

**SECTION 1014 GEOSYNTHETICS:** of the Standard Specifications is revised to read:

**1014-1 General Requirements:**

The contractor shall submit a Certificate of Compliance, conforming to the requirements of Subsection 106.05, to the Engineer upon delivery of geosynthetic material for use on the project. If the delivered materials have not been evaluated and preapproved as noted below, a Certificate of Analysis shall be submitted to the Engineer along with supporting documentation before the material may be considered for use on the project. Each geosynthetic material lot or shipment must be approved by the Engineer before the materials can be incorporated in the work.

Certificates of Analysis, conforming to the requirements of Subsection 106.05, shall be submitted. Samples of geosynthetic materials may be requested by the Engineer and shall be obtained and submitted for testing in accordance with the requirements of the ADOT Materials Quality Assurance Program (Appendix C – Sampling Guide Schedule.) When requested by the Engineer, samples shall be submitted to the ADOT Structural Materials Section for testing.

Geosynthetic materials, including eligible biaxial geogrid, must be on the DataMine list for geotextiles and geosynthetics on the National Transportation Product Evaluation Program (NTPEP) website. The product line evaluation report from NTPEP shall be provided to the Engineer prior to use on the project.

Fibers, yarns, and filaments used in the manufacture of geotextile fabric, and the threads used in joining by sewing, shall consist of long-chain synthetic polymers, composed at least 95 percent, by weight, of polyolefins or polyesters. They shall be formed into a stable network such that the filaments or yarns retain their dimensional stability relative to each other, including selvages.

Geosynthetic materials shall be furnished in protective covers capable of protecting the materials from harmful environmental conditions such as ultraviolet rays, abrasion, extreme heat, and water. Storage of the materials shall be in a manner that prevents damage, contamination, or deterioration.

Geotextile fabric shall be resistant to chemical attack, rot, and mildew, and shall have no tears or defects which will adversely alter its physical properties.

All numeric values in the following tables, except for apparent opening size (AOS), represent minimum average roll values (MARV) in the weaker principal direction. Numeric values for (AOS) represent maximum average roll values.

Woven slit film geosynthetics will not be allowed for use in Subsections 1014-5, 1014-6, 1014-7, and 1014-9.

**1014-2 Pavement Fabric:**

The pavement fabric shall be specifically designed for the designated pavement application, as a waterproofing and stress relieving membrane between two successive asphalt layers.

The width of the fabric shall be appropriate for the proposed construction. Pavement fabric shall meet the requirements of the following table:

<b>Pavement Fabric Requirements</b>		
<b>Property</b>	<b>Requirement</b>	<b>Test Method</b>
Mass per unit area: oz./sq. yd.	4.0	ASTM D5261
Grab strength: lb.	100	ASTM D4632
Ultimate elongation: %	≥ 50	ASTM D4632
Melting point: degrees F	300	ASTM D276
Asphalt Retention: gal./sq. yd.	(Notes 1 and 2)	ASTM D6140
Notes:		
(1) Asphalt is required to saturate paving fabric only. Asphalt retention must be provided in the manufacturer certification. Value does not indicate the asphalt application rate required for construction.		
(2) Product asphalt retention property must meet the MARV value provided by the manufacturer certification.		

**1014-3 Geogrid:**

Geogrid reinforcement material for roadway base applications shall be a biaxial polymer grid structure, specifically fabricated for use as a base reinforcement. The width of the geogrid shall be approximately 13 feet or as appropriate for the proposed construction. The geogrid shall be one of the following structure types:

- (A) A structure comprised of punched and drawn polypropylene sheet to form a grid.
- (B) A structure comprised of polypropylene extruded to form a grid.
- (C) A structure comprised of polypropylene integrally formed by extruding then stretching longitudinally and transversely to form a grid.

