

3733 GEOTEXTILES

3733.1 SCOPE

Provide geotextiles (permeable fabrics) for the typical uses classified as follows:

- (1) Type 1 for wrapping subsurface drain pipe, joints of concrete pipe culvert, or other drainage applications;
- (2) Type 2. The Department no longer uses this classification. If the contract specifies Type II, use Type III property requirements;
- (3) Type 3 for use under Class 1 and Class 2 random riprap, gabions, and revetment mattresses;
- (4) Type 4 for use under Class 3 and Class 4 random riprap and hand-placed riprap on slopes no steeper than 1:3, vertical to horizontal;
- (5) Type 5 for separating materials for stabilization;
- (6) Type 6 for earth reinforcement;
- (7) Type 7 for use under Class 3 and Class 4 random riprap on slopes steeper than 1:3, vertical to horizontal, and under Class 5 random riprap.
- (8) Type 8 for use as a bond breaker interlayer for concrete overlays over existing concrete pavement.

3733.2 REQUIREMENTS

A General

Provide geotextiles consisting of woven, nonwoven, or knit fabric of polymeric filaments or yarns, such as polypropylene, polyethylene, polyester, or polyamide, that form a stable network. Knit fabric shall only be used as perforated pipe wrap. Provide geotextile resistant to biological and chemical environments normally found in soils, and that is free of chemical treatment or coating that may significantly reduce porosity or permeability.

Provide geotextile that is uniform in texture, thickness, and appearance, and is free of defects, flaws, or tears that may alter the strength or filtering properties. Repair geotextile as approved by the Engineer.

Deliver rolls of geotextile or geotextile-wrapped perforated pipe with an opaque plastic covering to protect the material from ultraviolet rays or contamination with mud, dirt, dust, or debris. Provide rolled geotextile labeled on the outside wrap and inside the core in accordance with ASTM D 4873 and as follows:

- (1) Manufacturer,
- (2) Product name, and
- (3) Roll number.

Ensure unprotected geotextile is not exposed to sun for more than seven days. Replace contaminated geotextile or geotextile exposed to the sun for more than seven days, if directed by the Engineer.

Provide geotextile meeting the requirements of Table 3733-1 or Table 3733-2 for the type required by the contract.

If using Type 5 or Type 6 geotextile, produce seams meeting the requirements of Table 3733-1, row B3, "Seam Breaking Strength Minimum."

B Physical Properties

**Table 3733-1
Geotextile Properties**

Geotextile Property	Test Method (ASTM) Units	Type (a)							
		1		3	4	5	6	7 (c)	8(h)
		Fabric	Knit sock (b)						
B1 Grab Tensile Strength minimum, each principal direction	D4632 lb	100	—	100	200	200	(d)	300	—
B2 Elongation minimum, each principal direction	D4632 percent	—	—	50	50	—	(d)	50	—
B3 Seam Breaking Strength minimum (e)	D4632 lb	90	—	90	180	180	(d)	270	—
B4 Apparent Opening Size (AOS) maximum (f)	D4751 U.S. Std. sieve size [mm]	40	40 as applied	50	50	30	20	50	—
B5 Permittivity minimum (g)	D4491 falling head sec ⁻¹	0.7	2.75 relaxed	0.5	0.5	0.05	0.05	0.5	—

Table 3733-1 Geotextile Properties									
B6 Puncture strength minimum	D6241 lb	—	180	—	—	—	—	—	—
B7 Wide Width Strip Tensile Strength minimum each principal direction	D4595 lb/ft	—	—	—	—	—	(d)	—	—
<p>(a) Minimum Average Roll Values (MARV) based on average of at least three tests per swatch.</p> <p>(b) Provide socks made of knit polymeric materials and meeting the requirements of ASTM D6707-06, for Type H: fabric. Ensure the sock exhibits minimum snag or run potential, is factory-applied to maintain uniform installed mass, and conforms to the outside diameter of the tubing with a snug fit.</p> <p>(c) Needle-punched nonwoven. Do not use thermally bonded (heat-set) fabric.</p> <p>(d) Requirements are site-specific and will be as specified in the contract. The property values for B1 and B3 may not be less than shown for Type 5. If the contract does not specify either B1 or B7, use a default value of 300 lb for B1. If the contract does not specify seam strength, use a default value of 270 lb for B3.</p> <p>(e) Adhere to this requirement if the contract requires or allows seams. Strength specifications apply to factory and field seams. Use thread for sewing that has strength of at least 25 lb. Sew seams with a Federal Type 401 stitch using a two-spool sewing machine, and install seams facing upward. For seaming with adhesives, see the Approved/Qualified Products List available at the Department's website.</p> <p>(f) For U.S. sieve sizes, the AOS Number must be equal to or greater than the number specified.</p> <p>(g) Permittivity: $P = K/L$, where K = fabric permeability and L = fabric thickness.</p> <p>(h) See Table 3733.2 for requirements.</p>									

Table 3733-2 Non-woven Geotextile Interlayer Material for Concrete Overlay		
Property	Requirements ¹	Test Procedure
Geotextile type	Nonwoven, needle-punched geotextile, no thermal treatment (calendaring or IR)	Manufacturer Certificate of Compliance
Color	Uniform/nominally same-color fibers	Visual Inspection
Mass per unit area	≥ 14.7 oz/yd ²	ASTM D 5261
Thickness under load (pressure)	[a] At 0.29 psi [2 kPa]: ≥ 0.12 in [b] At 2.9 psi [20 kPa]: ≥ 0.10 in [c] At 29 psi [200 kPa]: ≥ 0.04 in	ASTM D 5199
Wide-width tensile strength	≥ 685 lb/ft	ASTM D 4595
Wide-width maximum elongation	≤ 130%	ASTM D 4595
Water permeability in normal direction under load (pressure)	At 2.9 psi: ≥ 3.3x10 ⁻⁴ ft/s	Mod. ASTM D 5493 or ASTM D 4491
In-plane water permeability (transmissivity) under load (pressure)	[a] At 2.9 psi: ≥ 1.6x10 ⁻³ ft/s [b] At 29 psi: ≥ 6.6x10 ⁻⁴ ft/s	Mod. ASTM D 6574 or ASTM D 4716
Weather resistance	Retained strength ≥ 60%	ASTM D 4355 @ 500 hrs. exposure
Alkali resistance	≥ 96% polypropylene/polyethylene	Manufacturer certification of polymer

3733.3 SAMPLING AND TESTING

A Certificate of Compliance

Ensure the supplier submits to the Engineer a Certificate of Compliance and a document stating the manufacturer's MARV with each shipment of geotextile. MARV are two standard deviations below the mean value of all rolls tested. Provide a copy of the Certificate of Compliance and MARV with each geotextile sample sent to the Materials Laboratory for testing.

B Sampling and Testing

The Department's inspection and test results will determine acceptance of the geotextile, in accordance with 1603.4, "Acceptance." In the presence of the Engineer, randomly select samples in the field at the rates and sample sizes shown in the Schedule of Materials Control. Cut samples across the full width of the roll. Do not sample the first full turn (outside layer) of the roll. Provide seam samples in addition to the regular sample. Use the same machine, or an equal machine to the one on the project, to produce seam samples.