SECTION 716 - GEOTEXTILES

716.01 General Requirements.

(A) Materials. Unless otherwise indicated in the contract documents, geotextiles shall be manufactured from long-chain polymeric fibers or yarns, composed of at least 95 percent, by weight, of polyolefins or polyesters. Fibers or yarns, including selvages, shall be formed into a stable network such that their dimensional stability relative to each other is retained during handling, placement, and design service life. Geotextiles shall be free from defects or tears, and free of treatment or coating that would adversely alter hydraulic or physical properties of geotextiles after installation.

Factory and field seams shall be sewn with thread consisting of high strength polypropylene, polyester, or polyamide, having same or greater durability as geotextile material. Nylon threads will not be allowed. Thread shall be at least as ultraviolet resistant as geotextile material and of contrasting color to geotextile.

Unless otherwise indicated in the contract documents, geotextiles shall be of rot-, mildew-, and chemical-resistant material conforming to requirements of this section.

(B) Geotextile Acceptance. The manufacturer's certificate of compliance and certified test results on the product, tested within six months of the submittal, shall be submitted. The following shall be included:

(1) Manufacturer's name, current address, and telephone number.

(2) Full product name by trademark and product number.

(3) Geotextile polymer type(s).

(4) Recommended geotextile use.

(5) Recommended stapling pattern.

(6) Six square yards of geotextile sample, with machine direction marked clearly on sample. Machine direction (long direction) is defined as direction perpendicular to axis of geotextile roll. Geotextile sample shall conform to requirements of Subsection 716.01(C) - Sampling.

(C) Sampling. Sampling shall be in accordance with ASTM D 4354 and this subsection. Samples shall be cut from geotextile roll with scissors, sharp

knife, or other suitable method that produces a smooth edge and does not rip or tear the material. Samples shall not be taken from outer wrap of geotextile roll, nor inner wrap of the core.

If geotextile seams are to be field sewn, the Contractor shall provide a section of sewn seam that can be sampled by the Engineer before geotextile is installed. Sewn seam for sampling shall be sewn using same equipment and procedures that will be used to sew production seams. If production seams will be sewn in both machine and cross-machine directions, sewn seams for sampling shall be provided that are oriented in both machine and cross-machine directions.

If geotextile seams are to be factory sewn, the Engineer will obtain samples of factory seam at random, from any of the rolls to be used. The Contractor shall submit seam assembly description, and the Engineer will include that description with seam sample obtained for testing. Seam assembly description shall include seam type, sewing thread type(s), and stitch density.

Each sample shall have minimum of 2 yards of seam length, with minimum of 18 inches of material on each side of seam, for each seam orientation (machine or cross-machine direction).

(D) Physical Properties. Physical property values in these specifications, with the exception of apparent opening size (AOS), represent minimum average roll values (MARV). Average test results (weaker principal direction for mechanical tests) for a particular property, for any individual roll tested within a lot sampled, shall meet or exceed specified values. Values for AOS represent maximum average roll values.

(E) Packaging. Geotextiles shall be packaged in rolls of length and width to meet requirements. Geotextiles shall be wound uniformly onto suitable cylindrical forms or cores to aid in handling and unrolling. Each roll of fabric and form or core shall be packaged individually in a sheath, wrapper, or container.

(F) Identification. Unless otherwise indicated in the contract documents, geotextiles shall be identified in accordance with ASTM D 4873 and this subsection. Include the following information:

(1) Unique roll number, serially designated.

(2) Manufacturer's lot number or control numbers.

(3) Name of fabric manufacturer.

(4) Date of manufacture.

(5) Product brand name.

(6) Manufacturer's style or catalog designation of the fabric.

(7) Roll width, in feet.

(8) Roll length, in feet.

(9) Gross weight of entire package, including fabric, core, wrapping, and container.

(10) Net weight of fabric alone.

(G) Storage and Handling. Geotextiles shall be stored and handled in accordance with ASTM D 4873 and this subsection. Geotextiles shall be kept dry and stored off the ground. During shipment and storage, material shall not be exposed to sunlight or other forms of light that contain ultraviolet rays, for more than five days.

716.02 Geotextiles For Permeable Separator Applications. Material shall conform to Subsection 716.01 - General Requirements and Table 716.02-1 - Material Requirements.

