

## 918-R-675 GEOSYNTHETIC MATERIALS

(Adopted 01-18-18)

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 ~~A~~ *approved M* ~~materials L~~ *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,<br>ASTM  | REQUIREMENTS <sup>(1)</sup>  |  |   |  |                        |
|--|------------------|--|--|---|--|------------------------|
|  |                  | 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  | <del>700</del> 625 lbs  | 1000 lbs   | <del>950</del> 875 lbs |
| Trapezoid Tear Strength, min.  | D 4533           | 80 lbs   | 75 lbs   | 100 lbs   | 150 lbs  | 60 lbs                 |
| UV Degradation Resistance<br>500 hrs, min.   | D 4355<br>D 6637 | 70%  | 70%  | 70%   | 70%  | 90%                    |
| Apparent Opening Size, AOS;<br><del>min.</del>   | D 4751           | ≤ No. 80 sieve,<br>for soils ≥<br>40%<br>passing the<br>No. 200 sieve;<br>≤ No. 80 sieve | ≤ No. 40 sieve,<br>for soils <<br>40%<br>passing the<br>No. 200 sieve;<br>≤ No. 40 sieve | ≤ No. 100<br>sieve, for soils<br>≥ 40%<br>passing the No.<br>200 sieve;<br>≤ No. 70 sieve | ≤ No. 40<br>sieve, for<br>soils < 40%<br>passing the<br>No. 200<br>sieve;<br>≤ No. 40<br>sieve | ≤ No. 70<br>sieve      |
| Permittivity, <del>min.</del>  | D 4491           | ≥ 1.2 sec <sup>-1</sup>  | ≥ 2.1 sec <sup>-1</sup>  | ≥ <del>1.20</del> 0.80 sec <sup>-1</sup>  | ≥ 0.90 sec <sup>-1</sup>   | 0.28 sec <sup>-1</sup> |
| Note:<br><sup>(1)</sup> 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,<br>ASTM | REQUIREMENTS <sup>(1)(2)</sup> |         |         |                        |                        |
|--------------------------------|-----------------|--------------------------------|---------|---------|------------------------|------------------------|
|                                |                 | Type 1A                        | Type 1B | Type 2A | Type 2B                | Type 3                 |
| Grab Tensile Strength,<br>min. | D 4632          | 80 lbs                         | 200 lbs | 160 lbs | 200 lbs                | <del>300</del> 200 lbs |
| Grab Elongation                | D 4632          | ≥ 50%                          | < 50%   | ≥ 50%   | < 50%                  | < 50%                  |
| CBR Puncture<br>Strength, min. | D 6241          | 175 lbs                        | 600 lbs | 410 lbs | <del>400</del> 750 lbs | 1100 lbs               |
| UV Degradation                 | D 4355          | 70%                            | 70%     | 70%     | 70%                    | 90%                    |

|   |        |  |   |   |   |                         |
|---|--------|--|---|---|---|-------------------------|
| Resistance 500 hrs,<br>Retained, min.   | D 6637 |  |   |   |   |                         |
| Apparent Opening Size,<br>AOS, min.   | D 4751 | $\leq$ No. 50 sieve,<br>for soils $\geq$ 40%<br>passing the No.<br>200 sieve;<br><del><math>\leq</math> No. 70 sieve</del> | $\leq$ No. 40 sieve,<br>for soils $<$ 40%<br>passing the No.<br>200 sieve;<br><del><math>\leq</math> No. 40 sieve</del> | $\leq$ No. 70 sieve,<br>for soils $\geq$<br>40%<br>passing the No.<br>200 sieve;<br><del><math>\leq</math> No. 70 sieve</del> | $\leq$ No. 30 sieve,<br>for soils $<$ 40%<br>passing the No.<br>200 sieve;<br><del><math>\leq</math> No. 40 sieve</del> | $\leq$ No. 40<br>sieve  |
| Permittivity, min.  | D 4491 | $\geq 1.2 \text{ sec}^{-1}$  | $\geq 2.1 \text{ sec}^{-1}$   | <del><math>\geq 1.20.8 \text{ sec}^{-1}</math></del>  | $\geq 1.5 \text{ sec}^{-1}$   | $0.90 \text{ sec}^{-1}$ |
| Notes:  |        |  |   |   |   |                         |
| (1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D 4354 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 D 4354.  |        |  |   |   |   |                         |

