SECTION 593 -- GEOTEXTILE

Description

1.1 This work shall consist of furnishing and installing geotextile fabric as shown on the plans or as ordered, including any labor and materials needed to anchor, splice, or repair the geotextile.

Materials

2.1 General.

2.1.1 Geotextile shall be a product tested under the AASHTO National Transportation Product Evaluation Program (NTPEP) and included on the Qualified Products List for the Application, Strength Class, and Structure specified. Manufacturers of geotextiles and those marketing geotextiles made by others as a “Private Labeler” shall participate in and maintain compliance with the NTPEP audit program for geotextiles. Manufacturer’s labels providing product name, AASHTO M288 class, roll number, and production date shall be affixed to both ends of the roll.

2.1.2 All geotextile properties referenced in the specifications and certified by the Contractor, with the exception of Apparent Opening Size (AOS), shall be considered minimum average roll values in the weaker principal direction (i.e., the average test results for any sampled roll in a lot shall meet or exceed the minimum values specified). Values for AOS shall represent maximum average roll values.

2.1.3 Fibers used in the manufacture of geotextiles, and threads used in joining geotextiles by sewing, shall meet the requirements of the most current version of the applicable sections of AASHTO M 288.

2.1.4 Geotextile shall exhibit an ultraviolet stability (retained strength) of at least 50% after 500 hours of exposure, measured in accordance with ASTM D 4355.

2.2 Application.

Following are the basic Applications of geotextile included under this specification. Applications are described according to their most common use(s) and may not include every function for which a geotextile is specified.

2.2.1 Application 1 – Subsurface Drainage. Geotextile for this Application consists of fabric placed against a soil to allow for long-term passage of water into a subsurface drain system while retaining the in situ soil.

2.2.2 Application 2 – Separation. Geotextile for this Application consists of fabric placed to prevent mixing of in situ or subgrade soil with aggregate cover materials.

2.2.3 Application 3 – Stabilization. Geotextile for this Application consists of fabric placed in wet, saturated conditions to provide the coincident functions of separation and filtration. This Application may also be specified for geotextiles used to provide the function of reinforcement.

2.2.4 Application 4 – Permanent Erosion Control. Geotextile for this Application consists of fabric placed below riprap or other armor systems to prevent soil loss and/or instability of the erosion control system.

2.3 Strength Class. Following are the basic Strength Classes of geotextile included under this specification:

2.3.1 Class 1, Class 2, and Class 3. Geotextile specified as Class 1 (high strength), Class 2 (medium strength), or Class 3 (low strength) shall meet the applicable requirements of AASHTO M 288, Table 1, including sewn seam strength when sewn seams are used. A higher strength geotextile may be substituted for a lower strength geotextile provided all other specification requirements are met.

2.3.2 Class 0. Geotextile specified as Class 0 (extra high strength) shall meet the following minimum requirements:

<table>
<thead>
<tr>
<th>Geotextile Property</th>
<th>Test Method</th>
<th>Property Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength</td>
<td>ASTM D 4632</td>
<td>375</td>
</tr>
<tr>
<td>Sewn Seam Strength</td>
<td>ASTM D 4632</td>
<td>335</td>
</tr>
<tr>
<td>Tear Strength</td>
<td>ASTM D 4533</td>
<td>135</td>
</tr>
<tr>
<td>Puncture Strength</td>
<td>ASTM D 6241</td>
<td>1237</td>
</tr>
</tbody>
</table>

2.4 Structure. The Contract Item Number for geotextile includes a designation for Structure that defines the basic composition of the fabric. Geotextile shall conform to the specified structure as identified by the Item Number.

2.5 Permittivity and Apparent Opening Size (AOS). Geotextile shall meet the requirements for permittivity and Apparent Opening Size (AOS) as described in the Geotextile Qualification Criteria Document. Located on the Department’s Website.
2.6 Each roll shall be clearly labeled so as to easily identify the product in the field. The label shall include as a minimum the manufacturer’s name, product name and number, and the Contract Item name and number.

