

## SECTION 202

### GEOSYNTHETICS FOR ROADWAYS

#### 202.1 DESCRIPTION

**A. General:** Items of work covered by this specification are those pertaining to the supply and installation of nonwoven, woven geotextile, and multiaxial (biaxial or triaxial) geogrids for roadway applications. Geosynthetics shall not be used for reduction in basecourse or pavement depths.

**B. Related Work:**

|             |  |
|-------------|--|
| Section 12  | Roadway and Drainage Excavation and Embankment |
| Section 20  | Granular Bases and Surfacing                   |
| Section 65  | Riprap   |
| Section 66  | Gabions  |
| Section 117 | Aggregates for Granular Bases and Surfacing    |
| Section 203 | Submittals                                     |

#### 202.2 MATERIALS

Unless otherwise specified slit-film / slit-tape geotextiles shall not be used.

**A. Materials Certification:** Engineer reserves the right to require verification of any or all of the following certifications.

1. Contractor shall provide to the Engineer a manufacturer certificate stating the material properties are in compliance with this specification.
2. The manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request. The manufacturer shall have a quality control program that includes an on-site laboratory accredited by the Geosynthetic Accreditation Institute Laboratory Accreditation Program (GAI-LAP) to perform the required test methods.
3. The manufacturer's certificate shall state that the furnished geosynthetic meets Minimum Average Roll Value (MARV) requirements, except as otherwise specified, of the specification as evaluated under the manufacturer's quality control program.
4. For woven and non-woven geotextiles only, the manufacturer must participate in the AASHTO National Transportation Product Evaluation Program's (NTPEP) Audit Program for Geotextiles (GTX). Upon request, the manufacturer will provide:
  - a) Public status data in NTPEP's DataMine website.

- b) Current publicly released NTPEP Reports on Laboratory Results of Evaluations showing the physical properties of the geosynthetic product or product line is in compliance with the specifications.
- B.** Products without proper identification or labelling, mislabeling, or misrepresentation of materials shall be reason to reject those geosynthetic materials. Identification includes an NTPEP stamp at every 15 feet along a length of a roll.

**C. Submittals:**

1. The contractor shall provide the Engineer a Manufacturer's Certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the geotextile for review and approval before being used.
2. Certificates with distributor or private label letterhead will not be accepted. Technical or Material Data Sheets will not be accepted.
3. The contractor shall provide the Engineer the Manufacturer's valid GAI-LAP laboratory accreditation certificate.
4. Preliminary review of the material as represented by the test results shall not constitute general acceptance of all the material or source of supply.
5. Rejected material will not be paid for. The Engineer has the right to request roll test data or additional testing if there are any concerns with the proposed geosynthetic.

**D. Delivery and Storage:**

1. Each geotextile roll shall be wrapped with a material that will protect the geosynthetic, 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. Each geotextile roll shall include an inner core made from a different material that shall protect, ensure ease of handling, and prevent damage from forklifts or other equipment used to transfer or move the geosynthetic roll.
2. During delivery and storage, the geotextile shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultra violet radiation, chemicals that are strong acids or strong bases, flames and sparks, temperatures in excess of 150° F, and any other environmental condition that may damage the physical property values of the product.

**E. General:** For the purposes of this specification, Geosynthetics shall be divided into the following functional categories:

**1. Separation and Filtration Applications:**

- a) This specification is applicable to the use of a geotextile to prevent mixing of a subgrade soil and an aggregate cover material (subbase, base, select embankment). The secondary function is allowing moisture to travel through the plane of the geotextile while preventing the migration of fine soil particles.
- b) The geotextile for under drains and storm sewer joints shall be an AASHTO M288-17 Class 2 nonwoven meeting the requirements of the following table. All numerical values in the table except Apparent Opening Size (AOS) represent MARV in the weakest principal direction. Values for AOS represent maximum average roll value.
- c) The geotextile to be placed beneath rip-rap and gabion baskets shall be an AASHTO M288-17 Class 1 nonwoven meeting the requirements of the following table. All numerical values in the table except AOS represent MARV in the weakest principal direction. Values for AOS represent maximum average roll value.

