

# Mansker Creek TN

## GENERAL NOTES:

### DESIGN PROVISIONS:

- THE FOLLOWING EFFECTIVE STRENGTH PARAMETERS WERE ASSUMED IN THE PREPARATION OF THE STRUCTURAL CALCULATIONS FOR THE RETAINING WALL SYSTEM:

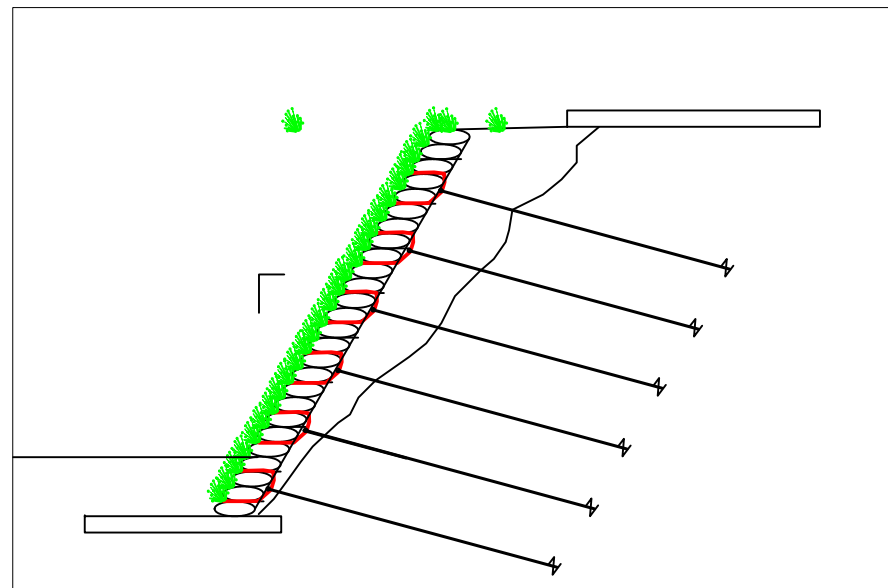
	$\phi$	c	$\gamma$	SOIL TYPE
REINFORCED SOIL	28°	0 PSF	120 PCF	--
RETAINED SOIL	28°	0 PSF	120 PCF	--
FOUNDATION SOIL	28°	0 PSF	120 PCF	--

SOIL TYPES AND DESIGN PROPERTIES SHALL BE CONFIRMED BY THE SITE GEOTECHNICAL ENGINEER PRIOR TO WALL CONSTRUCTION.

- THE WALL(S) ARE DESIGNED TO SUPPORT THE FOLLOWING MAXIMUM SURCHARGE LOADINGS:

BEARING LOAD: 1500 PSF  
 DEAD LOAD: NONE  
 BACK SLOPE: NONE  
 SEISMIC: NOT APPLICABLE  
 HYDROSTATIC: NOT APPLICABLE

- THE FOUNDATION SOILS AT WALL LOCATIONS SHALL BE CAPABLE OF SAFELY SUPPORTING THE MAXIMUM APPLIED BEARING PRESSURE, AS SHOWN ON THE WALL PROFILES, WITHOUT FAILURE OR EXCESSIVE SETTLEMENT. LOCAL BEARING CAPACITY SHALL BE CONFIRMED BY THE SITE GEOTECHNICAL ENGINEER AFTER FOUNDATION EXCAVATION AND PRIOR TO WALL CONSTRUCTION.



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## GENERAL NOTES:

### SUGGESTED QUALITY ASSURANCE PROVISIONS:

- WALL CONSTRUCTION SHALL BE SUPERVISED BY A QUALIFIED ENGINEER OR TECHNICIAN TO VERIFY FIELD AND SITE SOIL CONDITIONS. IF THIS WORK IS NOT PERFORMED BY THE SITE GEOTECHNICAL ENGINEER, A QUALIFIED GEOTECHNICAL ENGINEER/TECHNICIAN SHALL BE CONSULTED IN THOSE MATTERS PERTAINING TO THE SOIL CONDITIONS AND WALL PERFORMANCE.
- THE FOUNDATION SOILS AT THE BASE OF THE WALL(S) SHALL BE INSPECTED BY THE GEOTECHNICAL ENGINEER. ANY UNSUITABLE SOILS OR IMPROPERLY COMPACTED EMBANKMENT MATERIAL SHALL BE REMOVED AND REPLACED AS DIRECTED BY THE ENGINEER PRIOR TO WALL CONSTRUCTION TO PROVIDE ADEQUATE BEARING CAPACITY AND MINIMIZE SETTLEMENT.
- ALL WALL EXCAVATION AND RETAINED SOILS SHALL BE INSPECTED FOR GROUNDWATER CONDITIONS. ANY ADDITIONAL DRAINAGE PROVISIONS REQUIRED IN THE FIELD SHALL BE INCORPORATED INTO THE WALL CONSTRUCTION AS DIRECTED BY THE GEOTECHNICAL ENGINEER.
- WALL BACKFILL MATERIAL SHALL BE TESTED AND APPROVED BY THE ENGINEER, MEETING THE MINIMUM REQUIREMENTS OF THE APPROVED DESIGN PLANS OR SPECIFICATIONS.
