

SECTION 2372

GEOTEXTILES

PART 1 GENERAL

1.01 SCOPE

- A. This section shall apply to geotextiles used for subsurface drainage applications and for material separation to prevent mixing of a subgrade soil and an aggregate cover material, or riprap from the subsoil material.

1.02 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
 - 1. American Association of State Highway and Transportation Officials (AASHTO): M288, Standard Specification for Geotextile Specification for Highway Applications.
 - 2. ASTM International (ASTM):
 - a. D737, Test Method for Air Permeability of Textile Fabrics.
 - b. D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 - c. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - d. D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - e. D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - f. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - g. D4716, Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - h. D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - i. D4873, Guide for Identification, Storage, and Handling of Geotextiles.
 - j. D4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 - k. D4884, Standard Test Method For Strength Of Sewn Or Thermally Bonded Seams Of Geotextiles.
 - l. D4886, Standard Test Method For Abrasion Resistance Of Geotextiles (Sand Paper/Sliding Block Method).
 - m. D5199, Standard Test Method For Measuring The Nominal Thickness Of Geosynthetics.

- n. D5261, Standard Test Method For Measuring Mass Per Unit Area Of Geotextiles.
- o. D6193, Standard Practice For Stitches And Seams.

1.03 DEFINITIONS

- A. Fabric: Geotextile, a permeable geosynthetic comprised solely of textiles.
- B. Minimum Average Roll Value (MinARV): Minimum of series of average roll values representative of geotextile furnished.
- C. Maximum Average Roll Value (MaxARV): Maximum of series of average roll values representative of geotextile furnished.
- D. Nondestructive Sample: Sample representative of finished Work, prepared for testing without destruction of Work.
- E. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.
- F. Seam Efficiency: Ratio of tensile strength across seam to strength of intact geotextile, when tested according to ASTM D4884.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Manufacturer's material specifications and product literature.
 - b. Installation drawings showing geotextile sheet layout, location of seams, direction of overlap, and sewn seams.
 - c. Description of proposed method of geotextile deployment, sewing equipment, sewing methods, and provisions for holding geotextile temporarily in place until permanently secured.
 - 2. Samples:
 - a. Geotextile: One-piece, minimum 18 inches long, taken across full width of roll of each type and weight of geotextile furnished for Project. Label each with brand name and furnish documentation of lot and roll number from which each Sample was obtained.
 - b. Field Sewn Seam: 5-foot length of seam, 12 inches wide with seam along center, for each type and weight of geotextile.
 - c. Securing Pin and Washer: One each.
- B. Informational Submittals:
 - 1. Certification:
 - a. Name of the manufacturer, product name, style number, chemical composition of the filaments or yarns and other pertinent information to fully describe the geotextile.
 - b. Certification shall state that furnished geotextile meets either the MinARV or the MaxARV requirements of the Specification as evaluated under manufacturer's quality control program.
 - c. Certification shall be attested to by a person having legal authority to bind the manufacturer.
 - 2. Field seam efficiency test results.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Geosynthetic Accreditation Institute (GAI) - Laboratory Accreditation Program (LAP).
 - 2. American Association for Laboratory Accreditation (A2LA).

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Geotextile labeling, shipment, and storage shall follow ASTM D4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- B. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- C. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geotextile.

1.07 SCHEDULING AND SEQUENCING

- A. Notify OWNER whenever geotextiles are to be placed. Do not place geotextile without OWNER's approval of underlying materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
 - 1. Carthage Mills, Cincinnati, OH.
 - 2. BP Amoco Chemical Civil Engineering Fabrics, Austell, GA.
 - 3. Linq Industrial Fabrics, Summerville, SC.
 - 4. Synthetic Industries, Chattanooga, TN.
 - 5. TC Mirafi, Pendergrass, GA.
 - 6. TNS Advanced Drainage Systems, Spartanburg, SC.

2.02 NONWOVEN GEOTEXTILE

- A. Pervious sheet of polyester, polypropylene, or polyethylene fabricated into stable network of fibers that retain their relative position with respect to each other. Nonwoven geotextile shall be composed of continuous or discontinuous (staple) fibers held together through needle-punching, spun-bonding, thermal-bonding, or resin-bonding.
- B. Geotextile Edges: Salvaged or otherwise finished to prevent outer material from pulling away from geotextile.

