918-M-060 GEOSYNTHETIC MATERIALS

(Revised 11-18-22)

The Standard Specifications are revised as follows:

SECTION 918, BEGIN LINE 3, DELETE AND INSERT AS FOLLOWS:

918.01 General Requirements

Geosynthetics are polymer-based products used for separation, filtration, reinforcement, liquid containment, *moisture management,* soil and aggregate confinement, and many other soil related purposes within many conventional civil engineering structures. When appropriate, the Department will require the use of geosynthetics meeting the categories and characteristics indicated below.

~~A manufacturer requesting that a geosynthetic be added to the QPL shall submit the required documents in accordance with ITM 806 to the Department's Division of Materials and Tests~~*Geosynthetic materials including geotextile, geomembrane, geocell, and geogrid shall be selected from the QPL of Geosynthetic Materials. Geosynthetics will be considered for inclusion on the QPL in accordance with ITM 806 Procedure S. The product shall be labeled clearly and indicate the manufacturer or private labeler name, product identification, lot number, manufactured date, and roll dimensions.*

Geosynthetics shall be protected from temperatures greater than 140°F, mud, dirt, dust, and debris during shipment and storage. Manufacturer recommendations shall be followed with regard to protection from direct sunlight. Geosynthetics shall be identified, stored, and handled in accordance with ASTM D4873. Damaged geosynthetics shall be replaced for the entire width of the roll.

918.02 Geotextile

The geotextile shall be either non-woven or woven and consist of at least 85% long-chain synthetic polymers. The geotextile shall contain stabilizers or inhibitors added to the base polymer mix to make the filaments and yarns resistant to deterioration caused by ultraviolet radiation exposure. The geotextile shall be produced such that the yarns and fibers retain their relative positions. The non-woven geotextile shall be needle punched, heat bonded, or resin bonded.

~~All damaged geotextile shall be replaced for the entire width of the roll. The Contractor shall furnish the product labeled that clearly indicates the manufacturer's or supplier's name, product identification, lot number, manufactured date, and roll dimensions. Geotextiles used for Department projects shall be NTPEP listed and shall be in accordance with AASHTO M 288 and the QPL of Geosynthetic Materials. Geotextiles will be placed and maintained on the QPL in accordance with ITM 806.~~

The geotextile shall meet the following requirements:

(a) Geotextile Properties for Riprap and Revetment Applications

		Requirements[(1)]				
Test	Method, ASTM	Type 1A	~~Type 1B~~	Type 2A	Type 2B	~~Type 3~~

Grab Tensile Strength, min.	D4632	200 lb	~~200 lb~~	250 lb	300 lb	~~250 lb~~
Grab Elongation	D4632	> 50%	~~< 50%~~	> 50%	< 50%	~~< 50%~~
CBR Puncture Strength, min.	D6241	500 lb	~~600 lb~~	625 lb	1,000 lb	~~875 lb~~
Trapezoid Tearing Strength, min.	D4533	80 lb	~~75 lb~~	100 lb	150 lb	~~60 lb~~
Deterioration in Tensile Strength due to UV Degradation 500 h~~rs~~, min.	D4355 D6637	70% strength retained	~~70% strength retained~~	70% strength retained	70% strength retained	~~90% strength retained~~
Apparent Opening Size, AOS	D4751	≤ No. 80 sieve, for soils ≥ 40% passing the No. 200 sieve	~~≤ No. 40 sieve, for soils < 40% passing the No. 200 sieve~~	≤ No. 100 sieve, for soils ≥ 40% passing the No. 200 sieve	≤ No. 40 sieve, for soils < 40% passing the No. 200 sieve	~~≤ No. 70 sieve~~
Permittivity	D4491	≥ 1.2 sec^{-1}	~~≥ 2.1 sec^{-1}~~	≥ 0.80 sec^{-1}	≥ 0.90 sec^{-1}	~~0.28 sec^{-1}~~

Note:
(1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D4354 in the weaker principal direction, except AOS size is based on maximum average roll value.

