SECTION 31 05 19
GEOTEXTILES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Geotextile fabrics.

1.2 REFERENCES

A. ASTM D 146: Standard Methods of Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.
B. ASTM D 276: Standard Test Methods for Identification of Fibers in Textiles.
C. ASTM D 882: Standard Test Methods for Tensile Properties of Thin Plastic Sheeting.
D. ASTM D 3786: Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics -Diaphragm Bursting Strength Tester Method.
E. ASTM D 4354: Standard Practice for Sampling of Geotextiles for Testing.
F. ASTM D 4355: Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon -Arc Type Apparatus).
G. ASTM D 4491: Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
H. ASTM D 4533: Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
I. ASTM D 4632: Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).
J. ASTM D 4751: Standard Test Method for Determining Apparent Opening Size for a Geotextile.
K. ASTM D 4759: Standard Practice for Determining Specification Conformance of Geosynthetics.
L. ASTM D 4833: Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
M. ASTM D 4873: Standard Guide for Identification, Storage, and Handling of Geotextiles.
N. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials.
O. ASTM E 154: Standard Methods of Testing Materials for Use as Vapor Barriers Under Concrete Slabs and as Ground Cover in Crawl Spaces.

1.3 DEFINITIONS

A. MARV (acronym for minimum average roll value): A statistical value of a particular test property embracing 95 percent confidence level of all possible values of that property. For a normally distributed set of data, it is approximately the mean value plus and minus two standard deviations.

1.4 **SUBMITTALS**

A. Submit prior to use:

1. Sample of geotextile.
2. Manufacture's certificate that each fabric complies with requirements of this section.

1.5 **DELIVERY STORAGE AND HANDLING**

A. Label fabric, ASTM D 4873.

B. Deliver geotextile dry, in a wrapping that protects it from the elements during shipping and storage. Keep fabric dry.

C. Protect geotextile from ultraviolet light and temperature greater than 140 deg. F. until application.

1.6 **QUALITY ASSURANCE**

A. Provide manufacturer's on-site technical supervision and assistance.

PART 2 PRODUCTS

2.1 **GEOTEXTILE -GENERAL**

A. Stated values are for non-critical, non-severe applications.

B. Fabric consists of synthetic fibers at least 85 percent by weight of polyolefins, polyesters or polyamides.

C. Resistant to chemical attack, rot and mildew.

D. No tears or defects that adversely alter fabric's physical properties.

E. All numerical values represent minimum average roll values in the weaker principal direction.

2.2 **STABILIZATION-SEPARATION GEOTEXTILES**

A. Woven or non-woven fabric. Meet the following properties and survivability ratings.

Table 1 – Stabilization-Separation Geotextile

Property	ASTM	MARV			
		Moderate		High	
		Woven	Non-woven	Woven	Non-woven
Grab Tensile Strength, lbs.	D 4632	180	115	270	180
Grab Elongation, percent	D 4632	<50	>50	<50	>50
Trapezoid Tear, lbs.	D 4533	70	40	100	75
Puncture Resistance, lbs.	D 4833	70	40	100	60
Apparent Opening Size, (AOS-US Sieve)	D 4751	≥30	≥60	≥30	≥60
Construction Survivability					
Subgrade, CBR		1		1 – 2	> 2
Tire Pressure, psi		<50	>50	<50 >50	<50 >50
6 inches Cover		NR		H H	M M
12 inches Cover		NR	NR NR	H M	M M
18 inches Cover		H	M	M M	M M
Where H = High; M = Medium; NR = Not Recommended					

2.3 **SILT FENCE GEOTEXTILE**

A. Use woven fabric. Meet standard or high performance properties.

Table 2 – Silt Fence Geotextile

Property	ASTM	MARV	
		Standard	High
Grab Tensile Strength, lbs. (a)	D 4632	90	120
Grab Elongation, percent	D 4632	< 40	< 40
Flux, gal/min/ft2	D 4491	15	90
Apparent Opening Size, (AOS-US sieve)	D 4751	> 20	> 30
Ultraviolet Degradation, percent	D 4355	70	90
NOTES (a) Percent of tensile strength retained determined after weathering, ASTM D 4355 for 500 hours.			

