

918-R-675 GEOSYNTHETIC MATERIALS

(Revised 09-20-18)

The Standard Specifications are revised as follows:

SECTION 918, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 918 – GEOSYNTHETIC MATERIALS

918.01 General Requirements

Geosynthetics are polymer based products used for separation, filtration, reinforcement, liquid containment, soil and aggregate confinement and many other soil related purposes within many conventional ~~engineered~~ *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 approved materials list shall submit the required documents in accordance with ITM 806 to the Office of Materials Management.

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 Department's ~~Approved Materials List~~. *Geotextiles will be placed and maintained on the Department's list in accordance with ITM 806.*

The geotextile shall meet the following requirements:

(a) Geotextile Properties for Riprap and Revetment Applications

TEST	METHOD, ASTM	REQUIREMENTS ⁽¹⁾				
		Type 1A	Type 1B	Type 2A	Type 2B	Type 3
Grab Tensile Strength, min.	D 4632	200 lbs	200 lbs	250 lbs	300 lbs	250 lbs
Grab Elongation	D 4632	≥ 50%	< 50%	≥ 50%	< 50%	< 50%
CBR Puncture Strength, min.	D 6241	500 lbs	600 lbs	700 625 lbs	1000 lbs	950 875 lbs
Trapezoid Tear Strength, min.	D 4533	80 lbs	75 lbs	100 lbs	150 lbs	60 lbs
UV Degradation Resistance 500 hrs, min.	D 4355 D 6637	70%	70%	70%	70%	90%
Apparent Opening Size, AOS; min.	D 4751	≤ No. 80 sieve, for soils ≥ 40% passing the No. 200 sieve; ≤ No. 80 sieve	≤ No. 40 sieve, for soils < 40% passing the No. 200 sieve; ≤ No. 40 sieve	≤ No. 100 sieve, for soils ≥ 40% passing the No. 200 sieve; ≤ No. 70 sieve	≤ No. 40 sieve, for soils < 40% passing the No. 200 sieve; ≤ No. 40 sieve	≤ No. 70 sieve
Permittivity, min.	D 4491	≥ 1.2 sec ⁻¹	≥ 2.1 sec ⁻¹	≥ 1.20 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 D 4354 <i>in the weaker principal direction, except AOS size is based on maximum average roll value.</i>						

(b) Geotextile Properties for Underdrains and Drainage Applications

TEST	METHOD, ASTM	REQUIREMENTS ^{(1) (2)}				
		Type 1A	Type 1B	Type 2A	Type 2B	Type 3
Grab Tensile Strength, min.	D 4632	80 lbs	200 lbs	160 lbs	200 lbs	300 200 lbs
Grab Elongation	D 4632	≥ 50%	< 50%	≥ 50%	< 50%	< 50%
CBR Puncture Strength, min.	D 6241	175 lbs	600 lbs	410 lbs	1000 750 lbs	1100 lbs
UV Degradation Resistance 500 hrs, Retained , min.	D 4355 D 6637	70%	70%	70%	70%	90%

Apparent Opening Size, AOS, min.	D 4751	\leq No. 50 sieve, for soils $\geq 40\%$ passing the No. 200 sieve; \leq No. 70 sieve	\leq No. 40 sieve, for soils $< 40\%$ passing the No. 200 sieve; \leq No. 40 sieve	\leq No. 70 sieve, for soils $\geq 40\%$ passing the No. 200 sieve; \leq No. 70 sieve	\leq No. 30 sieve, for soils $< 40\%$ passing the No. 200 sieve; \leq No. 40 sieve	\leq No. 40 sieve
Permittivity, min.	D 4491	$\geq 1.2 \text{ sec}^{-1}$	$\geq 2.1 \text{ sec}^{-1}$	$\geq 1.20.8 \text{ sec}^{-1}$	$\geq 1.50.9 \text{ sec}^{-1}$	0.90 sec^{-1}
Notes: (1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D 4354 <i>in the weaker principal direction, except AOS size is based on maximum average roll value.</i> (2) Type 3 value is a maximum average roll value (Max ARV) as determined in accordance with ASTM D 4354.						