TABLE 716.02-1 - MATERIAL REQUIREMENTS

PHYSICAL PROPERTY	TEST PROCEDURE	REQ'T MARV
Grab Strength, (lbs.) (minimum)	ASTM D 4632	180
Sewn Seam Strength (lbs.) (minimum)	ASTM D 4884	160
Trapezoid Tear Strength (lbs.)(minimum)	ASTM D 4533	75
Puncture Resistance (lbs.) (minimum)	ASTM D 4833	80
Permittivity (sec^{-1})(minimum)	ASTM D 4491	0.02[1]
Apparent Opening Size (U.S. Standard Sieve)[2]	ASTM D 4751	70-120
Ultraviolet Degradation, 500 hours. (Percent Strength Retained) (minimum)	ASTM D 4355	50

[1] Permittivity of geotextile shall be greater than that of soil.
[2] Apparent Opening Size (AOS) requirement may be adjusted when less than 50 percent of soil particles, by weight, passes U.S. No. 200 sieve, or when geotextile permeability (ASTM D 4491) is equal to or less than soil permeability.

716.03 Geotextiles for Underdrain Applications. Material shall conform to Subsection 716.01 - General Requirements and Table 716.03-1 - Material Requirements.

TABLE 716.03-1 - MATERIAL REQUIREMENTS		
PHYSICAL PROPERTY	**TEST PROCEDURE**	**REQ'T MARV**
Grab Strength (lbs.) (minimum)	ASTM D 4632	180
Seam Strength (lbs) (minimum)	ASTM D 4884	160
Trapezoid Tear Strength (lbs.)(minimum)	ASTM D 4533	75
Puncture Resistance (lbs.) (minimum)	ASTM D 4833	80
Apparent Opening Size (U.S. Standard Sieve)[1]	ASTM D 4751	70-120
Ultraviolet Degradation, 500 hrs. (Percent Strength Retained) (minimum)	ASTM D 4355	50
[1] Apparent Opening Size (AOS) requirement may be adjusted when less than 50 percent of soil particles, by weight, passes U.S. No. 200 sieve, or when geotextile permeability (ASTM D 4491) is equal to or less than soil permeability.		

716.04 Geotextiles for Paving Applications. Material shall conform to Subsection 716.01 - General Requirements and Table 716.04-1 - Material Requirements; shall be nonwoven, needle-punched, and heat-bonded on one side; and manufactured from polyester, polypropylene, or polypropylene-nylon material.

TABLE 716.04-1 - MATERIAL REQUIREMENTS		
PHYSICAL PROPERTY	**TEST PROCEDURE**	**REQ'T MARV**
Grab Strength, either direction (lbs.) (minimum)	ASTM D 4632	100
Ultimate Elongation (percent) (minimum)	ASTM D 4632	50
Mass Per Unit Area (ounce/square yard) (minimum)	ASTM D 5261	4
Asphalt Retention (gallon/square yard) (minimum)	ASTM D 6140	Notes 1 and 2
Melting Point (degrees F) (minimum)	ASTM D 276	325
[1] Asphalt required to saturate paving fabric only. Asphalt retention shall be provided in manufacturer's certification. [2] Product asphalt retention property shall meet MARV value provided by manufacturer's certification.		

716.05 Geotextiles for Geocomposite Drain Applications. Material shall conform to Subsection 716.01 - General Requirements and Table 716.05-1 - Material Requirements; and shall be one-side impermeable, able to pass water and to retain soil without clogging.

TABLE 716.05-1 - MATERIAL REQUIREMENTS

PHYSICAL PROPERTY	TEST PROCEDURE	REQ'T MARV
Fabric Properties:		
Grab Strength, either direction, (lbs) (minimum)	ASTM D 4632	110
Elongation, either direction (percent) (maximum)	ASTM D 4632	70
Puncture Resistance (lbs) (minimum)	ASTM D 4833	70
Apparent Opening Size (U.S. Standard Sieve)[1]	ASTM D 4751	70–120
Core Properties:		
Compressive Strength (psi) (minimum)	ASTM D 1621	40
Flow Rate at 14.5 psi, gradient 1.0 (gal/min/ft) (minimum)	ASTM D 4716	15

[1] Apparent Opening Size (AOS) requirement may be adjusted when less than 50 percent of soil particles, by weight, passes U.S. No. 200 Sieve, or when geotextile permeability (ASTM D 4491) is equal to or less than soil permeability.

716.06 Geotextiles for Stabilization Applications. Material shall conform to Subsection 716.01 - General Requirements and Table 716.06-1 - Material Requirements.