B. High performance fence to have tape yarns in one principle direction only.

C. Add stabilizers or inhibitors to make the filaments resistant to sunlight or heat deterioration.

D. Finish edges to prevent outer yarn from pulling away from the fabric.
E. Sheets of fabric may be sewn or bonded together. Provide minimum width recommended by manufacturer.
F. No deviation from any requirement in Table 2 due to the presence of seams.
G. Manufactured with pockets for posts, hems with cord, or with posts pre-attached using staples or button head nails.

2.4 EROSION CONTROL GEOTEXTILES

A. Use woven or non-woven fabric.

Table 3 – Erosion Control Geotextile

Property	ASTM	MARV		
		Class A	Class B	Class C
Grab Tensile Strength, lbs. (a)	D 4632	300	200	100
Grab Elongation, percent	D 4632	>15	>50	>50
Puncture Resistance, lbs.	D 4833	100	60	30
Trapezoid Tear, lb.	D 4533	80	50	40
Flux, gal/min/ft^2	D 4491	25	25	25
Apparent Opening Size, (AOSUS sieve)	D 4751	>59	>59	>59
Ultraviolet Degradation, percent	D 4355	70	70	70
Permittivity, sec.$^{-1}$ (b)	D 4491	0.1	0.1	0.1

NOTES
(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.
(b) This number reflects typical not minimum values for this test method only. The k value of the geotextile shall be greater than the k value of the soil.

B. Class A erosion control applications are those where the geotextile is used under conditions where installation stresses are greatest (more severe than Class B, i.e., stone placement height should be no more than 5 feet and stone weights should not exceed 250 pounds.
C. Class B erosion control applications for geotextiles are used under conditions where

installation stresses are more severe than Class C, i.e., stone placement height should be less than 3 feet and stone weights should not exceed 250 pounds.
D. Class C erosion control applications are those where the geotextile is used in structures or under conditions where the geotextile is protected by a sand cushion or by "zero drop height" placement of stone.

2.5 ROADWAY PAVEMENT GEOTEXTILES

A. Sheet Fabric: Non-woven. Heat bonded only on one side to assist in preventing bleed through of tack coat and sticking of fibers to wheels of laydown equipment.

Table 4 – Roadway Paving Geotextile			
		MARV	
Property	ASTM	Standard	Heavy Duty
Grab Tensile Strength, lbs. (a)	D 4632	80	120
Grab Elongation, percent	D 4632	50	50
Asphalt Retention, gal/yd2		0.2	0.3
Melting Point, deg. F.	D 276	300	300
Ultraviolet Degradation	D 4355	70	70
Apparent Opening Size, (AOSUS sieve)	D 4751	60	60
NOTES (a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.			

B. Crack Patch Fabric: Needle-punched non-woven coated with asphalt cement and a rubberized asphalt adhesive.

Table 5 – Crack Patching Geotextile		
Property	ASTM	MARV
Strip Tensile, lbs/in (a)	D 882	50
Puncture resistance, lb	E 154	200
Permeance, perms	E 69 Method B	0.10 (max)
Pliability (b)	D 146	No crack in fabric or rubberized asphalt
NOTES (a) Using 12 in/min test speed and 1" initial distance between grips. (b) Using 180 degree bend on 1/4" mandrel at –25 deg. F.		

2.6 **DRAINAGE GEOTEXTILES**

A. Use non-woven fabric.

Table 6 – Drainage Geotextile

Property	ASTM	MARV	
		Class A	Class B
Grab Tensile Strength, lbs. (a)	D 4632	200	100
Grab Elongation, percent	D 4632	>50	>50
Puncture Strength, lbs.	D 4833	60	30
Trapezoid Tear, lbs.	D 4533	50	40
Flux, gal/min/ft2	D 4491	25	25
Apparent Opening Size,(AOS -US Sieve)	D 4751	>59	>59
Permittivity, sec. -1 (b)	D 4491	0.1	0.1

NOTES
(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.
(b) The k value of the geotextile shall be greater than the k value of the soil. This number reflects typical not minimum values for this test method only.

B. Class A drainage applications are for fabrics where installation stresses 399 are more severe than Class B, i.e. very coarse sharp angular aggregate is used, a heavy degree of compaction (greater than or equal to 95 percent Standard Proctor, Section 31 23 36) is specified or depth of Trench is greater than 10 feet deep.