The geogrid material shall additionally conform to the requirements shown in the table below:

<b>Geogrid Requirements</b>			
<b>Property</b>	<b>Requirement</b>		<b>Test Method</b>
	<b>MD</b> (Note 2)	<b>XMD</b> (Note 3)	
Average Aperture Size: inch	0.8 - 1.5	0.8 - 1.5	I.D. Calipered (Note 1)
Rib Thickness: inch	0.05	0.05	ASTM D1777

Tensile Strength: lb./ft. At 2% Strain	410	620	ASTM D6637
At 5% Strain	810	1,340	
Ultimate Tensile Strength	1,310	1,970	
Flexural Rigidity: mg-cm	750,000		ASTM D7748
Junction Efficiency: %	93		ASTM D7737
Resistance to UV Degradation: %	100		ASTM D4355
Notes:			
(1) Maximum inside dimension in each principal direction measured by calipers.			
(2) MD: Machine direction which is along roll length.			
(3) XMD: Cross machine direction which is across the roll width.			

#### 1014-4 Separation Geotextile Fabric:

The physical requirements for the separation fabric will be determined by the survivability rating called out for the fabric in the Special Provisions or as shown on the project plans. Requirements for each survivability rating are listed herein and in Subsections 1014-4.01, 1014-4.02, and 1014-4.03.

Separation geotextile fabric shall meet the following requirements:

Property	Non-Woven	Test Method
Permittivity: $\text{sec}^{-1}$	0.5	ASTM D4491
Apparent opening size: U.S. Standard sieve size	No. 70	ASTM D4751

#### 1014-4.01 Low Survivability Fabric:

Low survivability fabric shall additionally meet the following requirements:

Low Survivability Separation Fabric Requirements		
Property	Non-Woven	Test Method
	Elongation $\geq 50\%$ (Note 1)	
Grab strength: lb.	112	ASTM D4632
Tear strength: lb.	40	ASTM D4533
Puncture strength: lb.	223	ASTM D6241
Ultraviolet stability (retained strength):	$\geq 50\%$ after 500 hours exposure	ASTM D4355
Notes:		
(1) As measured in accordance with ASTM D4632.		

**1014-4.02 Moderate Survivability Fabric:**

Moderate survivability fabric shall additionally meet the following requirements:

<b>Moderate Survivability Fabric Requirements</b>		
<b>Property</b>	<b>Non-Woven</b>	<b>Test Method</b>
	<b>Elongation ≥50% (Note 1)</b>	
Grab strength: lb.	157	ASTM D4632
Tear strength: lb.	56	ASTM D4533
Puncture strength: lb.	309	ASTM D6241
Ultraviolet stability (retained strength):	≥ 50% after 500 hours exposure	ASTM D4355
Notes: (1) As measured in accordance with ASTM D4632. (2) The required MARV tear strength for woven monofilament geotextiles is 56 lb.		

**1014-4.03 High Survivability Fabric:**

High survivability fabric shall additionally meet the following requirements:

<b>High Survivability Fabric Requirements</b>		
<b>Property</b>	<b>Non-Woven</b>	<b>Test Method</b>
	<b>Elongation ≥50% (Note 1)</b>	
Grab strength: lb.	202	ASTM D4632
Tear strength: lb.	79	ASTM D4533
Puncture strength: lb.	433	ASTM D6241
Ultraviolet stability (retained strength):	≥ 50% after 500 hours exposure	ASTM D4355
Notes: (1) As measured in accordance with ASTM D4632.		

**1014-5 Bank Protection Fabric:**

Bank protection fabric shall meet the following requirements:

<b>Bank Protection Fabric Requirements</b>		
<b>Property</b>	<b>Non-Woven</b>	<b>Test Method</b>
	<b>Elongation ≥50% (Note 1)</b>	

Grab strength: lb.	202	ASTM D4632
Tear strength: lb.	79	ASTM D4533
Puncture strength: lb.	433	ASTM D6241
Ultraviolet stability (retained strength):	≥ 50% after 500 hours exposure	ASTM D4355
Permittivity: sec <sup>-1</sup>	0.7	ASTM D4491
Apparent opening size: U.S. Standard sieve size	No. 70	ASTM D4751
Notes: (1) As measured in accordance with ASTM D4632.		