TABLE 716.06-1 - MATERIAL REQUIREMENTS

PHYSICAL PROPERTY	TEST PROCEDURE	REQ'T MARV
Grab Strength, (lbs.) (minimum)	ASTM D 4632	315
Sewn Seam Strength (lbs.) (minimum)	ASTM D 4884	285
Trapezoid Tear Strength (lbs.)(minimum)	ASTM D 4533	115
Puncture Resistance (lbs.) (minimum)	ASTM D 4833	115
Permittivity (sec^{-1}) (minimum)	ASTM D 4491	0.05[1]
Apparent Opening Size (U.S. Standard Sieve)	ASTM D 4751	40
Ultraviolet Degradation, 500 hrs (Percent Strength Retained) (minimum)	ASTM D 4355	50

[1] Permittivity of geotextile shall be greater than that of soil.

716.07 Geotextiles for Permanent Erosion Control Applications. Material shall conform to Subsection 716.01 - General Requirements and Tables 716.07-1 and 716.07-2- Material Requirements.

(A) Woven Monofilament Geotextiles.

TABLE 716.07-1 - MATERIAL REQUIREMENTS

PHYSICAL PROPERTY	TEST PROCEDURE	REQ'T MARV		
Grab Strength, (lbs.) (minimum)	ASTM D 4632	250		
Sewn Seam Strength (lbs.) (minimum)	ASTM D 4884	225		
Trapezoid Tear Strength (lbs.)(minimum)	ASTM D 4533	60		
Puncture Resistance (lbs.) (minimum)	ASTM D 4833	90		
Ultraviolet Degradation, 500 hrs (Percent Strength Retained) (minimum)	ASTM D 4355	50		
		Percent In-Situ Soil Passing 0.075 mm[1]		
PHYSICAL PROPERTY	**TEST PROCEDURE**	**<15**	**15 to 50**	**>50**
Permittivity (sec^{-1}) (minimum)	ASTM D 4491	0.7	0.2	0.1
Apparent Opening Size (U.S. Standard Sieve)	ASTM D 4751	40	60	70

[1] Based on grain size analysis of in-situ soil in accordance with AASHTO T 88.

(B) All Other Geotextiles.

TABLE 716.07-2 - MATERIAL REQUIREMENTS				
PHYSICAL PROPERTY	**TEST PROCEDURE**	**REQ'T MARV**		
Grab Strength, (lbs.) (minimum)	ASTM D 4632	315		
Sewn Seam Strength (lbs.) (minimum)	ASTM D 4884	285		
Trapezoid Tear Strength (lbs.)(minimum)	ASTM D 4533	115		
Puncture Resistance (lbs.) (minimum)	ASTM D 4833	115		
Ultraviolet Degradation, 500 hrs (Percent Strength Retained) (minimum)	ASTM D 4355	50		
		Percent In-Situ Soil Passing 0.075 mm[1]		
PHYSICAL PROPERTY	**TEST PROCEDURE**	**<15**	**15 to 50**	**>50**
Permittivity (sec^{-1}) (minimum)	ASTM D 4491	0.7	0.2	0.1
Apparent Opening Size (U.S. Standard Sieve)	ASTM D 4751	40	60	70
[1] Based on grain size analysis of in-situ soil in accordance with AASHTO T 88.				

716.08 Geotextiles for Temporary Silt Fence Applications. Material shall conform to Subsection 716.01 - General Requirements and Table 716.08-1 - Material Requirements; and shall be installed in combination with support net of polymeric mesh or other material accepted by the Engineer and post supports, as indicated in the contract documents.

TABLE 716.08-1 - MATERIAL REQUIREMENTS

PHYSICAL PROPERTY	TEST PROCEDURE	REQ'T MARV
Grab Strength, (lbs.) (minimum)	ASTM D 4632	100
Puncture Resistance (lbs.) (minimum)	ASTM D 4833	55
Trapezoid Tear Strength (lbs.)(minimum)	ASTM D 4533	40
Permittivity (sec^{-1}) (minimum)	ASTM D 4491	0.05
Apparent Opening Size (U.S. Standard Sieve) Slit film woven geotextiles All other geotextile types	ASTM D 4751	 30 50
Ultraviolet Degradation, 500 hrs (Percent Strength Retained) (minimum)	ASTM D 4355	70

END OF SECTION 716