**Table 202-1**

| <b>Non-Woven Geotextile Specifications and Physical Properties</b> |                         |                                 |                                 |
|--|-------------------------|---------------------------------|---------------------------------|
| <b>Properties</b>  | <b>ASTM Test Method</b> | <b>AASHTO Class 1 Non-woven</b> | <b>AASHTO Class 2 Non-woven</b> |
| Apparent Opening Size (AOS)<br>US Standard Sieve                   | D 4751                  | 40-100                          | 40-100                          |
| Permittivity, Sec <sup>-1</sup>                                    | D 4491                  | 0.05 Min.                       | 0.1 Min.                        |
| Grab Strength, lbs   | D 4632                  | 200                             | 160 lbs                         |
| Elongation, %  | D 4632                  | ≥50%                            | ≥50%                            |
| Trapezoidal Tear Strength, lbs                                     | D 4533                  | 80                              | 55                              |
| Puncture Strength, lbs   | D 6241                  | 430                             | 310                             |
| UV Strength Retention, %   | D4355                   | 50                              | 50                              |

- d) The severity of installation conditions for the application generally dictate the required geotextile class. Class 1 nonwoven geotextile shall be used for more severe or harsh installation conditions.

**2. Stabilization Applications:** Geotechnical engineer's recommendations for use of geosynthetics shall be followed on projects with known unstable subgrade. The California Bearing Ratio (CBR) ranges listed are for general guidance when unknown unstable subgrade is encountered during construction. Use of all **geosynthetics for unstable subgrade** shall be approved by the Engineer.

- a) These products shall be installed where identified in detailed plans and

specifications or as directed by the Engineer, and are typically used for saturated conditions to provide the coincident functions of separation, filtration, reinforcement, and confinement.

- b) The geotextile shall meet the requirements of the following table. All numerical values in the table except AOS represent MARV in the weakest principal direction. Values for AOS represent maximum average roll value.

**Table 202-2**

| <b>Stabilization Woven Geotextile Specifications and Physical Properties</b> |                         |  |                                   |
|--|-------------------------|--|-----------------------------------|
| <b>Properties</b>  | <b>ASTM Test Method</b> | <b>Moderate<br/>(2% &lt; CBR &lt; 3%)*</b> | <b>Severe<br/>(CBR &lt; 2%)**</b> |
| Tensile Strength (at ultimate)   | D 4595                  | 3200 lbs/ft                                | 4800 lbs/ft                       |
| Tensile Strength (at 5% strain)  | D 4595                  | 1500 lbs/ft                                | 2400 lbs/ft                       |
| Flow Rate  | D 4491                  | 30 gal/min/ft <sup>2</sup>                 | 30 gal/min/ft <sup>2</sup>        |
| Permittivity   | D 4491                  | 0.4 sec <sup>-1</sup>                      | 0.4 sec <sup>-1</sup>             |
| Apparent Opening Size (AOS)  | D 4751                  | 0.6 mm                                     | 0.60 mm                           |

\* shear strength between 9.0 psi and 13.0 psi

\*\* shear strength below of 9.0 psi. AASHTO Class 1A.

- c) Alternatively, a separation/filtration nonwoven geotextile meeting section 1 combined with a multiaxial geogrid meeting the requirements of the following table can be used. All numerical values in the table represent MARV in the weakest principal direction.

