

CONSTRUCTION SPECIFICATION

VA-795. GEOTEXTILES

1. SCOPE

This work will consist of furnishing all materials, equipment and labor necessary for the installation of geotextiles for slope protection, subsurface drains and road stabilization.

2. MATERIALS

Geotextiles will be manufactured from synthetic long chain or continuous polymeric filaments or yarns, having a composition of at least 95 percent, by weight, of polypropylene, polyester or polyvinylidene-chloride. The geotextile will be formed into a stable network of filaments or yarns that retain their relative position to each other, are inert to commonly encountered chemicals and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. The geotextile will be free of any chemical treatment or coating that might significantly reduce its permeability and will have no flaws or defects that significantly alter its physical properties. Unless otherwise specified, the class and type of geotextile will be as shown on the construction drawings and will meet the requirements for materials that follow:

a. Woven Geotextile

The woven geotextile will conform to the physical properties listed in Table 1. The woven geotextile will be manufactured from monofilament yarns that are woven into a uniform pattern with distinct and measurable openings. The geotextile will be manufactured so that the yarns will retain their relative position with regard to each other. The yarns will contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure. The edges of the material will be selvaged or otherwise finished to prevent the outer yarn from unraveling.

b. Nonwoven Geotextile

Nonwoven geotextiles will conform to the physical properties listed in Table 2. Nonwoven geotextiles will be manufactured from randomly oriented fibers that have been mechanically bonded together by the needle-punched process. In addition, one side may be slightly heat bonded. Thermally bonded, nonwoven geotextiles, in addition to mechanically bonded, nonwoven geotextiles, may be used for road stabilization.

The geotextile will be manufactured from individual fibers formed into a random pattern with distinct but variable small openings, retaining their position relative to each other when bonded by needle punching, heat, or resin bonding. The filaments will contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure.

c. Shipping, Product Identification, Certification and Test Data

The geotextile will be shipped in rolls wrapped with a protective covering to protect against mud, dirt, dust, debris and direct sunlight (UV rays). Each roll of geotextile will be clearly marked to identify the brand, type and production run.

The geotextile will meet the specified requirements (Table 1 or 2) for the product style or type shown on the label. The manufacturer or distributor will provide a letter of certification to the NRCS or SWCD representative stating the compliance of the delivered product to the requirements of Table 1 or Table 2, whichever is applicable. Test data pertaining to the

production run of the product must be submitted to the NRCS or SWCD representative if requested to do so, in writing, by the NRCS or SWCD representative. All geotextile materials will be subject to sampling and testing by an independent testing laboratory at any time until final inspection and acceptance.

3. STORAGE

Prior to use, the geotextile will be stored in a clean, dry place, out of direct sunlight, not subject to extremes of either hot or cold, and with the manufacturer's protective cover in place. The geotextile will be stored and handled in accordance with the requirements listed in ASTM D4873.

4. SURFACE PREPARATION

The surface on which the geotextile is to be placed will be graded to the neat lines and grades as shown on the construction drawings. The surface will be reasonably smooth and free of loose rock and clods, holes, depressions, sharp objects, projections, muddy conditions, and standing or flowing water (unless otherwise specified). The surface preparation will be inspected and approved by the NRCS or SWCD representative prior to placing the geotextile.

5. PLACEMENT

a. General

The geotextile will be placed on the approved, prepared surface at the locations and in accordance with the details shown on the construction drawings. The geotextile will be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when stone or other material is placed on or against it. The geotextile may be folded and overlapped to permit proper placement in the designated area.

The geotextile will be secured during placement of the overlying materials to prevent slippage, folding, wrinkling, or other movement of the geotextile. Unless otherwise specified, methods of securing will not cause punctures, tears or other openings to be formed in the geotextile.

Where seaming is required or desired, the seam will be composed of a sewing thread having a composition of at least 95 percent polypropylene, polyester or polyarimid. The sewn overlap will be 6 inches and the sewing will consist of two parallel stitched rows at a spacing of approximately 1 inch and will not cross (except for any restitching).

The sewing thread will have a minimum breaking strength of 28 pounds (125 N) when tested in accordance to ASTM D2256 and will be highly contrasting in color to the geotextile. The seam will conform to Federal Standard SSa-2, SSn-2 or SSd-2, using a minimum of 4 stitches per inch per stitch line. The stitch lines will be parallel, a maximum of 0.75 inches (20 mm) apart and parallel to the geotextile edge (SSa) or fold (SSn or SSd). The stitch line closest to the edge or fold will be no more than 2 inches (50 mm) and no less than 0.75 inches (20 mm) from the edge or fold. Federal Standard 401 or 301 stitches will be used. Federal Standard 101 stitches will not be accepted.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area will be removed and restored to the original

approved condition. The repair will consist of a patch of the same type of geotextile being used, overlaying the existing geotextile. When the geotextile seams are required to be sewed, the overlay patch will extend a minimum of one foot beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing will be a minimum of 6 inches from the edge of the damaged geotextile. Geotextile panels joined by overlap will have the patch extend a minimum of 2 feet from the edge of any damaged area.

b. Slope Protection

The roll or panel length will be placed parallel to the direction of water flow unless otherwise indicated on the construction drawings. The upstream or up-slope geotextile will overlap the abutting down-slope geotextile. The minimum overlap will be 18 inches (45 cm), in any direction, unless adjacent panels are sewn together.

