Construction Specification
013 Geotextiles

SCOPE

This work shall consist of furnishing all materials, equipment, and labor necessary for the installation of geotextiles.

MATERIALS

The class and type of geotextile shall be as shown on the drawings.

Geotextiles shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns composed of at least 95 percent by weight of polypropylene, polyethylene, polyester, polyamide, or polyvinylidene-chloride. Fibers shall contain stabilizers and/or inhibitors to enhance its resistance to ultraviolet light. The geotextile shall be formed into a stable network of filaments or yarns that retain dimensional stability relative to each other, including selvages. The geotextile shall be free of any chemical treatment or coating that might significantly reduce its permeability and shall have no flaws or defects that significantly alter its physical properties.

Thread used for factory or field sewing shall be of a contrasting color to the fabric and made of polypropylene, polyester, or polyamide thread. The sewing thread shall have a minimum breaking strength of 28 pounds when tested in accordance to ASTM D 2256. The thread shall be as resistant to ultraviolet light as the geotextile being sewn.

Additional requirements for geotextile materials are as follows:

1. Woven Geotextile
   Woven geotextile shall conform to the physical properties listed in TABLE 1. The woven geotextile shall be manufactured from monofilament yarn that is woven into a uniform pattern with distinct and measurable openings. The fabric shall be manufactured so that the yarns will retain their relative position with regard to each other. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.

2. Nonwoven Geotextile
   Nonwoven geotextile shall conform to the physical properties listed in TABLE 2. Nonwoven geotextile shall be manufactured from randomly oriented fibers that have been bonded together by needle-punching.

SHIPPING AND STORAGE

Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number. Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight, and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

Prior to use, the geotextile shall be inspected and approved by the Technician, then stored in a clean, dry, place, out of direct sunlight, not subject to temperature extremes, and with the manufacturer’s protective cover in place.

SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of holes, vegetation, excessive mud, and projections. The surface preparation will be inspected and approved by the Technician prior to placing the geotextile.

PLACEMENT

1. General

   The geotextile shall be placed on the approved, prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when the 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.

   No cuts, punctures, tears, or gaps in sewn or overlapped joints will be permitted in the geotextile.

   The panel length shall be placed parallel to the direction of water flow, except as stated below in paragraph 2. Slope Protection and 4. Road Stabilization.

   The geotextile panels may be joined by overlapping the roll ends 36 inches and sides a minimum of 18 inches and securing the overlap against the underlying foundation materials. The fabric shall be restrained as needed to prevent lifting and displacement during construction. Allowable restrainment methods include backfilled trenches, stitching, sandbags, rocks, and securing pins that are approved and provided by the geotextile manufacturer. The upstream or up-slope geotextile shall overlap the abutting down-slope geotextile.

   The geotextile panels may be joined by machine sewing using thread described under 2. Materials. The seam shall conform to Federal Standard SSa-2, SSn-2 or SSd-2.The sewing shall consist of two parallel stitched rows spaced approximately 1 inch apart. Each row of stitching shall be located a minimum of 2 inches from the geotextile edge. The seam type and sewing machine to be used shall produce a seam strength, in the specified geotextile, that provides a minimum of 90 percent of the tensile strength in the weakest principal direction of the geotextile being used, when tested in accordance with ASTM D 4884. The seams may be factory or field sewn. All seaming and stitching of woven geotextiles shall be in the selvage.

   Non-woven geotextiles shall be sewn a minimum of ½ inch from the edge. Geotextile shall be installed with the sewn seams pointing up.

   The geotextile shall be restrained as needed during placement of overlying materials to prevent slippage, folding, or other movements of the geotextile.

   Prior to covering, the geotextile shall be inspected by the Technician to ensure that the geotextile has not been damaged during construction. Backfill shall be placed by end dumping onto the geotextile from the edge of the geotextile or over previously placed backfill. Vehicles shall not be allowed directly on the geotextile. Materials shall be placed on the geotextile without causing tears, punctures, or separations of overlaps or sewn joints. Should such damage occur, the backfill around the damaged or displaced area will be removed and the subgrade restored to the original approved condition. Repair of the area shall consist of a patch of the same type of geotextile overlaying the existing geotextile. The patch shall extend a minimum of 2 feet from the edge of any damaged area.

