Project Name:
Project Number:

Section 02340

Specification for Geotextile Used in Subgrade Stabilization/Restraint Application

1 GENERAL

1.1 SECTION INCLUDES

A. Geotextile to stabilize and reinforce an aggregate cover material (subbase, base, select embankment, etc.) of an unpaved roadway. The stabilization and reinforcement application is appropriate for unpaved roadways constructed over soft subgrade soils with a California Bearing Ratio (CBR) less than 3 (CBR < 3) (shear strength less than approximately 90 kPa).

1.2 RELATED SECTIONS

A. Section 02050 - Basic Site Materials and Methods
B. Section 02100 - Site Remediation
C. Section 02200 - Site Preparation
D. Section 02300 - Earthwork
E. Section 02700 - Bases, Ballasts, Pavements, and Appurtenances

1.3 UNIT PRICES

A. Method of Measurement: By the square meter (or square yard - as indicated in contract documents) including seams, overlaps, and wastage.

B. Basis of Payment: By the square meter (or square yard - as indicated in contract documents) installed.

1.4 REFERENCES

A. AASHTO Standards:

1. T88 - Particle Size Analysis of Soils
2. T90 - Determining the Plastic Limit and Plasticity Index of Soils
3. T99 - The Moisture-Density Relations of Soils Using a 5.5lb (2.5 kg) Rammer and a 12in (305 mm) Drop.
4. M288-96 - Geotextile Specification for Highway Applications

B. American Society for Testing and Materials (ASTM):

1. D 123 - Standard Terminology Relating to Textiles
2. D 276 - Test Method for Identification of Fibers in Textiles
3. D 3786 - Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics
4. D 4354 - Practice for Sampling of Geosynthetics for Testing
5. D 4355 - Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
6. D 4439 - Terminology for Geotextiles
7. D 4491 - Test Methods for Water Permeability of Geotextiles by Permittivity
8. D 4533 - Test Method for Index Trapezoid Tearing Strength of Geotextiles
9. D 4595 - Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method

10. D 4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles
11. D 4751 - Test Method for Determining Apparent Opening Size of a Geotextile
12. D 4759 - Practice for Determining the Specification Conformance of Geosynthetics
13. D 4833 - Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
14. D 4873 - Guide for Identification, Storage, and Handling of Geotextiles
15. D 5141 - Test Method to Determine Filtering Efficiency and Flow Rate for Silt Fence Applications Using Site Specific Soils

C. Texas Department of Transportation, Manual of Testing Procedures:

1. TEX 616-J - Asphalt Retention and Potential Change of Area

D. Federal Highway Administration (FHWA) - Geosynthetic Design and Construction Guidelines, Publication No. FHWA HI-95-038, May 1995.

E. American Association for Laboratory Accreditation (A2LA)

F. Geosynthetic Accreditation Institute (GAl) - Laboratory Accreditation Program (LAP).

G. National Transportation Product Evaluation Program (NTPEP)

H. International Standards Organization (ISO) – 9001:2000

1.5 DEFINITIONS

A. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.

1.6 SUBMITTALS

A. Submit the following:

1. Certification: The contractor shall provide to the Engineer a certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns and other pertinent information to fully describe the geotextile. The Certification shall state that the furnished geotextile meets MARV requirements of the specification as evaluated under the Manufacturer's quality control program. The Certification shall be attested to by a person having legal authority to bind the Manufacturer.

2. Quality Standards: The contractor shall provide to the Engineer the Manufacturer’s Quality Control Plan along with their current A2LA, GAI-LAP, and ISO 9001:2000 certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. The geotextile Manufacturer shall have all of the following credentials:

a. Geosynthetic Accreditation Institute (GAI)- Laboratory Accreditation Program (LAP)

b. American Association for Laboratory Accreditation (A2LA)

c. ISO 9001:2000 Quality Management System

B. The geotextile m anufacturer shall have a GAI-LAP accredited laboratory at the location production capable of performing the ASTM tests as outlined in the specification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

B. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

C. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geotextile.

2 PRODUCTS

2.1 MANUFACTURERS

A. TenCate™ Geosynthetics
365 South Holland Drive
Pendergrass, GA, USA 30567
1-800-685-9990
1-706-693-2226
1-706-693-4400, fax
www.tencate.com

2.2 MATERIALS

A. Geotextile:

1. The geotextile shall be woven from high-tenacity long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins or polyesters. They shall form a stable network such that the filaments or yarns retain their dimensional stability relative to each other, including selvages.

