*Delete Section 630 in its entirety and substitute the following:*

**SECTION 630**

**GEOTEXTILE FOR EMBANKMENT AND ROADWAY**

**SEPARATION, STABILIZATION AND REINFORCEMENT**

**630-1.01 DESCRIPTION.** Prepare ground surface, and furnish and place geotextiles for separation, stabilization, and/or reinforcement as shown on the Plans.

**630-2.01 MATERIALS.** Use materials that conform to the following:

Geotextiles and Sewn Seam Strength Subsection 729-2.01

Sewing Thread. Use high strength polypropylene, or polyester. Do not use nylon thread. Use thread of contrasting color to that of the geotextile itself.

**630-3.01 CONSTRUCTION.**

1. Surface Preparation. Prepare ground surface by removing stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer.

2. Geotextile Placement. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases, folds or wrinkles. Do not drag the geotextile through mud or over sharp objects that could damage the geotextile. Do not expose geotextiles to sunlight for longer than 14 days after removal of protective covering. Do not allow geotextiles to get wet prior to installation.

a. Separation and Stabilization. Lay geotextile for embankment separation and stabilization parallel to roadway centerline. Shingle overlaps in the same direction as fill placement. Prevent overlapped edges from lifting during construction.

b. Reinforcement. Lay the machine direction of the geotextile for culvert foundation reinforcement perpendicular to the roadway centerline (i.e. parallel to the culvert centerline). Join seams perpendicular to the road centerline (i.e. parallel to the culvert centerline) by overlapping a minimum of 5 feet. Seams parallel to the road centerline (i.e. perpendicular to the culvert centerline) shall not be allowed. Prevent overlapped edges from lifting during construction.

3. Joining. Join adjacent geotextiles for separation or stabilization by overlapping a minimum of 3 feet or sewing. Join adjacent geotextiles for reinforcement by overlapping a minimum of 5 feet.

a. Sew seams with a Butterfly or J-Seam using a double-thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches (±1/4 inch) from the folded edge of the seam and at least 1/2 inch from the free edge of the geotextile. Sew seams so that they face upward and can be easily inspected by the Engineer. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-NHI-07-092, August 2008.

4. Material Placing and Spreading. During placing and spreading of material, maintain a minimum depth of 6 inches of cover material at all times between the geotextile and the wheels or tracks of the construction equipment. Limit the size and weight of construction equipment to reduce rutting in the initial lift above the geotextile to not greater than 3 inches deep to prevent overstressing the geotextile.

Place the cover material and spread in only one direction for the entire length of the geotextile. On weak subgrades limit height of dumped cover material to prevent localized subgrade and/or geotextile failure.

Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material. Do not allow turning of vehicles on the initial lift of cover material above the geotextile. Fill any ruts over 3 inches deep occurring during construction with material shown on the Plans; do not grade adjacent material into rut; and compact to the specified density.

5. Geotextile Repair. Repair and replace damaged geotextile (torn, punctured, or disturbed at the overlaps or sewn joints). For damage evidenced by visible geotextile damage, subgrade pumping, intrusion, or embankment distortion, remove the backfill around and under the damaged or displaced area, and repair with material matching the damaged material. Make patches overlap or sew patches to the existing geotextile.

a. Separation and Stabilization. Overlay torn area with geotextile with a minimum 3 foot overlap around the edges of the torn or damaged area or sew and bond according to Subsection 630‑3.01.3.a. Ensure the patch remains in place when cover material is placed over the affected area.

b. Reinforcement. Overlay torn area with geotextile with a minimum 3 foot overlap around the edges of the torn or damaged area. Ensure the patch remains in place when cover material is placed over the affected area.

**630-4.01 METHOD OF MEASUREMENT.** By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for overlap, whether at joints or patches.

**630-5.01 BASIS OF PAYMENT.** Payment will be made at the contract unit price per square yard. Material used to fill ruts and holes is subsidiary to the 630 (3B) pay item.

|  |  |
| --- | --- |
| **Pay Item** | **Pay Unit** |
| 630(3B) Geotextile, Reinforcement – Type 2 | Square Yard |

*Delete Section 631 in its entirety and substitute the following:*

**SECTION 631**

**GEOTEXTILE FOR SUBSURFACE**

**DRAINAGE AND EROSION CONTROL**

**631-1.01 DESCRIPTION.** Prepare ground surface, and furnish and place geotextiles for subsurface drainage and erosion control, as shown on the Plans.