- ALL SOIL BACKFILL SHALL BE TESTED BY THE GEOTECHNICAL ENGINEER FOR MOISTURE, DENSITY, AND COMPACTION PERIODICALLY (EVERY 2' VERTICALLY, 100'-200' C/C) MEETING THE MINIMUM REQUIREMENTS OF THE APPROVED DESIGN PLANS OR SPECIFICATIONS.
- THE CONTRACTOR SHALL ESTABLISH AND MAINTAIN QUALITY CONTROL FOR THE CONSTRUCTION OF THE WALL TO ASSURE COMPLIANCE WITH CONTRACT REQUIREMENTS AND MAINTAIN RECORDS OF ITS QUALITY CONTROL.
- ALL WALL ELEVATIONS, GRADES, AND BACK SLOPE CONDITIONS SHALL BE VERIFIED BY THE ENGINEER IN THE FIELD FOR CONFORMANCE WITH APPROVED DESIGN PLANS. ANY REVISIONS TO THE STRUCTURE GEOMETRY OR DESIGN CRITERIA SHALL REQUIRE DESIGN MODIFICATIONS PRIOR TO PROCEEDING WITH CONSTRUCTION.



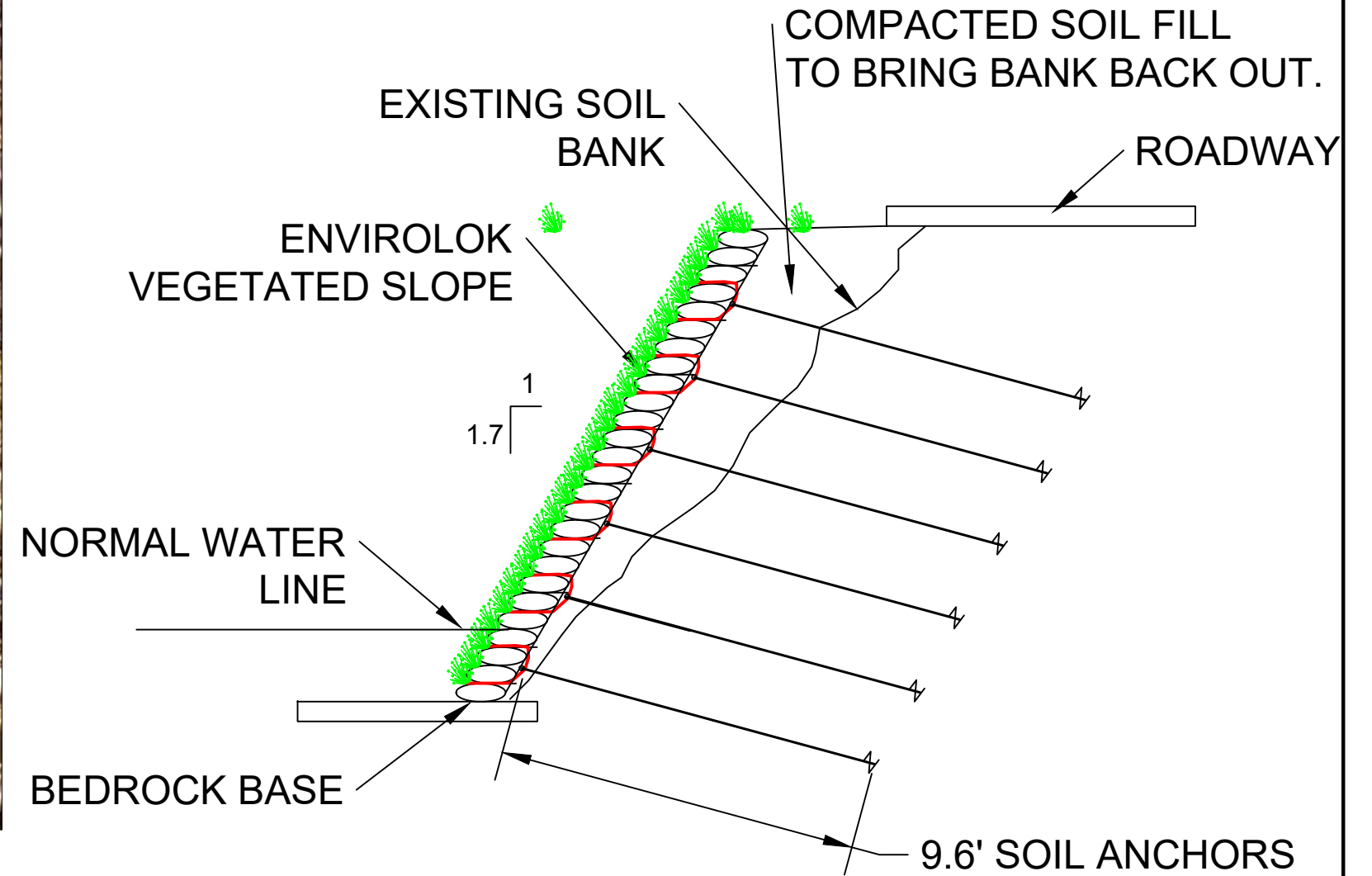
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No.	Date	Revision	By	Designed By:	Project:	Project No:
				rjfr	Mansker Creek, TN	
				Scale: As Noted		
				Date: 3/15/16	Title:	Sheet No.
1					<b>TITLE</b>	1



