Water Holding Capacity: 0.10 to 0.15 gal/SF when tested in accordance with ASTM D 4250.

C. Vegetated Roofing Composite: Enkamat 7010.

1. Core: Nylon 6.
2. Thickness: 0.40 inches (10 mm).
3. Core Weight: 7.7 oz/sq yd (966 g/sm).
4. Performance Characteristics:
 - a. Low temperature: Minus 100 degrees F (minus 73 degrees C).
 - b. High temperature: 250 degrees F (121 degrees C).
 - c. Fuel and gasoline submersion – Stable.
5. Fire Rating:
 - a. NFPA Class A, ASTM E 84.
 - b. Flamespread: 25.
 - c. Smoke density: 30.

D. Pre-Vegetated Roofing Composite: Enkaroo VM

1. Core: Nylon 6 with a geotextile membrane on one side.
2. Thickness: 0.75 inches (19 mm).
3. Total Weight: 13.7 oz/sq yd (465 glsm).
4. Core Weight: 10.5 oz/sq yd (356 g/sm).
5. Fabric Properties:
 - a. Polymer: PA6 and PET.

- b. Weight: 3.2 oz/sq yd (109 glsm) when tested in accordance with ASTM D 3776.
 - c. Grab Strength: 125 lbs (556 N) when tested in accordance with ASTM D 4632.
 - d. Grab Elongation 40 percent when tested in accordance with ASTM D 4632.
 - e. Trapezoidal Tear: 40 lbs when tested in accordance with ASTM D 4533.
 - f. Puncture Resistance: 35 lbs (155 N) when tested in accordance with ASTM D 4833.
 - g. Mullen Burst: 160 psi (1102 kPa) when tested in accordance with ASTM D 3786.
 - h. AOS: 0.357 mm, maximum average when tested in accordance with ASTM D 4751.
 - i. Flow Rate: 185 gal/m/sf (7536 l/sec/sm) when tested in accordance with ASTM D 4491.
 - j. Permittivity: 2.5 seconds when tested in accordance with ASTM D 4491.
6. Performance Characteristics:
- a. Low temperature: Minus 100 degrees F (minus 73 degrees C).
 - b. High temperature: 250 degrees F (121 degrees C).
 - c. Fuel and gasoline submersion – Stable.
7. Fire Rating:
- a. NFPA Class A, ASTM E 84.
 - b. Flamespread: 5.
 - c. Smoke density: 70.

E. Drainage Composites for Planter Drainage System:

1. Enkadrain 3611R:
- a. Core: Recycled polypropylene with geotextile on one side.
 - b. Thickness: 0.45 inches (11.4 mm).
 - c. Total Weight: 20.5 oz/sq yd (695 glsm).
 - d. Core Weight: 16 oz/sq yd (543 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 22.0 gal/min/ft @ 500 psf; 19.0 gal/min/ft @ 2000 psf; At 0.2 Gradient - 8.7 gal/min/ft @ 500 psf; 8.3 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties: Black side.
 - 1) Polymer: Polypropylene.
 - 2) Weight: 4.5 oz/sq yd (152.6 glsm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 120 lbs (0.54 kN) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 50 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 50 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 70 lbs (310 N) when tested in accordance with ASTM D 4833.
 - 7) AOS: 0.212 mm, maximum average when tested in accordance with ASTM D 4751.
 - 8) Flow Rate: 120 gal/m/sf (4887 l/sec/sm) when tested in accordance with ASTM D 4491.