**1014-6 Geocomposite Wall Drain System:**

The geocomposite wall drain system shall be of composite construction, consisting of a supporting structure of drainage core material and a geotextile filter fabric permanently bonded to the core material on one side only. The geocomposite shall be resistant to commonly encountered chemicals and hydrocarbons, and resistant to ultraviolet exposure.

**1014-6.01 Geocomposite Wall Drain Core:**

The geocomposite wall drain core material shall consist of a preformed, stable, polymer plastic material with a cusped, nipped, or geonet structure. The drainage core shall provide support for and shall be bonded to the geotextile filter fabric at intervals not exceeding 1-1/8 inches in any direction. Its preformed structure shall be perforated to allow water to flow freely to the weep hole drainage outlets. If not perforated during manufacture, the core shall be perforated in the field at the weep hole drainage outlet locations. The core shall have at least 14 square inches per square foot of flat area in contact with the geotextile fabric to support the fabric. The core material shall additionally conform to the following physical requirements:

<b>Geocomposite Wall Drain Core Requirements</b>		
<b>Property</b>	<b>Requirement (Note 1)</b>	<b>Test Method</b>
Thickness with fabric: inch	0.23	ASTM D1777
Compressive Strength: psf	6,000	ASTM D1621
Transmissivity; Gradient = 1.0, Normal Stress = 5000 psf, gpm/ft.	4.0	ASTM D4716
Note: (1) All numeric values represent minimum values.		

The geocomposite core shall be connected to outlet pipes or weep holes as shown on the plans. These fittings shall allow entry of water from the core, but shall not allow intrusion of backfill material into the core.

**1014-6.02 Geocomposite Wall Drain Fabric:**

The geocomposite wall drain fabric shall be laminated onto or adhere to the side of the drainage core which will face the backfill. Geocomposite wall drain fabric shall meet the requirements of Subsection 1014-9. A minimum 3-inch wide flap of fabric shall extend beyond both longitudinal edges of the geocomposite core. The fabric shall cover the full length of the core.

**1014-7 Geocomposite Edge Drain System:**

The geocomposite edge drain system shall be of composite construction, consisting of a supporting rectangular structure of drainage core material wrapped with a geotextile filter fabric. The fabric shall surround and be attached to the core material in a manner which does not restrict the flow capacity of the core material. The geocomposite edge drain system shall be resistant to commonly encountered chemicals and hydrocarbons, and resistant to ultraviolet exposure.

**1014-7.01 Geocomposite Edge Drain Core:**

The geocomposite edge drain core material shall consist of a preformed, stable, polymer plastic material with a cusped, nipped, ridged, slotted, and/or perforated structure. The drainage core shall provide support for and may be bonded to the geotextile filter fabric. Its preformed structure shall be perforated to allow water to flow freely to the weep hole drainage outlets. If not perforated during manufacture, the core shall be perforated in the field at the weep hole drainage outlet locations unless otherwise approved by the Engineer. The core shall have at least 14 square inches of flat area in contact with the geotextile fabric to support the fabric per square foot. The core material shall additionally conform to the following physical requirements:

<b>Geocomposite Edge Drain Core Requirements</b>		
<b>Property</b>	<b>Requirement (Note 1)</b>	<b>Test Method</b>
Thickness Wrapped with Fabric: inch	0.75	ASTM D1777
Compressive Strength: psf	6,000	ASTM D1621
Transmissivity; Fabric Wrapped Core, Gradient = 0.1, Normal Stress = 1440 psf, gpm/ft.	4.0	ASTM D4716, (Note 2)
Width: ft.	1.0 (Note 3)	Measured
Notes: (1) All values represent minimum values. (2) Use a full width panel, if possible, testing flow on the side which may be placed against the soil to be drained. (3) Minimum width normally required, but shall be the minimum width specified on the plans, if that is greater.		