2. The geotextile shall meet the requirements of Table 1. All numeric values in Table 1 except AOS represent MARV in the specified direction. Values for AOS represent maximum average roll values.

TABLE 1 - SUBGRADE STABILIZATION GEOTEXTILE

Property	Test Method	Units	Required Value	
Reinforcement Properties			MD[1]	CD[1]
Ultimate Tensile Strength	ASTM D 4595	kN/m (lbs/ft)	70.0 (4800)	70.0 (4800)
Tensile Strength @ 2% Strain	ASTM D 4595	kN/m (lbs/ft)	14.0 (960)	19.3 (1320)
Tensile Strength @ 5% Strain	ASTM D 4595	kN/m (lbs/ft)	35.0 (2400)	39.4 (2700)
Coefficient of Interaction -Ci (sand)	ASTM D 5321	--	0.8	
Permittivity	ASTM D 4491	sec^{-1}	0.40	
Apparent Opening Size	ASTM D 4751	mm (U.S. Sieve)	0.6 (30)	
Sewn Seam Strength[2]	ASTM D 4884	kN/m (lbs/ft)	43.8 (3000)	
Survivability Index Values			MD[1]	CD[1]
Grab Tensile Strength	ASTM D 4632	N (lbs)	2114 (475)	1958 (440)
Tear Strength	ASTM D 4533	N (lbs)	801 (180)	801 (180)
CBR Puncture Strength	ASTM D 4833	N (lbs)	8900 (2000)	
Ultraviolet Stability (after 500 hrs)	ASTM D 4355	%	80	

[1] MD - Machine, or roll, direction; CD - Cross machine direction
[2] When sewn seams are required. Refer to **Section 3 - Execution** for overlap / seam requirements.

4. Approved geotextiles are as follows:

Mirafi® HP570

2.3 QUALITY CONTROL

A. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP and A2LA for tests required for the geotextile, at frequency meeting or exceeding ASTM D 4354.

B. Sewn Seam Strength shall be verified based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality assurance samples obtained using Procedure B of ASTM D 4354. A lot size for conformance or quality assurance sampling shall be considered to be the shipment quantity of the given product or a truckload of the given product, whichever is smaller.

C. Ultraviolet Stability shall be verified by an independent laboratory on the geotextile or a geotextile of similar construction and yarn type.

3 EXECUTION

3.1 PREPARATION

A. The installation site shall be prepared by clearing, grubbing, and excavation or filling the area to the design grade. This includes removal of topsoil and vegetation.

3.2 INSTALLATION

A. The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Adjacent geotextile rolls shall be overlapped, sewn or joined as required in the plans. Overlaps shall be in the direction as shown on the plans. See table below for overlap requirements.

Soil CBR	Method of Joining
Greater than 3	300 - 450 mm (12 - 18 in) overlap
1 - 3	600 - 1000 mm (24 - 40 in) overlap
0.5 - 1	1000 mm (40 in) overlap or sewn
Less than 0.5	Sewn
All roll ends	1000 mm (40 in) overlap or sewn

B. On curves, the geotextile may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and held in place by pins, staples, or piles of fill or rock.

C. Prior to covering, the geotextile shall be inspected by a certified inspector of the Engineer to ensure that the geotextile has not been damaged during installation. Damaged geotextiles, as identified by the Engineer, shall be repaired immediately. Cover the damaged area with a geotextile patch which extends an amount equal to the required overlap beyond the damaged area.

D. The subbase shall be placed by end dumping onto the geotextile from the edge of the geotextile, or over previously placed subbase aggregate. On soils with CBR>3, most rubber-tired vehicles can be driven at slow speeds, less than 16 km/h (10 mph) and in straight paths over the exposed geotextile without causing damage to the geotextile. Sudden braking and sharp turning should be avoided. Tracked construction equipment should not be operated directly upon the geotextile. A minimum fill soil thickness of 15cm (6 in) is required prior to operation of tracked vehicles over the geotextile. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geotextile. Turning of vehicles shall not be permitted on the first lift above the geotextile.

E. On subgrades having a CBR value of less than 1, the subbase aggregate should be spread in its full thickness as soon as possible after dumping to minimize the potential of localized subgrade failure due to overloading of the subgrade.

F. Any ruts occurring during construction shall be filled with additional subbase material, and compacted to the specified density.

G. If placement of the backfill material causes damage to the geotextile, the damaged area shall be repaired as previously described above. The placement procedure shall then be modified to eliminate further damage from taking place.

END OF SECTION

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