- 9) Permittivity: 1.8 seconds when tested in accordance with ASTM D 4491.
2. Enkadrain 3615R:
 - a. Core: Recycled polypropylene with geotextile on one side.
 - b. Thickness: 0.45 inches (11.4 mm).
 - c. Total Weight: 28.5 oz/sq yd (966 glsm).
 - d. Core Weight: 24 oz/sq yd (814 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 21.0 gal/min/ft @ 500 psf; 19.0 gal/min/ft @ 2000 psf; At 0.2 Gradient - 8.2 gal/min/ft @ 500 psf; 8.0 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties: Black.
 - 1) Polymer: Polypropylene.
 - 2) Weight: 4.5 oz/sq yd (152.6 glsm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 120 lbs (0.54 kN) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 50 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 50 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 70 lbs (310 N) when tested in accordance with ASTM D 4833.
 - 7) AOS: 0.212 mm, maximum average when tested in accordance with ASTM D 4751.
 - 8) Flow Rate: 120 gal/m/sf (4887 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 9) Permittivity: 1.8 seconds when tested in accordance with ASTM D 4491.
 3. Enkadrain 3811R:
 - a. Core: Recycled polypropylene with geotextile on two sides.
 - b. Thickness: 0.45 inches (11.4 mm).
 - c. Total Weight: 23.7 oz/sq yd (804 glsm).
 - d. Core Weight: 16 oz/sq yd (543 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 18.1 gal/min/ft @ 500 psf; 16.8 gal/min/ft @ 2000 psf; At 0.2 Gradient - 7.3 gal/min/ft @ 500 psf; 7.0 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties: Gray Side.
 - 1) Polymer: PA6 and PET.
 - 2) Weight: 3.54 oz/sq yd (120 g/sm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 125 lbs (556 N) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 40 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 40 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 35 lbs (155 N) when tested in accordance with ASTM D 4833.
 - 7) Mullen Burst: 160 psi (1102 kPa) when tested in accordance with ASTM D 3786.

- 8) AOS: 0.357 mm, maximum average when tested in accordance with ASTM D 4751.
 - 9) Flow Rate: 185 gal/m/sf (7536 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 10) Permittivity: 2.5 seconds when tested in accordance with ASTM D 4491.
- h. Fabric Properties: Black side.
- 1) Polymer: Polypropylene.
 - 2) Weight: 4.5 oz/sq yd (152.6 glsm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 120 lbs (0.54 kN) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 50 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 50 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 70 lbs (310 N) when tested in accordance with ASTM D 4833.
 - 7) AOS: 0.212 mm, maximum average when tested in accordance with ASTM D 4751.
 - 8) Flow Rate: 120 gal/m/sf (4887 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 9) Permittivity: 1.8 seconds when tested in accordance with ASTM D 4491.
4. Enkadrain 9120:
- a. Core: Nylon 6 with geotextile on one side.
 - b. Thickness: 0.8 inches (20.3 mm).
 - c. Total Weight: 25.6 oz/sq yd (868 glsm).
 - d. Core Weight: 21.3 oz/sq yd (722 g/sm).
 - e. Flow Rate: At 1.0 Gradient - 17.5 gal/min/ft @ 500 psf; 3.0 gal/min/ft @ 2000 psf.
 - f. Compressive Load: Greater than 30,000 psf (4713 kN/sm) when tested in accordance with ASTM D1621 modified and ASTM D 4716.
 - g. Fabric Properties:
 - 1) Polymer: PA6 and PET.
 - 2) Weight: 3.54 oz/sq yd (120 g/sm) when tested in accordance with ASTM D 3776.
 - 3) Grab Strength: 125 lbs (556 N) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 40 percent when tested in accordance with ASTM D 4632.
 - 5) Trapezoidal Tear: 40 lbs when tested in accordance with ASTM D 4533.
 - 6) Puncture Resistance: 35 lbs (155 N) when tested in accordance with ASTM D 4833.
 - 7) Mullen Burst: 160 psi (1102 kPa) when tested in accordance with ASTM D 3786.
 - 8) AOS: 0.357 mm, maximum average when tested in accordance with ASTM D 4751.
 - 9) Flow Rate: 185 gal/m/sf (7536 l/sec/sm) when tested in accordance with ASTM D 4491.
 - 10) Permittivity: 2.5 seconds when tested in accordance with ASTM D 4491.