**1014-7.02 Geocomposite Edge Drain Fabric:**

The geocomposite edge drain fabric shall completely wrap around the drainage core material in a snug manner and may be permanently bonded to the core. Geocomposite edge drain fabric shall meet the requirements of Subsection 1014-9.

**1014-7.03 Outlet Pipes:**

The outlet pipe for the edge drain outlet lateral shall be rigid, 4-inch in diameter, Schedule 40 PVC pipe conforming to the requirements of ASTM D1785. The open end of the outlet pipe conduit shall be connected into either a drainage structure or a concrete pad drain in accordance with the details shown on the plans.

**1014-8 Temporary Silt Fence Fabric:**

Temporary silt fence fabric shall contain a stabilizer or inhibitors to make the filaments resistant to deterioration resulting from exposure to sunlight or heat.

The edges of the fabric shall be finished to prevent the outer yarn from pulling away from the fabric. The fabric shall be free of defects or flaws which significantly affect its physical or filtering properties. The fabric shall have a minimum width of 36 inches. Sheets of fabric may be bonded together. No deviation from any physical requirements will be permitted due to the presence of the seam.

The fabric may be manufactured with pockets for posts, hems with cord or with posts preattached using staples or button head nails.

During periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering which will protect the cloth from sunlight, mud, dust, and debris.

The fabric shall not be exposed to temperatures greater than 160 degrees F.

Temporary silt fence fabric shall additionally meet the following requirements:

<b>Temporary Silt Fence Requirements</b>			
<b>Property</b>	<b>Supported Silt Fence (Note 1)</b>	<b>Unsupported Silt Fence</b>	<b>Test Method</b>
		<b>Woven Elongation &lt;50% (Note 2)</b>	
Maximum post spacing: ft.	8	6.5	-
Grab strength: lb. MD (Note 3) and XMD (Note 4)	124	124	ASTM D4632
Permittivity: sec <sup>-1</sup>		0.05	ASTM D4491

Apparent opening size: U.S. Standard sieve size	No. 30	ASTM D4751
Ultraviolet stability (retained strength):	≥ 70% after 500 hours exposure	ASTM D4355
Notes: (1) Silt fence support shall consist of 14-gauge steel wire with a maximum mesh spacing of 6 inches by 6 inches or prefabricated polymeric mesh with a minimum strength of 200 lb./ft. x 200 lb./ft. per ASTM D6637. (2) As measured in accordance with ASTM D4632. (3) MD: Machine direction which is along roll length. (4) XMD: Cross machine direction which is across the roll width.		

**1014-9 Drainage Fabric:**

Drainage fabric shall meet the following requirements:

<b>Drainage Fabric Requirements</b>		
<b>Property</b>	<b>Non-Woven</b>	<b>Test Method</b>
	<b>Elongation ≥50%</b> (Note 1)	
Grab strength: lb.	157	ASTM D4632
Tear strength: lb.	56	ASTM D4533
Puncture strength: lb.	309	ASTM D6241
Ultraviolet stability (retained strength):	≥ 50% after 500 hours exposure	ASTM D4355
Permittivity: sec <sup>-1</sup>	0.5	ASTM D4491
Apparent opening size: U.S. Standard sieve size	No. 70	ASTM D4751
Notes: (1) As measured in accordance with ASTM D4632.		

**1014-10 Stabilization Fabric:**

Stabilization fabric shall meet the following requirements:

<b>Stabilization Fabric Requirements</b>		
<b>Property</b>	<b>Woven</b>	<b>Test Method</b>
	<b>Elongation &lt;50%</b> (Note 1)	
Grab strength: lb.	315	ASTM D4632
Tear strength: lb.	112	ASTM D4533
Puncture strength: lb.	618	ASTM D6241
Ultraviolet stability (retained strength):	≥ 50% after 500 hours exposure	ASTM D4355
Permittivity: sec <sup>-1</sup>	0.05	ASTM D4491

Apparent opening size: U.S. Standard sieve size	No. 40	ASTM D4751
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Notes:  
(1) As measured in accordance with ASTM D4632.