The geotextile will not be placed until it can be anchored and protected with the intended covering within 48 hours. If the geotextile will not be covered within 48 hours, a temporary covering will be used for protection from ultraviolet light. In no case will the material be dropped on uncovered geotextile from a height greater than 3 feet.

Securing pins, approved by the NRCS or SWCD representative and provided by the geotextile manufacturer, will be placed along the edge of the panel to adequately secure it during placement, except as noted under item d. below. At vertical laps, securing pins will be inserted through both layers along a line through the approximate midpoint of the overlap. At horizontal laps and laps across slopes, securing pins will be inserted through the bottom layer only. Securing pins will be placed along a line approximately 2 inches (50 mm) in from the edge of the outer limits of the placed geotextile at intervals not greater than 12 feet (3.6 m), unless otherwise specified. Additional pins will be installed as necessary to prevent any slippage of the fabric, regardless of locations. The use of securing pins will be held to the minimum necessary. The fabric may be secured with other methods when specified or directed by the Engineer. Pins will be steel or fiberglass, formed as a "U", "L", or "T" shape or with "ears" to prevent total penetration. Steel washers will be provided on all but the "U"-shaped pins.

c. Subsurface Drains

The geotextile will be covered by drainfill or other material within the same working day. Drainfill material will be placed in a manner that prevents damage to the geotextile. In no case will material be dropped on uncovered fabric from a height greater than 5 feet (1.5 m). Seams will be joined by sewing as detailed in section a. above or by overlapping a minimum of 18 inches and secured with pins as outlined in section b. above. If neither method is specified on the construction drawings then either method may be used.

d. Road Stabilization

The geotextile will be unrolled parallel to the roadway centerline. The minimum overlap of adjacent geotextile panels will be 24 inches (60 cm) for unsewn fabric. Alternately, adjacent panels may be sewn together per item 5a. above. Securing pins, approved by the NRCS or SWCD representative and provided by the geotextile manufacturer, may be used when necessary to ensure temporary anchoring of the geotextile during the installation process. The pins shall be removed prior to permanent backfilling.

Backfill will be dumped and spread in a uniform thickness generally not to exceed 9 inches after compaction. The first 2 or 3 lifts may be used to seal and consolidate with only light

compaction. Over-stressing the soil and severe rutting should be avoided by utilizing spreading and dumping equipment that exerts only moderate pressures on the soil. Granular backfill depths may have to be increased and equipment loads reduced to control soil stress if determined necessary by the NRCS or SWCD representative. Ruts developed during spreading and compacting will be filled with additional backfill material so that backfill thickness can be maintained. In no case will blading or backblading of a rutted surface be allowed to reduce rut depth.

Gravel and other coarse-grained backfill will be compacted with vibratory rollers except on animal trails or stream crossings. Compaction methods for these practices will be as shown on the construction drawings or as determined by the NRCS or SWCD representative. Vibration will not be used for coarse-grained backfill when the resulting dynamic forces will cause a loss in subgrade or backfill soil strength; e.g., fine sand backfill over a sand or silt subgrade having a high water table. If such conditions exist, moderate to heavy static rollers (steel drum or rubber tired) will be used. Fine-grained backfill will be compacted with sheepsfoot or rubber tired rollers.

TABLE 1 - REQUIREMENTS FOR WOVEN GEOTEXTILES BY USE

Property	Test Method	Class I	Class II and III	Class IV
Tensile strength (pounds) ¹	ASTM D4632 grab test	200 min. in any principle direction	120 min. in any principle direction	180 min. in any principle direction
Elongation at failure (percent) ¹	ASTM D4632 grab test	< 50	< 50	< 50
Puncture (pounds) ¹	ASTM D4833	90 minimum	60 minimum	60 minimum
Ultraviolet light (% residual tensile strength)	ASTM D4355 150-hour exposure	70 minimum	70 minimum	70 minimum
Apparent Opening Size (AOS)	ASTM D4751	As specified, but no smaller than 0.212. mm (#70) ²	As specified, but no smaller than 0.212. mm (#70) ²	As specified, but no smaller than 0.212. mm (#70) ²
Percent Open Area (percent)	CWO-02215-86 ³	4.0 minimum	4.0 minimum	1.0 minimum
Permitivity sec ⁻¹	ASTM D4491	0.1 minimum	0.1 minimum	0.1 minimum

1/ Minimum roll value (weakest principal direction)

2/ U.S. standard sieve size.

3/ Test methods prepared by U.S. Army Corps of Engineers.

TABLE 2 - REQUIREMENTS FOR NONWOVEN GEOTEXTILES BY USE

Property	Test Method	Class I	Class II	Class III	Class IV ³
Tensile strength (pounds) ¹	ASTM D4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (percent) ¹	ASTM D4632 grab test	≥ 50	≥ 50	≥ 50	≥ 50
Puncture (pounds) ¹	ASTM D4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D4355 150-hour exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent Opening Size (AOS)	ASTM D4751	As specified, max #40 ²			
Permittivity sec ⁻¹	ASTM D4491	0.7 minimum	0.7 minimum	0.7 minimum	0.1 minimum

1/ Minimum roll value (weakest principal direction)

2/ U.S. standard sieve size.

3/ Heat-bonded or resin-bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle-punched geotextiles are required for all other classes.