

Section 4196. Engineering Fabrics

4196.01 GENERAL REQUIREMENTS.

- A.** Meet the following requirements for engineering fabrics (known as geotextiles):
1. Permeable, synthetic textile materials suitable for use with soil, rock, or other geotechnical engineering related materials as an integral part of a highway project, structure, or system.
 2. Mildew, rot, insect, and rodent resistant.
 3. Inert to commonly encountered chemicals found in soil.
 4. During all periods of shipment and storage, the fabric is maintained by wrapping in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, mud, dirt, dust, and debris.
 5. Free of defects or flaws which significantly affect its physical properties.
- B.** Comply with [Materials I.M. 496.01](#) for inspection and acceptance of engineering fabrics. Label each roll of fabric in a shipment with a number or symbol to identify the production run. Meet the following additional fabric requirements for the specific applications:
1. **Silt Fencing.**
 - a. Meet the following requirements:
 - 1) Woven material with a minimum width of 36 inches (0.9 m).
 - 2) Top edge of the fabric hemmed or modified otherwise so that a braided cord or woven belt can be suitably attached for loop tying to fence posts.
 - 3) The cord or belt of minimum tensile strength of 150 pounds (670 N).
 - 4) Fabric and any reinforcing plastic netting contains or is treated with ultraviolet stabilizers, sufficient to prevent damaging deterioration for 2 years of outdoor exposure.
 - 5) Has the properties listed in Table 4196.01-1.
 - b. The fabric may be reinforced with plastic netting of nominal 3/4 inch (19 mm) strand spacing and a minimum three strand grab strength of 40 pounds (180 N) and 15 pounds (70 N) after the same accelerated weathering as required for the fabric. Fabric that is reinforced in this manner may have lower grab strengths as indicated.

Table 4196.01-1: Silt Fencing Fabric Properties

Property	Value	Test Method No.
Grab Strength, dry, minimum average full fill direction run direction ^(a)	100 lbs. (445 N) 150 lbs. (667 N)	Iowa 913 Iowa 913 ASTM D 4632
Grab strength, after 500 hr. in a QUV weatherometer with a cycle of 4 hr. UV @ 60°C and 4 hr. COND @ 40°C, minimum average value in either principal direction ^(a) Ultraviolet Stability (Retained Strength)	50 lbs. (222 N) 70%	Iowa 913 ASTM D 4355
Filtering Efficiency ^(b) Flow Time, maximum minutes Permittivity	25 - 50% 15 0.05	Iowa 909 Iowa 909 ASTM D 4491
Apparent Opening Size, maximum	US mesh 30 (600 µm)	ASTM D 4751
<p>(a) When plastic net reinforcing is used, ensure the minimum average grab strength requirement for fabric, before and after accelerated weathering, is 100 pounds (445 N) and 35 pounds (155 N), respectively. Apply the grab strength to both the fill and run direction.</p> <p>(b) Fabrics that do not meet the minimum filtering efficiency requirement may be approved for trial use on specific projects. Approval will be based on acceptable field performance. Fabric exceeding the maximum filtering efficiency will not be considered.</p>		

2. Subsurface Drainage.

In subsurface drains, use fabric that:

- Is capable of withstanding normal installation stresses, and
- Has the properties listed in Table 4196.01-2.

Property	Value	Test Method
Grab strength, dry, minimum average value in either principal direction	90 lbs. (400 N)	Iowa 913 ASTM D 4632
Elongation, dry, minimum average value in either principal direction	20%	Iowa 913 ASTM D 4632
Water Permeability, K Permittivity	0.02 - 0.30	Iowa 911 ASTM D 4491
Apparent Opening Size, minimum maximum	US mesh 40 (450 µm)	Corps of Engineers W-02215 ASTM D 4751

3. Embankment Erosion Control.

Under erosion stone or gabions used for embankment or erosion control, use fabric that:

- Is capable of withstanding normal installation stresses, and
- Has the properties listed in Table 4196.01-3.

Property	Value	Test Method
Grab strength, dry, minimum average value in either principal direction	150 lbs. (667 N)	Iowa 913 ASTM D 4632
Elongation, dry, minimum average value in either principal direction	20%	Iowa 913 ASTM D 4632
Water Permeability, K Permittivity	0.02 - 0.30	Iowa 911 ASTM D 4491
Apparent Opening Size, minimum maximum	US mesh 40 (450 µm)	Corps of Engineers W-02215 ASTM D 4751

4. Asphalt Overlay Fabric.

- a. When placing fabric under asphalt mixtures to provide waterproofing and delay reflective cracking, ensure the fabric:
- Is capable of withstanding installation stresses,
 - Is not damaged by temperatures common to asphalt mixtures, and
 - Has the properties listed in Table 4196.01-4.

Property	Value	Test Method
Grab strength, dry, minimum average value in either principal direction	90 lbs. (400 N)	Iowa 913 ASTM D 4632
Elongation, dry, minimum average value in either principal direction	20%	Iowa 913 ASTM D 4632
Grab Strength after 400°F (204°C) for 3 hr. ^(a) minimum average value in either principal direction	75 lbs. (335 N)	Iowa 913 ASTM D 4632
(a) Applies only when asphalt temperatures exceeding 300°F (149°C) are anticipated.		

- b. Ensure asphalt absorption is sufficient to produce a good bond between the overlay and the overlaid surface when a tack coat of 0.20 gallon to 0.25 gallon (0.9 L to 1.1 L) of asphalt binder per square yard (square meter) is used.
- c. The Engineer may approve fabrics, such as fiberglass, which do not lend themselves to testing by some of the previously specified methods.

5. Subgrade Stabilization Material.

- a. To stabilize a subgrade under pavement or pavement patches, use material that:
- Is capable of withstanding installation stresses, and
 - Has the properties listed in Table 4196.01-5 for the type specified for use in the contract documents.

**Table 4196.01-5: Fabric for use as Subgrade Stabilization
(Polymer Grid)**

Property	Value	Test Method
Minimum tensile strength at 2% strain. Both directions.	250 lbs./ft. (3650 N/m)	GRI Test Method GG1-87
Maximum aperture. Both directions.	2 in. (50 mm)	Internal Dimension Measuring Calipers
Minimum aperture. Both directions.	0.5 in. (13 mm)	Internal Dimension Measuring Calipers
Minimum Ultimate junction strength. Both directions.	800 lbs./ft. (11,675 N/m)	GRI Test Method GG2-87

- b. Inspection and acceptance of polymer grid will be according to [Materials I.M. 496.01](#).

6. Concrete and Stone Revetment and Bridge Abutment Backfill Fabric.

Use engineering fabric having properties listed in Table 4196.01-6.

Table 4196.01-6: Fabric for use under conc./stone revetment & abutment backfill

Property	Value	Test Method
Tensile Strength (at 5% Strain)	1356 lbs/ft (19.8 kN/m)	ASTM D 4595
Apparent opening size (AOS)	US Sieve #40 (0.43 mm)	ASTM D 4751
UV resistance (at 500 hours)	70% retained strength	ASTM D 4355
Flow Rate	18 gal./min./ft ² (733 L/min./m ²)	ASTM D 4491