**Table 202-3**

| <b>Specifications and Physical Properties for Biaxial Geogrid</b> |                         |                             |
|---|-------------------------|-----------------------------|
| <b>Properties</b>   | <b>ASTM Test Method</b> | <b>FHWA Class 1 Geogrid</b> |
| Tensile Strength (at ultimate)                                    | D 6637                  | 1300 lbs/ft                 |
| Tensile Strength (at 2% strain)                                   | D 6637                  | 400 lbs/ft                  |
| Tensile Strength (at 5% strain)                                   | D 6637                  | 800 lbs/ft                  |
| Junction Strength   | D 7737                  | 1200 lbs                    |
| UV Stability (after 500 hr)                                       | D 4355                  | 50%                         |

## 202.3 CONSTRUCTION REQUIREMENTS

### A. Geosynthetic Installation:

1. These installation instructions are intended for use in conjunction with the material specification for geosynthetics. The specification details material properties for geosynthetics used in separation, subsurface drainage, permanent erosion control, and stabilization applications. The material properties are only one factor in a successful installation involving geosynthetics. Proper material handling,

construction, and installation techniques are essential in order to ensure that the intended function of the geosynthetic is fulfilled.

2. Atmospheric exposure of the geosynthetics to the elements following laydown shall be a maximum of 14 days to minimize damage potential.
3. The installation site shall be prepared by clearing, grubbing, and excavating or filling the area to the design grade. This includes the removal of topsoil and vegetation.

#### B. Roadway Applications:

1. Soft spots and unsuitable areas will be identified during site preparation or subsequent proof rolling. These areas shall be excavated and backfilled with select material and compacted using normal procedures.
2. The geosynthetic shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Adjacent geosynthetic panels shall be overlapped or sewn as required in the plans. See Table 202-5 for overlap requirements.

**Table 202-5**

|                               |                         |
|-------------------------------|-------------------------|
| $\text{CBR} \geq 3\%$         | 12 – 18 inch overlap    |
| $1\% \leq \text{CBR} < 3\%$   | 24 - 36 inch overlap    |
| $0.5\% \leq \text{CBR} < 1\%$ | 36 inch overlap or sewn |
| $\text{CBR} < 0.5\%$          | sewn                    |

3. When using a multiaxial geogrid for subgrade stabilization, the separation/filtration nonwoven geotextile will be placed directly upon the subgrade and the multiaxial geogrid will be placed directly on top of the separation/filtration nonwoven geotextile.
4. On curves, the geotextile may be cut to conform to the curves. The overlap shall be in the direction of construction and held in place by piles of granular base course or granular subbase course. Pins or staples should not be used.
5. Prior to covering, the geotextile shall be inspected to ensure that it has not been damaged during installation. The inspection shall be done by the Engineer. Damaged geotextiles, as identified by the Engineer, shall be repaired immediately. Cover the damaged area with a geotextile patch that extends an amount equal to the required overlap beyond the damaged area.
6. Place and compact soil layers in accordance with Section 12 and granular base course per Section 20.
7. The granular base course shall be placed by end dumping onto the geotextile from the edge of the geotextile or from previously placed base course. Construction vehicles shall not be allowed directly on the geotextile. The granular base course shall be placed such that at least the minimum specified lift thickness shall always be

between the geotextile and equipment tires or tracks. Minimum first lift thickness shall be six (6) inches, or per geotechnical engineer's or manufacturers recommendation, whichever is greater. Turning of vehicles shall not be permitted on the first lift above the geotextile.

8. On subgrades having a CBR value of less than 1.0%, the subbase aggregate should be spread in its full thickness as soon as possible after dumping to minimize potential of localized subgrade failure due to overloading of the subgrade.
9. Any ruts occurring during construction shall be filled with additional subbase material and compacted to the specified density.

#### **202.4 METHOD OF MEASUREMENT**

Measurement of geosynthetics shall be per the nearest whole square yard (SY). Separation fabric beneath rip-rap, underdrains, and on pipe joints shall not be measured, they are incidental to the associated bid item.

#### **202.5 BASIS OF PAYMENT**

Payment for geosynthetics shall be per the contract unit price per square yard (SY), and shall not include joint overlap.

**END OF SECTION**