(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.	D 4632	200 lbs	300 lbs	350 290 lbs	440 400 lbs
Wide Width Tensile, @ 5% Strain, min.	D 4595	n/a	n/a	1200 lbs/ft	2400 lbs/ft
Grab Elongation, min	D 4632	15 $\leq 50\%$	15 $< 50\%$	n/a $\leq 50\%$	n/a $< 50\%$
CBR Puncture Strength, min.	D 6241	700 175 lbs	900 600 lbs	1000 410 lbs	2000 750 lbs
Trapezoid Tear Strength, min.	D 4533	75 lbs	110 lbs	n/a	n/a
UV Degradation Resistance 500 hrs, min.	D 4355 D 6637	70% retained	70% retained	n/a 70% retained	n/a 70% retained
Apparent Opening Size, AOS, min.	D 4751	use sieve No. 40/50	use sieve No. 40	use sieve No. 30	use sieve No. 30
Soil Retention, Pore Size, O_{50}/O_{95} , min.	D 6767	n/a	n/a	290/380	320/460 100/350
Permittivity, min.	D 4491	0.05 sec^{-1}	0.050 sec^{-1}	0.600 0.50 sec^{-1}	0.40 sec^{-1}
Notes: (1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D 4354 <i>in the weaker principal direction, except AOS size is based on maximum average roll value.</i>					

(d) Geotextile Properties for Silt Fence

REQUIREMENTS ⁽¹⁾

TEST	METHOD, ASTM	Wire Fence Supported	Self Supported
Grab Strength	D 4632	90 lbs	90 lbs
Elongation @ 45 lbs	D 4632		50% max.
Apparent Opening Size ⁽²⁾	D 4751	No. 20 sieve	No. 20 sieve
Permittivity ⁽²⁾	D 4491	0.01 sec ⁻¹	0.01 sec ⁻¹
Ultraviolet Degradation at 500 hrs	D 4355	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 D 4354. ⁽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: 1. All values are minimum average roll values (MARV) as determined in accordance with ASTM D 4354.			

~~Material furnished under this specification shall be covered by the type of certification specified in the Frequency Manual and in accordance with 916.~~

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 shall submit the tests for the intended use to the Department.

Geomembrane shall be selected from the Department's approved materials list. Geomembrane will be placed and maintained on the Department's list in accordance with ITM 806.

The geomembrane shall ~~be~~ meet the following requirements:

TEST	METHOD	REQUIREMENTS
Density, min.	ASTM D 1505	55 pcf
Sheet Thickness	ASTM D 5199	30 mils
Tear Resistance	ASTM D 1004	22 lbs
Resistance Soil Burial	ASTM D 3083	90% retained
pH	AASHTO T 289	Durability between 3 to 12
Roll Width	Calibered	20 ft

~~Material furnished under this specification shall be covered by the type of certification specified in the Frequency Manual and in accordance with 916.~~

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 shall be selected from the Department's approved materials list. Geocell will be placed and maintained on the Department's list in accordance with ITM 806.

The geocell shall meet the following requirements:

MECHANICAL PROPERTIES	MATERIAL/TEST METHOD	UNIT	*MD x CD VALUE
Grab Tensile Strength	ASTM D 4632	lbs	365 x 200
Grab Tensile Strength	ASTM D 4632	%	24 x 10
Trapezoidal Tear Strength	ASTM D 4533	lbs	115 x 75
CBR Puncture Strength	ASTM D 6241	lbs	675
Sheet Thickness	ASTM D 5199	mils	50
Environmental Stress Crack Reduction, min.	ASTM D 1693	hours	3500
Short-Term Seam Peel Strength for 4 in. depth	ASTM D 6392	lbs/ft	350320
Percent Open Area	COE-02215	%	12.6
Nominal Expanded Cell Size	Calibered	in.	12.6 x 11.3
Notes: * MD Machine direction x Cross direction. 1. Carbon Black shall be minimum 1.5% by weight in accordance with ASTM 5199. 2. Short term peel strength shall be 640 lbs for 6 in. depth cell.			

~~Material furnished under this specification shall be covered by the type of certification specified in the Frequency Manual and in accordance with 916.~~