### (c) Geotextile Properties for Pavement or Subgrade Stabilizations

| TEST  | METHOD,<br>ASTM  | REQUIREMENTS <sup>(1)</sup>                  |                                |                                |                                |
|---|------------------|--|--------------------------------|--------------------------------|--------------------------------|
|   |                  | Type 1A                                      | Type 1B                        | Type 2A                        | Type 2B                        |
| Grab Tensile Strength, min.   | D 4632           | 200 lbs                                      | 300 lbs                        | 350 lbs                        | <del>440</del> 400 lbs         |
| Wide Width Tensile , @ 5% Strain  | D 4595           | n/a  | n/a                            | 1200                           | 2400                           |
| Grab Elongation, min  | D 4632           | <del>15</del> $\leq 50\%$                    | <del>15</del> $< 50\%$         | <del>n/a</del> $\leq 50\%$     | <del>n/a</del> $< 50\%$        |
| CBR Puncture Strength, min.   | D 6241           | <del>700</del> 175 lbs                       | <del>900</del> 600 lbs         | <del>1000</del> 410 lbs        | <del>2000</del> 750 lbs        |
| Trapezoid Tear Strength, min.   | D 4533           | 75 lbs                                       | 110 lbs                        | n/a                            | n/a                            |
| UV Degradation Resistance 500 hrs, min.   | D 4355<br>D 6637 | 70% retained                                 | 70% retained                   | <del>n/a</del> 70% retained    | <del>n/a</del> 70% retained    |
| Apparent Opening Size, AOS, min.  | D 4751           | <del>use</del> sieve<br>No. <del>40</del> 50 | <del>use</del> sieve<br>No. 40 | <del>use</del> sieve<br>No. 30 | <del>use</del> sieve<br>No. 30 |
| Soil Retention, Pore Size, $O_{50}/O_{95}$ , min.   | D 6767           | n/a  | n/a                            | 290/380                        | 320/460                        |
| Permittivity, min.  | D 4491           | $0.05 \text{ sec}^{-1}$                      | $0.050 \text{ sec}^{-1}$       | $0.60 \text{ sec}^{-1}$        | $0.40 \text{ sec}^{-1}$        |
| Notes:  |                  |  |                                |                                |                                |
| (1) All values are minimum average roll values (MARV) as determined in accordance with ASTM D 4354 in the weaker principal direction, except AOS size is based on maximum average roll value. |                  |  |                                |                                |                                |

### (d) Geotextile Properties for Silt Fence

| TEST  | METHOD,<br>ASTM | REQUIREMENTS <sup>(1)</sup> |                        |
|---|-----------------|-----------------------------|------------------------|
|   |                 | Wire Fence Supported        | Self Supported         |
| Grab Strength   | D 4632          | 90 lbs                      | 90 lbs                 |
| Elongation @ 45 lbs   | D 4632          |                             | 50% max.               |
| Apparent Opening Size <sup>(2)</sup>  | D 4751          | No. 20 sieve                | No. 20 sieve           |
| Permittivity <sup>(2)</sup>   | D 4491          | 0.01 sec <sup>-1</sup>      | 0.01 sec <sup>-1</sup> |
| Ultraviolet Degradation at 500 hrs  | D 4355          | 70% strength retained       | 70% strength retained  |
| <p><sup>(1)</sup> 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.</p> <p><sup>(2)</sup> The values reflect the minimum criteria currently used. Performance tests may be used to evaluate silt fence performance if deemed necessary by the Engineer.</p> <p>Note:</p> <p>1. All values are minimum average roll values (MARV) as determined in accordance with ASTM D 4354.</p> |                 |                             |                        |

~~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:

| <del>MECHANICAL PROPERTIES</del>   | <del>MATERIAL/TEST METHOD</del> | <del>UNIT</del>   | <del>*MD x CD VALUE</del> |
|--|---------------------------------|-------------------|---------------------------|
| <del>Grab Tensile Strength</del>   | <del>ASTM D 4632</del>          | <del>lbs</del>    | <del>365 x 200</del>      |
| <del>Grab Tensile Strength</del>   | <del>ASTM D 4632</del>          | <del>%</del>      | <del>24 x 10</del>        |
| <del>Trapezoidal Tear Strength</del>   | <del>ASTM D 4533</del>          | <del>lbs</del>    | <del>115 x 75</del>       |
| <del>CBR Puncture Strength</del>   | <del>ASTM D 6241</del>          | <del>lbs</del>    | <del>675</del>            |
| <del>Sheet Thickness</del>   | <del>ASTM D 5199</del>          | <del>mils</del>   | <del>50</del>             |
| <del>Environmental Stress Crack Reduction, min.</del>                                    | <del>ASTM D 1693</del>          | <del>hours</del>  | <del>3500</del>           |
| <del>Short-Term Seam Peel Strength for 4 in. depth</del>                                 | <del>ASTM D 6392</del>          | <del>lbs/ft</del> | <del>350</del>            |
| <del>Percent Open Area</del>   | <del>COE-02215</del>            | <del>%</del>      | <del>12.6</del>           |
| <del>Nominal Expanded Cell Size</del>  | <del>Calibered</del>            | <del>in.</del>    | <del>12.6 x 11.3</del>    |
| Notes:   |                                 |                   |                           |
| * <del>MD Machine direction x Cross direction.</del>                                     |                                 |                   |                           |
| 1. <del>Carbon Black shall be minimum 1.5% by weight in accordance with ASTM 5199.</del> |                                 |                   |                           |
| 2. <del>Short term peel strength shall be 640 lbs for 6 in. depth cell.</del>            |                                 |                   |                           |

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