2.7 Staples or Pins. Staples or pins required to hold the geotextile prior to placing overlying materials shall be those prescribed by the geotextile manufacturer.

**Construction Requirements**

3.1 Protection of Geotextile. To prevent damage to the fabric, the Contractor shall exercise necessary care while transporting, storing, and installing the fabric. Prior to installation, the fabric shall be protected from weather, direct sunlight or other ultraviolet exposure, and from dust, mud, dirt, debris, and other elements which may affect its performance. Fabric that is torn, punctured, or otherwise damaged shall not be placed. After placement, fabric shall be covered within 5 days. Traffic or construction equipment shall not be placed directly on the geotextile.

3.2 Placement of Geotextile and Overlying Materials. The geotextile and overlying materials shall be placed in accordance with the plans, the manufacturer's requirements, and the following:

3.2.1 General. Prior to placement of the fabric, the site shall be prepared to provide a smooth surface which is free from debris, obstructions, and depressions which could result in gaps, tears, or punctures in the fabric during cover operations.

3.2.1.1 Successive sheets placed above water shall be overlapped by a minimum of 18". Sheets placed below water shall be sewn or overlapped by a minimum of 3 feet. Larger overlaps may be called for on the plans or required by the Engineer in soft soil conditions or if gaps between adjacent sheets occur during placement of overlying material. Pins or staples may be used to anchor the fabric as directed by the Engineer.

3.2.2 Subsurface Drainage. Trench excavation shall be done in accordance with details shown on the plans. In all instances, excavation shall be done in such a way so as to prevent large voids from occurring in the sides and bottom of the trench.

3.2.2.1 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 shall be shingled such that the upstream sheet is placed over the downstream sheet.

3.2.2.2 Placement of drainage aggregate shall proceed immediately following placement of the geotextile. The geotextile shall be covered with a minimum of 12" of loosely placed aggregate prior to compaction. If a collector pipe is to be installed in the trench, a bedding layer of drainage aggregate shall be placed below the pipe, with the remainder of the aggregate placed to the minimum required construction depth.

3.2.2.3 After placing the drainage aggregate, the geotextile shall be folded over the top of the aggregate in a manner that produces the overlap shown on the plans. In no case shall the minimum overlap be less than 12".

3.2.3 Separation/Stabilization. The installation site shall be prepared by clearing, grubbing, and removal of vegetation and topsoil. The site shall be excavated or filled to the proper grade as shown on the plans or as ordered. The Engineer may order that soft spots and unsuitable areas identified during site preparation or subsequent proof rolling be excavated, backfilled, and compacted with suitable materials.

3.2.3.1 The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade, except that it may be folded or cut to conform to curves. Joints and overlaps shall be in the direction shown on the plans or as ordered by the Engineer. The folds or overlaps shall be held in place by pins, staples, or piles of fill or rock.

3.2.3.2 Overlying fill or aggregate materials shall be placed by end dumping onto the geotextile from the edge of the geotextile, or over previously placed materials. Construction vehicles shall not be allowed directly on the geotextile. Materials shall be placed such that at least the minimum specified lift thickness is between the geotextile and equipment tires or tracks at all times. Turning of vehicles shall not be allowed on the first lift above the geotextile.

3.2.3.2.1 On very soft subgrades, the fill or aggregate shall be spread to the proper lift thickness as soon as possible after dumping to minimize the potential of localized subgrade failure due to concentrated loading.

3.2.3.2.2 In stabilization applications, vibratory compaction equipment on the initial lift of fill or aggregate material may be prohibited by the Engineer to prevent damage to the geotextile.

3.2.3.3 Placement procedures that result in instability or damage to the geotextile shall be modified to eliminate further damage. The Engineer may order remedial measures such as increasing the initial lift thickness or decreasing equipment loads.