ASSUMPTIONS:

- SLOPE HEIGHT APPEARS TO BE 10 TO 12 FT
- SOIL OBSERVED IS A SILTY SAND
- TOP SURFACE IS A PAVED ROAD.
- STREAM BED IS ROCK.



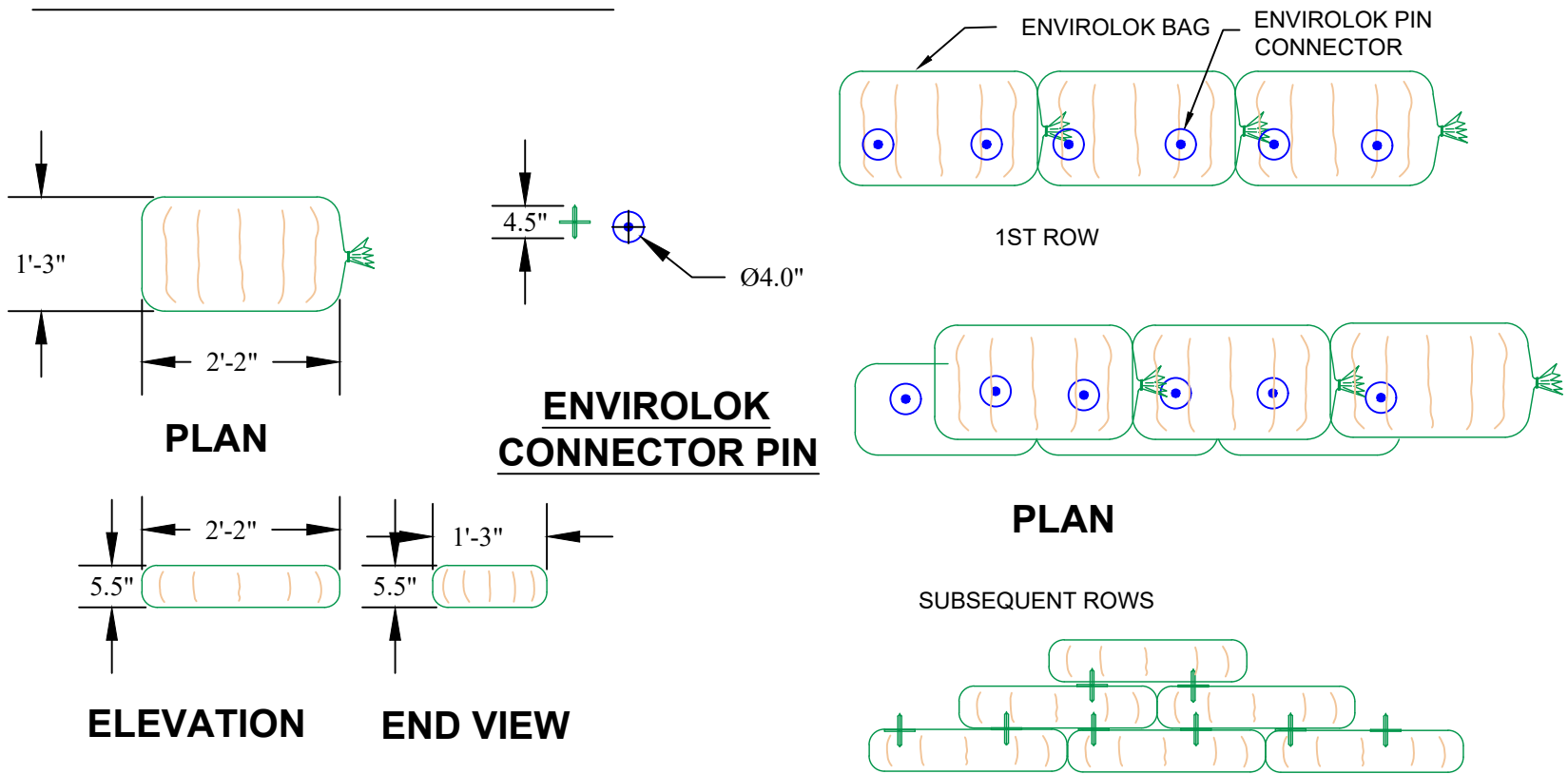
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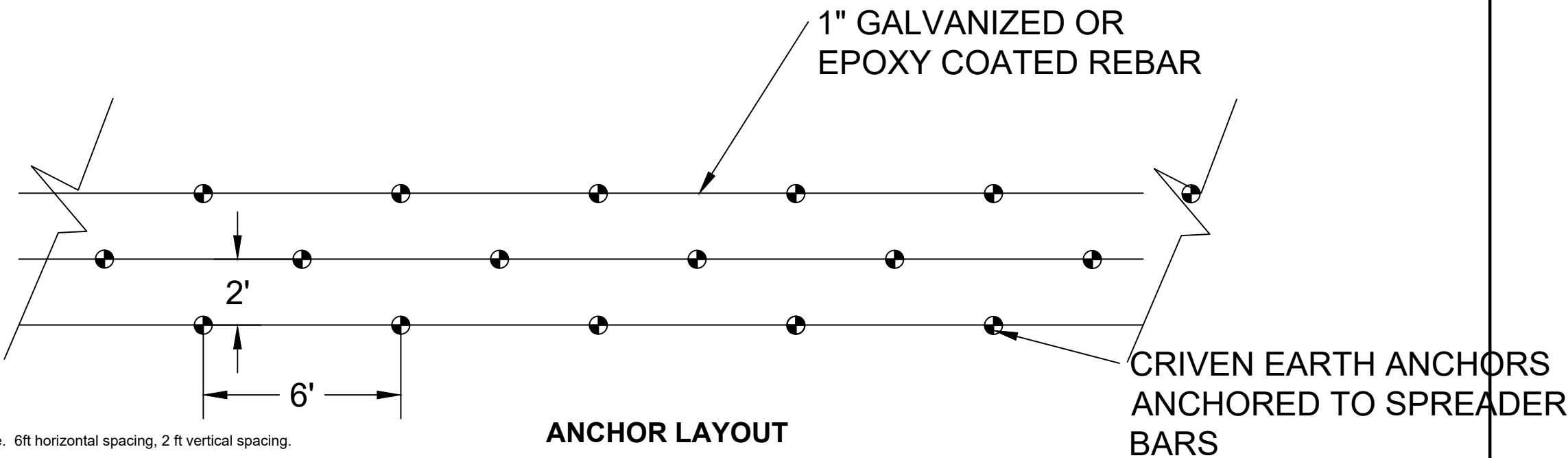
Designed By: rjfr	Project: <b>Mansker Creek, TN</b>
Scale: As Noted	
Date: 3/15/16	
Title: <b>ELEVATIONS</b>	

Project No:
Sheet No. 2

# Envirolok Standard Unit



Unit dimensions are approximate, they may vary with the amount of filling. The dimensions shown produce an 80 to 90 lb filled bag.