**631-2.01 MATERIALS.** Use materials that conform to the following for the class specified in the bid schedule:

Geotextiles and Sewn Seam Strength Subsection 729-2.01

Sewing Thread. Use high strength polypropylene, or polyester. Do not use nylon thread. Use thread of contrasting color to that of the geotextile itself.

**631-3.01 CONSTRUCTION.**

1. Surface Preparation. Prepare ground surface by removing stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer. Construct smooth and stable trench walls.

2. Geotextile Placement. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases, folds or wrinkles. Place geotextile in a manner which will ensure intimate contact between the trench wall and the geotextile (i.e., no voids, folds, or wrinkles). The geotextile may be held in place with securing pins at 3-foot spacing along all edges (but not closer than 2 inches from the edge) to prevent movement during construction. Do not expose geotextiles to sunlight for longer than 14 days after removal of protective covering. Do not allow geotextile rolls to get wet prior to installation.

a. Subsurface Drainage. In trenches, after placing the geotextile and material shown on the Plans, fold the geotextile over the top of the material shown on the Plans to produce a minimum overlap of 12 inches, for trenches greater than 12 inches wide. In trenches less than 12 inches wide, make the overlap equal to the width of the trench. Then cover the geotextile with the subsequent course of material.

b. Erosion Control. Place and anchor geotextile on the approved surface so it will not be torn or excessively stretched by placement of the overlying materials. Secure the geotextile to the slope but secure it loosely enough so that the geotextile will not tear when riprap or other cover material is placed on the geotextile. The geotextile shall not be keyed at the top of the slope until the riprap or other cover material is in place at the top of the slope. Anchor the terminal ends of the geotextile using key trenches or aprons with a minimum of 24 inches depth into the soil substrate at the crest and toe of slope, or as shown on the Plans. Place geotextile with the machine direction parallel to the direction of water flow (normally parallel to the slope for erosion control runoff and wave action, and parallel to the stream or channel).

3. Joining. Join geotextile by sewing or overlapping.

a. Sew seams with a Butterfly or J-Seam using a double thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches (±1/4 inch) from the folded edge of the seam and at least 1/2 inch from the free edge of the geotextile. Sew seams so that they can be easily inspected by the Engineer or representative. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-NHI-07-092, August 2008. Conform both factory and field sewn seams to the strength requirements of Table 1 as outlined in the AASHTO M288 for subsurface drainage and erosion control applications.

b. Overlap geotextile sections by a minimum of 3 feet at all longitudinal and transverse joints. Overlap successive geotextile sheets in the direction of flow so that the upstream sheet is placed over the downstream sheet and/or upslope over downslope. In trenches, where overlapped seams are constructed in the longitudinal trench direction, make the overlap equal to the width of the trench.

4. Placement of Cover Material. Following placement of the geotextile on the prepared surface, place cover material of the type shown on the Plans. Place the cover material and armor from the bottom to the top of the slope using methods which minimize tearing and/or excessive stretching of the geotextile. In underwater applications, place the geotextile and the required thickness of cover material in the same day. Maintain proper overlap and geotextile continuity. Do not exceed the allowable drop heights for cover material shown in Table 631-1. Do not allow stones with a weight of more than 100 pounds to roll down the slope on the geotextile. Do not grade the slope in a way that will disturb the cover material or armor stone once it has been placed. Backfill all voids in the riprap or other cover material, which allows the geotextile to be visible, with material shown on the Plans, so that the geotextile is completely covered.

**TABLE 631-1 ALLOWABLE DROP HEIGHT FOR GEOTEXTILE**

|  |  |
| --- | --- |
| **INDIVIDUAL STONE Max. Weight (lbs)** | **ALLOWABLE DROP HEIGHT (ft)** |
| UNPROTECTED GEOTEXTILE | PROTECTED GEOTEXTILE**\*** |
| < 5 | 3 | 3 |
| 5-250 | 0 | 3 |
| > 250 | 0 | 0**\*\*** |

\* Protected geotextile is defined as having a gravelly covering (cushion layer) at least 6 inches thick.

\*\* If stones greater than 250 pounds must be dropped or if a height of drop greater than 3 feet is required, then perform field trials to determine the minimum cushion thickness and/or maximum height of safe drop without damaging the geotextile.

Maintain a minimum depth of 12 inches of cover material between the geotextile and the wheels or tracks of the construction equipment.

5. Geotextile Repair. Should the geotextile be torn, punctured, or the overlaps or sewn joints disturbed – as evidenced by visible geotextile damage – remove the backfill around the damaged area and repair or replace the damaged area at no additional expense to the State. Make repairs to the damaged area with a patch of the same type of geotextile originally placed. Overlay torn area with geotextile with a minimum 3 foot overlap around the edges of the torn area. Ensure that the patch remains in place when material is placed over the affected area.