C. Class B drainage applications are those where fabric is used with smooth graded surfaces having no sharp angular projections, no sharp angular aggregate, compaction requirements are light, (less than 95 percent Standard Proctor, Section 31 23 36), and Trenches are less than 10 feet deep.

2.7 **WEED BARRIER GEOTEXTILE**

A. Use non-woven fabric.

Table 7 – Weed Barrier Geotextile

Property	ASTM	MARV
		Standard
Grab Tensile Strength, lbs. (a)	D 4632	90
Grab Elongation, percent	D 4632	>50
Puncture Strength, lbs.	D 4833	25
Trapezoid Tear, lbs.	D 4533	30
Apparent Opening size (AOS -US Sieve)	D 4751	>49
Ultraviolet Degradation, percent	D 4355	70

NOTES
(a) Percent of tensile strength retained determined after ultraviolet weathering, ASTM D 4355 for 500 hours.

2.8 **POSTS**

A. Minimum length: 4 feet.

B. Steel: Round, U shaped, T shaped, or C shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening wire.

C. Wood as follows:

1. Soft wood posts at least 3 inches in diameter, or nominal 2 x 4 inches and straight to provide a fence without noticeable misalignment.
2. Hard wood post providing a minimum cross sectional area of 2.25 square inches.

D. Fasteners for Wooden Posts:

1. Wire staples No. 17 gage minimum with a crown at least 3/4 inches wide and legs at least 1/2 inch long. Nails 14 gage minimum, 1 inch long with 3/4 inch button heads.

2.9 **SOURCE QUALITY CONTROL**

A. Sampling practices, ASTM D 4354.

B. Conformance verification, ASTM D 4759.

PART 3 EXECUTION

3.1 **STABILIZING POOR LOAD BEARING SOILS**

A. Remove all organic material larger than 1 inch in diameter from the Subgrade and grade to elevations required for overlaying backfill.

B. Compact Subgrade to the extent allowed by the condition of the substrate.

C. Roll fabric onto Subgrade so Subgrade remains smooth. Do not drag.

D. Fold or overlap geotextile in direction of drainage.

E. Provide fabric overlap joints as follows.

Table 8 – Geotextile Overlap

Soil CBR Rating	Overlap Required	
	Unsewn, inches	Sewn, inches
Less than 1	–	4
1-2	36	4
2-3	30	3
3-5	24	–
Greater than 5	18	–

NOTES
(a) Sewn seams, both factory and field seams shall conform to 90 percent of the grab tensile strength requirements.

F. Place granular material on top of fabric and spread carefully to insure no puncture. Minimum backfill lift on fabric; 6 inches.

G. Cover fabric with 12 inches of sand before placing rock larger than 4 inches diameter on top of fabric.

H. Avoid sudden stops or turning motions by equipment operating on aggregate placed over the fabric.

I. Compact backfill soils over fabric; Section 33 05 05 to a Standard Proctor Density of 95 percent or greater.
J. Repair any puncture by covering with new fabric using the same overlap dimensions indicated in Table above.

3.2 **SILT FENCE**

A. Beginning work means acceptance of existing conditions.
B. The quantity of temporary silt fences may be increased, decreased, or eliminated entirely at CONTRACTOR's discretion at no additional cost to OWNER. Maintain the silt fence until the Work is accepted or until the fence and silt accumulations are removed.
C. Clear area of any debris and obstructions that may damage geotextile.
D. Place post in all low points.
E. Install posts a maximum of 8 feet apart with at least 18 inches in the ground. If not possible to achieve depth, secure posts to prevent overturning.
F. Attach filter fabric by wire, cord, pockets, staples, nails, or other effective means.
   1. When using a wire support fence, provide at least 6 horizontal wires with a minimum of 12 gage wire. Space vertical wires 6 inches maximum. Secure geotextile to the up slope side of the post. Extend wire into the Trench a minimum of 2 inches and extend a maximum or 36 inches above the ground surface.
G. Install fabric so 6 to 8 inches of fabric is left at the bottom to be buried. Splice together only at support posts with any a minimum overlap of 18 inches. Extend buried portion 6 inches deep and the rest upstream of the fabric fence.
H. Sediment Removal: Remove sediment before deposit reaches 1/2 of the height of the silt fence, or extend height of silt fence. After removal of sediment, dress landscape.
I. Schedule of Locations: Typical locations include the toe of fill slopes, the downhill side of fill slopes, the downhill side of large cut areas, and at natural drainage areas. Limit geotextile materials to handle an area equivalent to 1,000 square feet per 10 feet of fence. Use caution should site slope be steeper than 1:1, and water flow rates exceed 1 cubic foot per second per 10 feet of fence face.