- C. Unseamed Sheet Width: Minimum 12 feet.
- D. Nominal Weight per Square Yard: 4.8 ounces per square yard per ASTM D5261.
- E. Nominal Thickness (mils): 1.4 mils per ASTM D5199.
- F. The geotextile shall meet the requirements of Table 1.

Table No. 1 Physical Property Requirements for Nonwoven Geotextile		
Property	Requirement	Test Method
Water Permittivity	0.5 sec. ⁻¹ , MinARV	ASTM D4491 (Falling Head)
Apparent Opening Size (AOS)	40U.S. Standard Sieve Size	ASTM D4751
Grab Tensile Strength, Machine Direction	110 lb/in, MinARV	ASTM D4632
Grab Elongation, Machine Direction	50 percent, MaxARV	ASTM D4632
Puncture Strength	40 lb, MinARV	ASTM D4833
Trapezoid Tear Strength	50 lb, MinARV	ASTM D4533
Abrasion Resistance	[A:] percent loss, 250 cycles, MaxARV	ASTM D4886
Ultraviolet Radiation Resistance	70 percent strength retention, MinARV after 500 hours	ASTM D4355

2.03 SEWING THREAD

- A. Polypropylene, polyester, or Kevlar thread.
- B. Durability: Equal to or greater than durability of geotextile sewn.

2.04 SECURING PINS

- A. Steel Rods or Bars:
 - 1. 3/16-inch diameter.
 - 2. Pointed at one end.
 - 3. With head on other end sufficiently large to retain washer.
 - 4. Minimum Length: 12 inches.
- B. Steel Washers for Securing Pins:
 - 1. Outside Diameter: Not less than 1.5 inches.
 - 2. Inside Diameter: 1/4 inch.
 - 3. Thickness: 1/8 inch.
- C. Steel Wire Staples:
 - 1. U-shaped.
 - 2. 10 gauge.
 - 3. Minimum Length: 6 inches.

PART 3 EXECUTION

3.01 JOINTS

- A. Unseamed Joints:
 - 1. Overlap, unless otherwise shown:
 - a. Foundation/Subgrade Stabilization: Minimum 18 inches.
 - b. Riprap: Minimum 18 inches.
 - c. Drain Trenches: Minimum 18 inches, except overlap shall equal trench width if trench width is less than 18 inches.
 - d. Other Applications: Minimum 12 inches.
- B. Sewn Seams: Made wherever stress transfer from one geotextile sheet to another is necessary. Sewn seams, as approved by OWNER, also may be used instead of overlap at joints for applications that do not require stress transfer.
 - 1. Seam Efficiency:
 - a. Minimum 70 percent.
 - b. Verified by preparing and testing minimum of one set of nondestructive Samples per acre of each type and weight of geotextile installed.
 - c. Tested according to ASTM D4884.

2. Types:
 - a. Preferred: "J" type seams.
 - b. Acceptable: Flat or butterfly seams.
3. Stitch Count: Minimum three to maximum seven stitches per inch.
4. Stitch Type: Double-thread chainstitch according to ASTM D6193.
5. Sewing Machines: Capable of penetrating four layers of geotextile.
6. Stitch Location: 2 inches from geotextile sheet edges, or more, if necessary to develop required seam strength.

3.02 SECURING GEOTEXTILE

- A. Secure geotextile during installation as necessary with sandbags or other means approved by OWNER.
- B. Secure Geotextile with Securing Pins or Staples:
 1. Insert securing pins with washers through geotextile.
 2. Securing Pin Alignment:
 - a. Midway between edges of overlaps.
 - b. 6 inches from free edges.
 3. Spacing of Securing Pins:

<u>Slope</u>	<u>Maximum Pin Spacing</u>
Steeper than 3:1	2 feet
3:1 to 4:1	3 feet
Flatter than 4:1	5 feet

4. Install additional pins across each geotextile sheet as necessary to prevent slippage of geotextile or to prevent wind from blowing geotextile out of position.
5. Push each securing pin through geotextile until washer bears against geotextile and secures it firmly to subgrade.
6. Where staples are used instead of securing pins, install in accordance with alignment and spacing above. Push in to secure geotextile firmly to subgrade.

3.03 PLACING PRODUCTS OVER GEOTEXTILE

- ii. Before placing material over geotextile, notify OWNER. Do not cover installed geotextile until after OWNER provides authorization to proceed.
- iii. If tears, punctures, or other geotextile damage occurs during placement of overlying products, remove overlying products as necessary to expose damaged geotextile. Repair damage as specified in Article Repairing Geotextile.