**631-4.01 METHOD OF MEASUREMENT**. Geotextile, Erosion Control, Class 1 will not be measured.

**631-5.01 BASIS OF PAYMENT.** Geotextile, Erosion Control, Class 1 and material used to fill ruts and holes are subsidiary to Pay Item 611(2) RIPRAP.

*Delete Section 633 in its entirety and substitute the following:*

**SECTION 633**

**SILT FENCE**

**633-1.01 DESCRIPTION.** Furnish, install, maintain, and remove temporary silt fence as shown on the Plans or as directed.

**633-2.01 MATERIALS.** Use materials that conform to the following:

Geotextile Subsection 729-2.01

Silt Fence Subsection 729-2.04

Posts Wood 1.5-inch x 1.5-inch x 36-inch min., steel, or approved synthetic material.

Prefabricated Silt Fence Meet the Plans and Section 633 requirements.

Attachment Devices Staples; wire; self-locking nylon, plastic, wire ties; or other approved means to attach fabric to posts.

Support Mesh between Posts 14-gage welded wire fencing, metal chain-link fabric, or geosynthetic mesh with equivalent strength. Use maximum mesh spacing of 6 inches. Use height shown on the Plans, or specified in the Bid Schedule.

**633-3.01 CONSTRUCTION.** Install silt fence according to Plans. Use Trenchless Detail when installing silt fence over permanently frozen ground. Drill holes for support posts, if required.

When joining to another roll, place both end posts together and wrap them with silt fence by turning them one full rotation. Drive the wrapped posts.

**633-3.02 MAINTENANCE.** Maintain the integrity of the fence to contain sediment in runoff until final stabilization.

**633-3.03 REMOVAL.** After disturbed area has been accepted as permanently stabilized or when sediment protection is no longer needed, remove silt fence.

**633-4.01 METHOD OF MEASUREMENT.** Section 109. Silt Fence will not be measured.

**633-5.01 BASIS OF PAYMENT.** Silt Fence is subsidiary to Pay Item 641(3) TEMPORARY EROSION AND POLLUTION CONTROL.

*Delete Section 729 in its entirety and substitute the following:*

**SECTION 729**

**GEOSYNTHETICS**

**729-2.01 GEOTEXTILE FOR SUBSURFACE DRAINAGE, SEPARATION, STABILIZATION, EROSION CONTROL AND EMBANKMENT REINFORCEMENT.**

1. Subsurface Drainage. Meet AASHTO M 288 for Subsurface Drainage, except provide a minimum permittivity of 0.50 sec-1, and meet Class 2 Strength Property Requirements.

2. Separation. Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.50 sec-1, and meet Class 3 Strength Property Requirements.

3. Stabilization. Meet AASHTO M 288 for Stabilization, except provides a minimum permittivity of 0.50 sec-1, and meet Class 1 Strength Property Requirements.

4. Erosion Control. Meet AASHTO M 288 for Permanent Erosion Control and meet Class 1 Strength Property Requirements.

5. Reinforcement. Meet the requirements in Table 729-1 for Type 1 or Type 2.

Package, label, handle and store geotextile materials according to ASTM D 4873.

**TABLE 729-1**

**GEOTEXTILE REINFORCEMENT PROPERTIES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Property** | **Test Method** | **Units** | **Requirementa** |
| **Type 1** | **Type 2** |
| Grab Tensile | ASTM D4632 | lb. | 200/200 | 400/400 |
| Grab Elongation | ASTM D4632 | % (MD) | 10 | 10 |
| Wide Width Tensile | ASTM D4595 | lb/in. (ultimate) | 200/200 | 400/400 |
| Wide Width Tensile | ASTM D4595 | lb/in. (@ 5% strain) | 100/100 | 200/200 |
| Seam Breaking Strength | ASTM D4632 | lb./in. | 180 | 360 |
| Puncture | ASTM D6241 | lb. | 500 | 1500 |
| Trapezoidal Tear | ASTM D4533 | lb. | 100 | 150 |
| AOS | ASTM D4751 | U.S. sieve size | #30b | #30b |
| Permittivity | ASTM D4491 | sec-1 | 0.20 | 0.20 |
| Flow Rate | ASTM D4491 | gal./min./ft2 | 10 | 10 |
| a Minimum Average Roll Values (MARV) in machine direction (MD) / cross-machine direction (XD) unless otherwise specifiedb Maximum average roll value |

**729-2.02 SILT FENCE.** Meet AASHTO M 288 for Temporary Silt Fence.