(b) Geotextile Properties for Underdrains, *Subsurface Drains,* and ~~Drainage~~*Filtration* Applications

		Requirements(1) (2)				
Test	Method, ASTM	Type 1A	~~Type 1B~~	Type 2A	Type 2B	~~Type 3~~
Grab Tensile Strength, min.	D4632	80 lb	~~200 lb~~	160 lb	200 lb	~~200 lb~~
Grab Elongation	D4632	> 50%	~~< 50%~~	> 50%	< 50%	~~< 50%~~
CBR Puncture Strength, min.	D6241	175 lb	~~600 lb~~	410 lb	750 lb	~~1,100 lb~~
Deterioration in Tensile Strength due to UV Degradation 500 h~~rs~~, min.	D4355 D6637	70% strength retained	~~70% strength retained~~	70% strength retained	70% strength retained	~~90% strength retained~~
Apparent Opening Size, AOS	D4751	≤ No. 50 sieve, for soils ≥ 40% passing the No. 200 sieve	~~≤ No. 40 sieve, for soils < 40% passing the No. 200 sieve~~	≤ No. 70 sieve, for soils ≥ 40% passing the No. 200 sieve	≤ No. 30 sieve, for soils < 40% passing the No. 200 sieve	~~≤ No. 40 sieve~~
Permittivity	D4491	≥ 1.2 sec^{-1}	~~≥ 2.1 sec^{-1}~~	≥ 0.8 sec^{-1}	≥ 0.9 sec^{-1}	~~0.90 sec^{-1}~~

Notes:
(1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D4354 in the weaker principal direction, except AOS size is based on maximum average roll

value.
(2) Type 3 value is a maximum average roll value (Max ARV) as determined in accordance with ASTM D4354.

(c) Geotextile Properties for Pavement or Subgrade Stabilizations

Test	Method, ASTM	Requirements(1)			
		~~Type 1A~~	~~Type 1B~~	Type 2A	Type 2B
Grab Tensile Strength, min.	D4632	~~200 lb~~	~~300 lb~~	290 lb	400 lb
Wide Width Tensile , @ 5% Strain, min.	D4595	~~n/a~~	~~n/a~~	1,200 lb/ft	2,400 lb/ft
Grab Elongation	D4632	~~≤ 50%~~	~~< 50%~~	≤ 50%	< 50%
CBR Puncture Strength, min.	D6241	~~175 lb~~	~~600 lb~~	410 lb	750 lb
Trapezoid Tearing Strength, min.	D4533	~~75 lb~~	~~110 lb~~	n/a	n/a
Deterioration in Tensile Strength due to UV Degradation 500 h~~rs~~, min.	D4355 D6637	~~70% strength retained~~	~~70% strength retained~~	70% strength retained	70% strength retained
Apparent Opening Size, AOS, min.	D4751	~~No. 50 sieve~~	~~No. 40 sieve~~	No. 30 sieve	No. 30 sieve
Soil Retention, Pore Size, O_{50}/O_{95}, min.	D6767	~~n/a~~	~~n/a~~	290/380	100/350
Permittivity, min.	D4491	~~0.05 sec $^{-1}$~~	~~0.050 sec $^{-1}$~~	0.50 sec $^{-1}$	0.40 sec $^{-1}$

Note:
(1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D4354 in the weaker principal direction, except AOS size is based on maximum average roll value.

(d) Geotextile Properties for Moisture Management

Type 1MA geotextile shall consist of woven polypropylene filaments, wicking filaments and shall be in accordance with the following:

Test	*Method, ASTM*	*Requirements*
		Type 1MA
Wide Width Tensile Strength, min. *Machine direction* *Cross machine direction*	*D4595[3]*	 *5,280 lbs/ft* *5,280 lbs/ft*
Wide Width Tensile Strength, @ 2% Strain, min. *Machine direction* *Cross machine direction*	*D4595[3]*	 *480 lbs/ft* *1,080 lbs/ft*
Apparent Opening Size, AOS, min.	*D4751*	*No. 40 sieve*
Flow Rate	*D4491[3]*	*30 gal./min/ft^2*
Wicking Requirement *Wet Front Movement[1] 24 minutes, min.*	*C1559[2]*	*6 in.* *Vertical Direction*
Wicking Requirement *Wet Front Movement[1] 983 minutes. Zero Gradient, min.*	*C1559[2]*	*73 in.* *Horizontal Direction*
Permittivity, min.	*D4491[3]*	*0.4 sec^{-1}*

