

SECTION 796
GEOSYNTHETICS

796.1 GENERAL:

This section defines the requirements for geosynthetic fabrics, grids and membranes typically used as pavement fabric beneath asphalt concrete overlays, filtration/drainage separation between soil/aggregate layers, erosion control filter/separators for riprap protection, and soil or base reinforcement to improve the stability of weak soils or reinforce aggregate bases.

796.2 MATERIALS AND REQUIREMENTS;

Identification, packaging, delivery, storage and handling of geosynthetic materials shall be in accordance with manufacturer's recommendations and ASTM D4873. Each roll shall be labeled or tagged to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number date of manufacture, and shipping date.

Geosynthetic materials shall be inert to commonly encountered chemicals, resistant to rot and mildew, and shall have no tears or defects which adversely affect or alter its physical properties.

Geosynthetic materials shall be packaged with material that will protect the geosynthetic (including ends of rolls) from damage due to shipment, water, sunlight and contaminants. During storage, geosynthetic materials shall be elevated off the ground and protected from the following: site construction damage, precipitation, extended ultraviolet radiation, strong acid or strong base chemicals, flames (including welding sparks), temperatures in excess of 160°F, and any other environmental condition that may damage geosynthetic material property values. Protection shall be in accordance with manufacturer's specifications and shall be maintained during periods of shipment and storage.

Materials required for complete and proper installation of geosynthetic materials that are not specifically described herein (such as pins, nails, washers, etc.) shall conform to the manufacturer's recommendations and be as selected and supplied by Contractor subject to final approval by the Engineer.

Requirements represent minimum average roll values in the weaker principal direction. Average of test results from any sampled roll in a lot shall meet or exceed the minimum values noted herein. Lot sampling shall be in accordance with ASTM D 4354.

796.2.1 Pavement: Pavement fabric geosynthetics are non-woven polyester or polypropylene fabrics that are field saturated with an asphalt binder and placed as an interlayer beneath a pavement overlay or between pavement layers. When placed, the fabric becomes an integral part of the roadway section, forming a barrier to water infiltration and absorbing stresses to reduce reflective and fatigue cracking of the new pavement surface layer.

Pavement fabric shall be constructed of at least 95 percent (by weight) nonwoven synthetic fibers of polyester or polypropylene, thermally bonded on one side. The fabric material shall additionally conform to the physical properties shown in Table 796-1.

TABLE 796-1			
PAVEMENT GEOSYNTHETIC PROPERTIES			
Property	Class A	Class B	Test Method
Weight: oz/yd ²	4.1 min.	4.0 min	ASTM D3776
Grab tensile strength: lbs.	100 min.	90 min	ASTM D4632
Elongation at break: %	50 min.	50 min	ASTM D4632
Melting point: degree F	300 min.	300 min	ASTM D276
Asphalt retention: gal/yd ²	0.25 min. ⁽¹⁾	0.20 min	ASTM D6140

(1) May be reduced within street intersections, on steep grades or in other zones where vehicle braking is common, but not less than 0.20 gal/yd², when approved by the Engineer.

796.2.2 Filtration (Drainage) and Separation: Filtration and separation fabrics are nonwoven or woven polypropylene or polyester fabrics with specified strength characteristics used as permeable separators to restrain soil or other particles subjected to hydrodynamic forces while allowing the passage of fluids into or across a geotextile and to prevent inter-migration of adjacent soil layers of vastly different particle sizes and particle distributions.

Filtration and separation fabrics shall be nonwoven or woven fabric consisting only of long chain polymeric filaments such as polypropylene or polyester formed or woven into a stable network such that the filaments retain their relative position to each other. The fabric material shall additionally conform to the physical properties shown in Table 796-2.

TABLE 796-2			
FILTRATION & DRAINAGE GEOSYNTHETIC PROPERTIES			
Property	Class A ⁽¹⁾	Class B ⁽²⁾	Test Method
Grab tensile strength: lbs.	180 min	80 min.	ASTM D4632
Seam strength: lbs.	160 min	70 min.	ASTM D4632
Puncture strength: lbs.	80 min	25 min.	ASTM D4833
Trapezoidal tear: lbs	50 min	25 min.	ASTM D4533
Apparent opening size: US Standard sieve size	> 50	>50	ASTM D4751
Ultraviolet Stability: %	50 min.	50 min	ASTM D4355

- (1) Class A - Use where installation stresses are more severe than for Class B application (i.e. very coarse sharp angular aggregate or high compaction requirements).
- (2) Class B – Use with smooth graded surface having no sharp angular projections and sharp angular aggregate.