Anchor detail for lower and middle wall along the lake. 6ft horizontal spacing, 2 ft vertical spacing.



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 Date:  
 3/15/16

Project:  
 Mansker Creek, TN  
 Title:  
**ENVIROLOK UNITS**

Project No:  
 Sheet No.  
 3

**PART 1: GENERAL**

- 1.1 Description:
  - A. Provide all labor, materials, equipment and supervision to install a vegetated wall/slope system in accordance with these specifications and in reasonable close conformity with the dimensions shown on the plans or as specified by the Owner or Owner's Engineer.
  - B. Work shall consist of furnishing and installing appurtenant materials required for the construction of the vegetated system shown on the construction plans.
- 1.2 Reference Standards
  - A. Engineering design
    - 1) AASHTO, "AASHTO LRFD Bridge Design Specifications", 17th edition, 2012.
  - B. Soils
    - 1) ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lb/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
    - 2) ASTM D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
    - 3) ASTM D 4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- 1.5 Definitions
  - A. Retained Soil
    - 1) Compacted, imported or in-situ soil behind reinforced zone of the retaining wall.
  - B. Reinforced Soil
    - 1) Compacted fill placed in the area behind that face units with internal geogrid reinforcing.

**PART 2: Products**

- 2.1 Vegetated Wall / Slope units
  - A. The Vegetated unit is composed of 100% polypropylene must be weather resistant to minus 30 degrees Celsius and is 100% recyclable. Two connection pins shall be supplied per Envirolok unit, interconnecting the units vertically and horizontally.
  - B. The Envirolok Unit is for use in all Envirolok System applications including applications using P.E.T. (polyester) geogrids or HDPE (high density polyethylene) for geogrid reinforced wall and slope applications.
  - C. Envirolok Bags are made from a specifically designed Non-Woven geotextile that will not rot or mildew, is non-biodegradable and is resistant to damage from insects and rodents. The Envirolok bags provide a filtering functionality, are water permeable and root friendly. Envirolok Bags have met all applicable ASTM standards for geotextile testing.
  - D. Envirolok units shall be manufactured from polypropylene resins. Facing panel polymers shall be greater than 70% U.V. stabilized.
  - E. Vegetated units are manufactured using an ultra violet resistant (UVR) bonded anti-wick polyester threat.
- 2.2 Unit Interlock
  - A. Unit interlock devices shall be polymeric and shall penetrate the units a minimum of 2 inches to form a positive connection.
  - B. Unit interlocks shall penetrate the geogrid reinforcing connecting the reinforcing to the vegetated facing system.
  - C. Connecting pins shall have a 35% open geometry to allow root penetration through the locking plate.
- 2.3 Infill Soil/ Reinforced Backfill
  - A. The reinforced backfill shall be free of debris, and consist of one of the following inorganic USCS soil types: SW, SP, SM, SC, meeting the following gradation as determined in accordance with ASTM D 422.
 


Sieve Size	Percent Passing
1 in.	100
No. 4	100 - 20
No. 40	0 - 60
No. 200	0 - 35
  - B. Cohesionless, coarse-grained soils, are preferred; finer soils with low-plasticity (i.e., PI of the finer fraction is less than 10) may be used provided they are approved by the Owner.
  - C. The maximum size should be limited to 1in. for geosynthetic reinforced soil unless tests have been performed to evaluate potential strength reduction in the geosynthetic due to installation damage.
- 2.4 Soil Reinforcement
  - A. Geosynthetic reinforcement formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock or earth and function as reinforcement. Soil reinforcement shall be specifically manufactured for use in reinforcing soil materials.
- 2.5 Envirolok Bag Fill Material
  - A. Bag fill material should be selected with the desired vegetation and specific application in mind. Criteria for bag fill soils should be specified by the Designer, suggestions include:
  - B. Walls, slopes and above High Waterline Applications
    - 1) Freely draining native soils and granular materials cleaned of all debris, roots, branches, stones in excess of 2" (50 mm) diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
    - 2) Properties should include (by volume)
      - a) Approximate Organic Content: 7% -12% (for an engineered structure)
      - b) Granular Content: smaller than 50 mm larger than 2 mm 60 - 70%
      - c) Granular Content larger than 0.05 mm smaller than 2mm 10 -15%
      - d) Clay and Silts 0 - 5%
      - e) Percolations shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation.