- F. Planter Bottom Drainage and Water Holding Composite:
1. EnkaRetain & Drain 3111.
 - a. Core: Recycled Polypropylene.
 - b. Total Thickness: 0.60 inch (15 mm).
 - c. Total Weight: 36.0 oz/SY (g/sm) (average).
 - d. Core Weight: 16.0 oz/SY (g/sm) (average).
 - e. Core Thickness 0.40 inch (10 mm)
 - f. Flow Rate: At 1.0 Gradient - 23.0 gal/min/ft @ 1000 psf.
 - g. Fabric Properties:
 - 1) Polymer: Polypropylene and PET.
 - 2) Weight: 20.0 oz/sq yd when tested in accordance with ASTM D 5261.
 - 3) Grab Strength: 135 lbs (61 k) when tested in accordance with ASTM D 4632.
 - 4) Grab Elongation 70 percent when tested in accordance with ASTM D 4632.
 - 5) Puncture Resistance: 70 lbs (31 k) when tested in accordance with ASTM D 4833.
 - 6) Mullen Burst: 300 psi (1102 kPa) when tested in accordance with ASTM D 3786.
 - 7) Water Holding Capacity: 1000-2000 percent when tested in accordance with ASTM D 4250.
 - 8) Water Holding Capacity: 0.10 to 0.15 gal/SF when tested in accordance with ASTM D 4250.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until waterproofing specified in Section 07130 has been properly installed and that substrate has been properly prepared for waterproofing installation.
- B. Do not begin installation until subsurface is smooth and sound.
- C. Do not begin installation until substrate has been properly prepared for subsurface drain installation. Before beginning installation, inspect to ensure that surface is clean free of debris that could puncture the membrane.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate and under the project conditions.

3.3 DRAINAGE COMPOSITE INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Apply in clear dry weather at recommended temperatures.

- C. Measure the length needed. Cut piece from roll to correct length.
- D. Start at the edge of the surface to be covered and install the first strip of drainage composite with the fabric flap facing the starting edge.
- E. Measure the length of the next drainage composite strip as needed. Cut piece from roll to correct length.
- F. Apply a continuous bead of construction adhesive in a zigzag pattern along the edge of the drainage composite strip without the flap. Apply the strip tightly to the previously placed strip overlapping and bonding the fabric.
- G. Continue placement over entire surface as required. Remove excess material from the last strip without removing the fabric overlap.
- H. Use temporary ballast if required to hold strips in position.

3.4 VEGETATED ROOFING DRAINAGE COMPOSITE INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Measure the length needed. Cut piece from roll to correct length.
- C. Start at the edge of the surface to be covered and install the first strip of vegetated roofing composite tight to the starting edge.
- D. Measure the length of the next strip as needed. Cut piece from roll to correct length.
- E. Apply the strip tightly to the previously placed strip.
- F. Continue placement over entire surface as required.
- G. Use temporary ballast if required to hold strips in position until placement of the soil medium and planting as specified in Section 02900.

3.5 PRE-VEGETATED ROOFING DRAINAGE COMPOSITE INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Measure the length needed. Cut piece from roll to correct length.
- C. Start at the edge of the surface to be covered and install the first strip of pre-vegetated roofing composite tight to the starting edge.
- D. Measure the length of the next strip as needed. Cut piece to correct length.
- E. Apply the strip tightly to the previously placed strip.
- F. Continue placement over entire surface as required.

3.6 PLANTER DRAINAGE COMPOSITE INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Measure the length needed. Cut piece from roll to correct length.

- C. Start at the longest direction of the planter and moving in the opposite direction of the fabric flap, cut the drainage composite to length and place the fabric flap against the planter bottom.
- D. Measure the length of the next drainage composite strip as needed. Cut piece from roll to correct length.
- E. Apply a continuous bead of construction adhesive in a zigzag pattern along the edge of the drainage composite strip without the flap. Apply the strip tightly to the previously placed strip overlapping and bonding the fabric.
- F. Continue placement over entire surface as required. Remove excess material from the last strip without removing the fabric overlap.
- G. Measure the perimeter of the planter. Cut a strip of drainage composite to the measured length and place horizontally around the planter wall.
- H. Place the soil medium and plants as specified in Section 02900.

3.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Repair or replace damaged products before Substantial Completion.

END OF SECTION