796.2.3 Erosion Control: Erosion control fabrics are used below areas to receive aggregate or riprap slope protection and act as filter/separators to provide sustained permeability while maintaining structural stability.

Erosion control fabrics shall be a woven monofilament fabric or a nonwoven fabric consisting only of long chain polymeric filaments such as polypropylene or polyester formed into a stable network that the filaments retain their relative position to each other. The fabric material shall additionally conform to the physical properties shown in Table 796-3.

TABLE 796-3			
EROSION CONTROL GEOSYNTHETIC PROPERTIES			
Property	Class A	Class B	Test Method
Grab tensile strength: lbs.	270 min	200 min.	ASTM D4632
Elongation at break: %	45min,115 max	15 min.,115 max.	ASTM D4632
Puncture strength: lbs.	110 min	75 min.	ASTM D4833
Burst strength: psi	430 min	320 min.	ASTM D3786
Trapezoidal tear: lbs	75 min	50 min.	ASTM D4533
Permittivity: second ⁻¹	0.07 min	0.07 min.	ARIZ 730 ⁽¹⁾
Apparent opening size: US Standard sieve size	30 – 140	30 - 140	ASTM D4751
Ultraviolet Stability: %	70 min.	70 min	ASTM D4355

- (1) Arizona Department of Transportation test method.

796.2.4 Soil or Base Reinforcement: Geogrid geosynthetic materials are used for improving the stability of weak soils or reinforcing aggregate bases. Geogrids are defined as biaxial or triaxial polymeric grids formed by a regular network of integrally connected polymer tensile elements with apertures of sufficient size to permit significant mechanical interlock with the surrounding soil, aggregate, or other fill materials to function primarily as reinforcement.

The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. Geogrids shall be integrally formed and deployed as a single layer; comprised of

100 percent polypropylene or high-density polyethylene. Geogrids shall additionally conform to the physical properties shown in Table 796-4.

TABLE 796-4			
REINFORCEMENT GEOGRID PROPERTIES			
Property	Requirement		Test Method
	Type 1	Type 2	
Aperture size: in	1 min.	1-3/8 min.	ID callipered
Rib Thickness: mil	30 min.	50 min.	ASTM D1777
Ultimate Tensile Strength: lb/ft	850	1300	ASTM D4945
Flexural Rigidity: Mg-cm	250,000	750,000	ASTM D1388
Min Tensile Strength @ 2% Strain: lb/ft MD ⁽¹⁾	270	410	ASTM D6637
Min Tensile Strength @ 2% Strain: lb/ft CMD ⁽²⁾	380	620	ASTM D6637
Min Tensile Strength @ 5% Strain: lb/ft MD ⁽¹⁾	550	810	ASTM D6637
Min Tensile Strength @ 5% Strain: lb/ft CMD ⁽²⁾	720	1340	ASTM D6637
Minimum Junction Strength: %	75		GRI-GG2 ⁽³⁾
Minimum Ultraviolet Stability: %	70		ASTM D4355

(1) MD = Test in the machine direction along roll length ~~Machine Direction~~

(2) CMD = Test in the cross-machine (transverse) direction across roll width ~~Cross Machine (transverse) Direction~~

(3) Geosynthetic Research Institute test method

796.3 TEST & CERTIFICATION REQUIREMENTS:

Certificates of compliance shall be submitted to the engineer upon delivery of material for use on a specified project. Samples of materials shall be submitted for testing. Each geosynthetic material lot or shipment must be approved by the Engineer before the materials may be incorporated in the work.

Testing methods and results shown in the certificate of compliance shall conform to the listed specifications for the proposed geosynthetic use. Manufacturer's supporting documentation including, but not limited to, product information sheets, installation procedures and recommendations, recommended use, and project references shall be submitted to the Engineer for product evaluation and approval.