- f) Organic additive materials should be a locally available commercial compost product.
- g) Mix all organic materials evenly throughout the bag fill material
- h) Other criteria may be required in Project Specific Engineered Drawings. Refer to Contract Documents.
- C. Below Waterline Applications
  - 1) Clean Granular material; 3/4 in (20mm) gravel minimum particle size 2mm. Pre-seeding bags is suggested for structures built below normal water levels if vegetation is desired.
  - 2) Clay soils shall not be used for bag fill.
- 2.8 Vegetated Materials
  - A. Vegetation shall be applied through hydro-seeding, hand application and/or planting methods.
  - B. Live Vegetation / Vegetation Mix shall [can] be applied during the construction of the structure.
    - 1) Hydro-seeding can be applied after completion of the structure.
    - 2) It is possible to complete after construction as approved by the Owner.
  - C. Hydro-seeding can be applied after completion of the structure or in phases as approved by the Owner.
  - D. Vegetation should be selected with consideration of the environment - weather, climate, exposure, etc. A vegetation specialist may assist in the selection of plant materials.
  - E. Depending on the location and climate, an irrigation system may need to be incorporated within the Envirolok System.
    - 1) A low pressure drip irrigation system may be located between selected rows should be used (if required)
  - F. Vegetation methods Include, but are not limited to:
    - 1) Hand Seeding -
    - 2) Hydro-seeding & Pre-Vegeted the Envirolok Bag
    - 3) Live Planting
    - 4) Live Staking
    - 5) Brush Layering
- 2.9 Materials NOT Allowed for Vegetated Wall / Slope Solutions
  - A. Systems or components that would provide entrapment to mammals.
  - B. System or components that will oxidize.
  - C. Systems with exposed surfaces or pieces that could cause injury to people or animals climbing or traversing the vegetated wall / slope system.
  - D. Systems that do not allow for 100% percent vegetation on exposed surfaces.

**PART 3: Execution**

- 3.1 General
  - A. Construction and construction tolerances shall be in accordance with the plans or specifications. Grades shall be within 3 inches of the grades shown on the plans.
  - B. Before beginning installation, verify site conditions are as indicated on the drawings. Notify the Owner if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.
- 3.2 Preparation of Envirolok Units
  - A. Ensure the bag fill material is suitably mixed with any required additives prior to beginning the filling process. Fill materials are shown in section 2.
  - B. Fill the bags completely, to a consistent weight, density, and size, allowing adequate geotextile material for secure closure of the bag.
    - 1) Placed and compacted units should have approximately one square of face area.
  - C. Bag closure methods include but are not limited to methods such as zip-ties, stapling or sewing.
  - D. Envirolok units shall be stored in a covered area and shall be kept dry.
- 3.3 Excavation
  - A. Contractor shall excavate to the lines and grades shown on the project grading plans and SRW plan and profile drawing. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted infill material, or as directed by the Owner/Engineer, at the Contractor's expense.
- 3.4 Foundation Preparation
  - A. Following excavation for the leveling pad and the reinforced soil zone, foundation soil shall be examined by the Owner's Engineer to assure the actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with soil meeting the design criteria, as directed by the Owner's Engineer.
- 3.5 Installation
  - A. Install the base course of filled Envirolok bags as per design drawings. Compact the units to ensure the connection pin penetrate the bags. Place bags so that the seam is horizontal and faces inwards towards backfill material. Start installation at the lowest point.
  - B. Place and compact backfill every course of units.
  - C. Place Envirolok units to straddle each juncture of soil bags as shown in the engineered drawings. Compact every row to ensure the connection pins on the unit interlock penetrate the bags.
    - 1) Envirolok connection pins interlock three units to form a totally connected slope/wall structure.
  - F. Maintain the specified batter or slope as rows of Envirolok units are placed.
- 3.6 Backfill
  - A. Backfill shall be placed in maximum 8 inch (200mm) uncompacted lift thickness and compacted to 95 percent Standard Proctor density as determined in accordance with ASTM D 698. The in-place moisture content shall not exceed the optimum moisture content as determined in accordance with ASTM D 698 and shall be no