Notes:
1. 'STP': Standard Temperature and Pressure
2. Modified, time
3. Minimum average roll values shall be in accordance with ASTM D4759

(~~d~~e) Geotextile Properties for Silt Fence

Test	Method, ASTM	Requirements(1)	
		Wire Fence Supported	Self Supported
Grab Strength	D4632	90 lb	90 lb

Elongation @ 45 lb	D4632		50% max.
Apparent Opening Size (2)	D4751	No. 20 sieve	No. 20 sieve
Permittivity (2)	D4491	0.01 sec^{-1}	0.01 sec^{-1}
Ultraviolet Degradation at 500 hrs	D4355	70% strength retained	70% strength retained

(1) The value in the weaker principal direction shall be used. All numerical values will represent the minimum average roll value. Test results from a sampled roll in a lot shall be in accordance with or shall exceed the minimum values shown in the above table. The stated values are for non-critical, non-severe conditions. Lots shall be sampled in accordance with ASTM D4354.

(2) The values reflect the minimum criteria currently used. Performance tests may be used to evaluate silt fence performance if deemed necessary by the Engineer.

Note: All values are minimum average roll values (MARV) as determined in accordance with ASTM D4354.

918.03 Geomembrane

This material shall consist of a geomembrane fabricated from high density polyethylene, HDPE, consisting of strong, rot resistant, chemically stable long-chain synthetic polymer materials, dimensionally stable with distinct and measurable openings. The ~~manufactures~~*manufacturer* shall submit the tests for the intended use to the ~~Department~~*Geotechnical Engineering Division*.

~~Geomembrane shall be selected from the QPL of Geosynthetic Materials. Geomembrane will be placed and maintained on the QPL in accordance with ITM 806.~~

SECTION 918, BEGIN LINE 60, INSERT AS FOLLOWS:

918.04 Geocell Confinement System

Geocell confinement system is a lightweight, flexible mat that consists of high density polyethylene strips. The mat shall be perforated, and the strips shall be ultrasonic bonded together to form a strong configuration. Cell seam strength shall be uniform over full depth. *Geocell materials shall be 4 in. in depth.*

~~Geocell shall be selected from the QPL of Geosynthetic Materials. Geocell will be placed and maintained on the QPL in accordance with ITM 806.~~

SECTION 918, BEGIN LINE 72, INSERT AS FOLLOWS:

918.05 Geogrid

Geogrid shall be *a* biaxial or multi axial of a regular network of connected polymer tensile elements with aperture geometry sufficient to enable significant mechanical interlock with the surrounding material. The material shall be polypropylene, ASTM D4101 (97% minimum) and Carbon Black, ASTM D1603 (0.5% minimum). The geogrid structure shall be dimensionally stable and shall be able to retain its geometry under construction stresses. The geogrid structure shall have a resistance to damage during construction, ultraviolet degradation, and all forms of chemical and biological degradation encountered in the soil being placed.

Geogrid shall be in accordance with the property requirements as specified in the Geosynthetic Research Institute, GRI, Standard Test Methods GG1, GG3, GG4, ASTM D5262, and ASTM D6637.

~~During periods of shipment and storage, the geogrid shall be protected from temperatures greater than 140°F, mud, dirt, dust, and debris. Each geogrid roll shall be~~

~~labeled or tagged to provide product identification. The manufacturer's recommendations shall be followed with regard to protection from direct sunlight. At the time of installation, the geogrid will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. All damaged portions of geogrid shall be replaced for the entire width of the roll. All of the geogrid shall be identified, stored, and handled in accordance with ASTM D4873. The Contractor shall furnish the product labels that clearly show the manufacturer's or supplier's name, product identification, lot number, manufactured date, roll dimension, and provide a document that the material is in accordance with manufacturer's or supplier's certificate.~~

~~Only geogrids selected from the QPL of Geosynthetic Materials shall be used. Geogrids will be placed and maintained on the QPL in accordance with ITM 806, Procedure S.~~