2. Slope Protection

   The geotextile shall not be placed until it can be anchored and protected with the intended covering within 48 hours. Temporary cover, for protection from ultraviolet light, may be used if the 48-hour limit will be exceeded. Material will not be dropped from a height of more than 3 feet on to uncovered geotextile. In lakeshore applications, the geotextile may be unrolled parallel or perpendicular to the bank. The geotextile shall be joined by machine sewing if the panel length is placed perpendicular to the direction of water flow (wave runup).

3. Subsurface Drains

   The geotextile shall not be placed until drainfill or other material can be used to cover it within the same working day. Material will not be dropped from a height of more than 5 feet on to the geotextile and sharp, angular aggregates will not be used unless the drawing details state otherwise.

4. Road Stabilization

   The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting it to conform to surface irregularities when the roadway fill material is placed on it. Overlap shall be in the direction of construction. The minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended by the manufacturer. They shall be removed prior to placement of the covering material. Material will not be dropped from a height of more than 5 feet on to uncovered geotextile.

Table 1. Requirements for Woven Geotextiles by Use

(The values in the tables are conversions of metric values from AASHTO M288)

Property	Test Method	Slope Protection		Road Stabilization
		Unprotected (Class I)	Protected (Class II)	(Class IV)
Grab Tensile Strength (lbs.)	ASTM D4632	247 minimum	180 minimum	315 minimum
Elongation at failure (Percent)[1]	ASTM D4632	≤ 50	≤ 50	≤ 50
Puncture (lbs.) [1]	ASTM D6241	495 minimum	371 minimum	618 minimum
Trapezoidal tear strength (lbs.)[1]	ASTM D4533	90 minimum	67 minimum	112 minimum
Ultraviolet Light (percent retained strength)	ASTM D4355 150 hours exposure	50 minimum	50 minimum	70 minimum
Apparent Opening Size (AOS)[2]	ASTM D4751	≥ #100 (.150 mm) and ≤ #70 (.212 mm)	≥ #100 (.150 mm) and ≤ #70 (.212 mm)	≥ #100 (.150 mm) and ≤ #70 (.212 mm)
Percent Open Area (POA)	CWO[3]-02215	4.0 min.	4.0 min.	1.0 min.
Permittivity (1/seconds)	ASTM D4491	0.20 minimum	0.10 minimum	0.10 minimum

[1]All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

[2]U. S. Standard Sieve Size

[3] CWO is a USACE reference

Table 2. Requirements for Nonwoven Geotextiles by Use

(The values in the tables are conversions of metric values from AASHTO M288)

Property	Test Method	Slope Protection		Subsurface Drainage	Road Stabilization
		Unprotected (Class I)	Protected (Class II)	(Class III)	(Class IV)[2]
Grab Tensile Strength (lbs.)[1]	ASTM D4632	202 minimum	157 minimum	112 minimum	202 minimum
Elongation At failure (percent)[1]	ASTM D4632	50 minimum	50 minimum	50 minimum	50 minimum
Trapezoidal tear strength (lbs.)[1]	ASTM D4533	79 minimum	56 minimum	40 minimum	79 minimum
Puncture (lbs.)[1]	ASTM D6241	433 minimum	309 minimum	223 minimum	433 minimum
Ultra-Violet Light (percent retained strength)	ASTM D4355 150 hours exposure	50 minimum	50 minimum	50 minimum	50 minimum
Apparent Opening Size (AOS)(mm)[3]	ASTM D4751	As specified or 0.22 maximum	As specified or 0.22 maximum	As specified or 0.22 maximum	As specified or 0.22 maximum
Permittivity (1/seconds)	ASTM D4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

[1]All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

[2]Heat-bonded, resin-bonded, or needle punched geotextile may be used in this class only.

[3]Maximum average roll value.

Specific Site Requirements

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