- lower than 3 percentage points below optimum moisture content.
- B. Backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack or loss of tension in the geogrid reinforcement layer. Preferred placement is from the units back toward the tail of reinforcement to increase tension.
- C. Only hand operated compaction equipment shall be operated within 3 feet (1m) of the back of the Envirolok units.
- D. Tracked equipment shall not be operated directly on the reinforcing. A minimum thickness of 6 inches (150mm) of fill is required prior to operating tracked equipment over the reinforcing.
- E. Rubber tired equipment may be operated on the geogrid reinforcing if care is taken, avoiding sudden braking and sharp turns.
- F. At the end of each day's operation the Contractor shall grade the backfill away from the wall area and direct runoff away from the wall area. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction area.
- 3.10 Geogrid Installation
  - A. Geogrid reinforcing shall be cut and laid at the proper elevations as shown on the construction drawings or as directed by the Engineer.
  - B. Geogrid reinforcing shall be attached to the Envirolok system by placing the geogrid to the front face of the Envirolok unit above the installed course. Install the connecting pins through geogrid and into the Envirolok units. The next course of units shall be placed, and compacted locking the reinforcement in place.
  - C. Geogrid shall be pulled taut removing any slack in the layer while fill is placed over the reinforcing. Care shall be taken to not operate equipment directly on the reinforcing to minimize potential for damage.
- 3.11 Vegetating
  - A. Finish in accordance with the supplier recommendations.
  - B. Vegetation can be applied through seeding or planting methods. Vegetation/ vegetation mix to be applied to the structure within two weeks of Envirolok System placement.
  - C. Seeding:
    - 1) Hydro-seeding is the preferred method of seeding. Apply hydro seeded material to the wall or slope face of the Envirolok structure to achieve complete coverage of the exposed bag face.
    - 2) Use a seed mixture which responds to the specific site environmental conditions such as shoreline, roadside, interior grasslands. The mixture should contain a variety of easily germinated, hardy, drought resistant vegetation proven for the area and exposure.
  - D. Pre-Vegetated Envirolok bags can be used.
  - E. Live Planting:
    - 1) Planting with locally available native plants, ornamental or plants proven to be sustainable in the area may also be used to re-vegetate the structure.
    - 2) The root ball can be positioned snugly under the Envirolok bags. Depending on the chosen plants and site location, a 10gm slow release fertilizer tablet sitting on top of the root ball may be required. Refer to construction documents for plant list, spacing and placement instructions.
  - F. Live Staking:
    - 1) Live-staking with locally available native materials such as willows may be used to re-vegetate the structure. Live staking is achieved by placing between units to be in contact with soil behind the units. Timing of construction must be coordinated to ensure the survivability of live stakes for successful vegetation.
  - G. Brush Layering:
    - 1) Brush layering is achieved by placing the plant between the bags with the root ball behind the Envirolok System. This method is may be recommended with applications in water.
- 3.12 Field Review
  - A. Field Review at regular intervals to ensure satisfactory germination and/or coverage of the Envirolok bags.
  - B. At six months, if adequate coverage of the Envirolok system has not occurred it is recommended that reseeded or remedial planting be performed.
- 3.13 Field Quality Control
  - A. Field Quality Assurance - The Owner shall engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. As a minimum, quality assurance testing should include foundation soil inspection, inspection for the need for any additional drainage, soil and backfill testing, verification of design parameters, and observation of construction for general compliance with design drawings and specifications. This does not relieve the Contractor from securing the necessary construction quality control testing during construction.
  - B. Field Quality Control - The Contractor's quality control testing and construction inspection services shall only be performed by independent, qualified and experienced technicians and engineers. The Contractor's quality control testing, as a minimum, shall include:
    - 1) Field density testing
    - 2) Sub grade: one test for every 2500 square feet (230 sm) of sub grade.
  - C. Reinforced Backfill: one test for every 2500 square feet (230 sm) per lift with a minimum of one test for every other lift.
  - D. Retained and Foundation Soil: per Section 02200 (Site Preparation).
  - E. Laboratory Moisture Density - minimum one test per soil type.



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Sheet No. 4