3.04 INSTALLATION OF GEOTEXTILE FOR MATERIAL SEPARATION

- A. Prepare installation site by clearing, grubbing, and excavation or filling the area to the design grade. This includes removal of topsoil and vegetation.
- B. The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Adjacent geotextile rolls shall be overlapped, sewn or joined as required in the Drawings.
- C. On curves, the geotextile may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and held in place by pins, staples, or piles of fill or rock.
- D. Prior to covering, the geotextile shall be inspected by the OWNER to ensure that the geotextile has not been damaged during installation. Damaged geotextiles, as identified by the OWNER, shall be repaired immediately. Cover the damaged area with a geotextile patch which extends an amount equal to the required overlap beyond the damaged area.
- E. The subbase shall be placed by end dumping onto the geotextile from the edge of the geotextile, or over previously placed subbase aggregate. Construction vehicles shall not be allowed directly on the geotextile. The subbase shall be placed such that at least the minimum specified lift thickness shall be between the geotextile and equipment tires or tracks at

all times. Turning of vehicles shall not be permitted on the first lift above the geotextile.

- F. Any ruts occurring during construction shall be filled with additional subbase material, and compacted to the specified density.
- G. If placement of the backfill material causes damage to the geotextile, the damaged area shall be repaired as previously described above. The placement procedure shall then be modified to eliminate further damage from taking place.

3.05 INSTALLATION OF GEOTEXTILE FOR SUBSURFACE DRAINAGE

- A. Trench excavation shall be done in accordance with the Drawings and Section 02321, Excavation, Bedding, and Backfill for Utilities. Excavation shall be done in such a way so as to prevent large voids from occurring in the sides and bottom of the trench. The graded surface shall be smooth and free of debris.
- B. The geotextile shall be placed loosely with no wrinkles or folds, and with no void spaces between the geotextile and the ground surface. Successive sheets of geotextiles shall be overlapped with the upstream sheet overlapping the downstream sheet.
- C. All seams shall be subject to the approval of the OWNER.
- D. Should the geotextile be damaged during installation or drainage aggregate placement, a geotextile patch shall be placed over the damaged area extending beyond the damaged area a distance of 18 inches.
- E. Placement of drainage aggregate should proceed immediately following placement of the geotextile. The geotextile should be covered with a minimum of 12 inches of loosely placed aggregate prior to compaction. If a perforated collector pipe is to be installed in the trench, a bedding layer of drainage aggregate should be placed below the pipe, with the remainder of the aggregate placed to the minimum required construction depth.
- F. The aggregate should be compacted with vibratory equipment to a minimum of 95 percent Standard AASHTO density unless the trench is required for structural support.

3.06 RIPRAP APPLICATIONS

- A. Riprap installation shall be done in accordance with details of the Drawings and Section 02371, Riprap. Excavation shall be done in such a way so as to prevent large voids from occurring in the sides and bottom of the excavation. The graded surface shall be smooth and free of debris.
- B. The geotextile shall be placed loosely with no wrinkles or folds, and with no void spaces between the geotextile and the ground surface. Successive sheets of geotextiles shall be overlapped with the upstream sheet overlapping the downstream sheet. Sew joints where wave run-up may occur.
- C. All seams shall be subject to the approval of the OWNER.
- D. Limit height of riprap fall onto geotextile to prevent damage.
 - 1. Drop Height: 1 foot for greater than 200-pound rock.

3.07 REPAIRING GEOTEXTILE

- A. Repair or replace torn, punctured, flawed, deteriorated, or otherwise damaged geotextile.
- B. Repair Procedure:
 - 1. Place patch of undamaged geotextile over damaged area and overlap and seam at least 18 inches in all directions beyond damaged area.
 - 2. Remove interfering material as necessary to expose damaged geotextile for repair.
 - 3. Sew patches or secure them with heat fusion tacking or with pins and washers, as specified above in Article Securing Geotextile, or by other means approved by OWNER.

3.08 REPLACING CONTAMINATED GEOTEXTILE

- A. Protect geotextile from contamination that would interfere, in OWNER'S opinion, with its intended function. Remove and replace contaminated geotextile with clean geotextile.

END OF SECTION