3.2.3.4 Geotextile placed below temporary fills shall be completely removed immediately after the fill is removed. Geotextile salvaged from use under temporary fills shall not be used for any permanent application in the project unless approved by the Engineer.

3.2.4 Permanent Erosion Control. The geotextile shall be placed in intimate contact with the soils without wrinkles or folds, and anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement...
of the overlying materials will not excessively stretch or tear the geotextile. Anchoring of the terminal ends of the geotextile shall be accomplished through the use of key trenches or aprons at the crest and toe of the slope as shown on the plans.

3.2.4.1 The geotextile shall be placed with the machine direction (long direction of the roll) parallel to the direction of water flow, which is normally parallel to the slope for erosion control runoff and wave action, and parallel to the stream or channel in the case of stream bank and channel protection. When overlapping, the fabric shall be placed such that the uphill sheet is placed over the downhill sheet, and the upstream sheet is placed over the downstream sheet. In cases where wave action or multidirectional flow is anticipated, all seams perpendicular to the direction of flow shall be sewn.

3.2.4.2 The armor system placement shall begin at the toe and proceed up the slope. Placement shall take place so as to avoid stretching, puncturing, and tearing of the geotextile. Particles smaller than 1.5 cubic feet, shall be placed with drop heights less than 3 feet. Particles greater than 1.5 cubic feet shall be placed with no free fall. Drop heights exceeding the distance specified above may be allowed by the Engineer if field tests demonstrate that larger drop heights will not result in damage to the fabric. In no case shall stones be rolled or pushed onto the geotextile.

3.2.4.3 The geotextile and armor materials shall be placed the same day in underwater applications.

3.2.4.4 Field monitoring shall be performed to verify that the armor system placement does not damage the geotextile. Fabric which is damaged as a result of careless or improper placement of stone, grading techniques, or equipment traffic above the stone shall be repaired or replaced in accordance with 3.3.

3.3 Repair of Geotextile. Fabric that is damaged during or after placement shall be replaced or repaired by stitching or patching at the expense of the Contractor. Patches shall be of the same material as the placed geotextile. The patch shall be joined to the existing fabric using overlapped seams as specified above or as directed by the Engineer.

3.3.1 The Contractor shall modify his placement or covering procedures to eliminate further or repeated damage from occurring.

3.4 Sewn Seams. Sewn seams, if specified, ordered, or allowed, shall result in a joint at least as strong as the sewn seam strength requirements described in 2.3. Field or factory seaming will be permitted unless otherwise specified. Sewn seams shall be lapped a minimum of 4" and double sewn using Stitch Type 401 as depicted in ASTM D 6193. Either a “J” seam (Type SSn-2) or “Butterfly” seam (Type SSD-2) shall be used as shown in Figure 1.

3.4.1 All seams shall be subject to the approval of the Engineer. Sewn seams shall be positioned on the exposed side of the fabric to allow for inspection and/or repair of the fabricated joint. Seams shall not be positioned as shown in Figure 2.

![Figure 1](image-url)
FIGURE 2

Method of Measurement

4.1 Geotextile will be measured by the square yard as determined by the actual surface measurements of the covered area. Additional material used for overlaps and repairs will not be measured.

Basis of Payment

5.1 The accepted quantity of geotextile will be paid for at the Contract unit price per square yard for the application, strength class, and structure specified, complete in place. The cost of all labor or materials used to anchor, splice, or repair the geotextile is considered subsidiary to the geotextile installation. Removal of temporary geotextile will be considered subsidiary to the geotextile installation.

Pay Item and Unit:

593.A B C Square Yard

Key:
A = Application
  1 = Subsurface Drainage
  2 = Separation
  3 = Stabilization
  4 = Permanent Erosion Control
B = Strength Class
  0 = Class 0
  1 = Class 1
  2 = Class 2
  3 = Class 3
C = Structure
  0 = Contractor Option
  1 = Nonwoven (Default for Application 1 & Application 4)
  2 = Monofilament, Woven
  3 = Slit Filament, Woven