3.3 **EROSION CONTROL**

A. Install fabric in locations shown on the Drawings.
B. Unless otherwise specified, the geotextile shall be overlapped a minimum of 2 feet at all longitudinal and transverse joints, or the geotextile shall be sewn.
C. If overlapped, the geotextile shall be placed so that the upstream sheet overlaps the downstream sheet.
D. For placement on slopes, each strip shall overlap the next downhill strip.
E. The geotextile shall be anchored using key Trenches or aprons at the crest and toe of the slope.
F. Pins, usually 18 inches in length, may be helpful in securing the geotextile during installation.
G. Repair: Place patch over damaged area and extend 3 feet beyond the perimeter of the tear or damage.

3.4 **ROADWAY PAVING FABRICS**

A. Preparing Asphalt Concrete Surface:
   1. Brush road surface clean of debris, dust and gravel. Remove all water from surface and allow to dry.
   2. Patch holes and level any uneven areas with asphalt concrete.
   3. Fill cracks between 1/8 inch to 1/2 inch with asphalt cement. Allow cement to cure prior to geotextile placement.
   4. Clean cracks larger than 1/2 inch to a depth of 3 inches and fill with asphalt concrete. Where Pavement is severely cracked, rutted, deformed or distressed, secure approval for providing an asphalt concrete leveling course prior to geotextile placement.

B. Tacking Asphalt Surface for Pavement Fabric: Use tack asphalt recommended by fabric manufacturer. Apply tack as follows:
   1. Dry Pavement surface; 0.20 to 0.30 gallons per square yard. Within street intersections, on steep grades and in zones where vehicle speed changes are commonplace, reduce the application rate to no less than 0.20 gallons per sq.yard.
   2. Heavy duty fabrics; 0.30 to 0.40 gallons per square yard.
   3. Provide a tack width equal to geotextile width plus 6 inches.
   4. Apply tack only as far in advance of geotextile installation as is appropriate to insure a tacky surface at the time of geotextile placement.
   5. Allow tack time to cure with no moisture remaining prior to placing the geotextile and overlay.
   6. Clean excess tack material from the road surface.

C. Placement of Fabric:
   1. Place paving fabric into the asphalt with a minimum amount of wrinkling or folding. Wrinkles or folds in excess of 1 inch shall be slit and laid flat.
   2. Shingle-lap all transverse joints and slit folds or wrinkles in the direction of the paving operation.
   3. Maximize geotextile contact with the Pavement surface by brooming or pneumatic rolling.
   4. Additional hand-placed asphalt may be required at laps and repairs.

D. Protection and Repair:
   1. Do not allow traffic except necessary construction equipment and emergency vehicles to drive on the fabric.
   2. Turn paver and other vehicles gradually and keep turning to a minimum to avoid movement and damage to the geotextile. Do not permit abrupt starts and stops.
   3. Remove and replace damaged geotextile with the same type of geotextile, and shingle-lap the overlaps in the direction of paving. Restrict overlaps to a maximum of 6 inches.

3.5 **SUBSURFACE DRAINAGE**

A. Excavate Trench to size and depth indicated.

B. Cut fabric to width required and place in Trench. Prevent damage to geotextile.

C. Overlap geotextile 12 inches or the full width of the Trench, whichever is less at the top of the Trench.

D. Overlap successive pieces of geotextile a minimum of 12 inches in the direction of

flow.

E. Place fill to hold fabric in place.

F. Repair any damage to geotextile by placing patches extending 3 feet in all directions beyond the damaged area.

3.6 **WEED BARRIER**

A. Preparation:

1. Remove sharp objects, large stones and undesirable vegetation.
2. If placing geotextile over existing bed, cut an "X" over each plant and push geotextile under plant base. If placing over new bed, roll geotextile over soil and cut an "X" for each plant hole. Fold excess geotextile under and cover with specified landscaping materials.

B. Surface Cover: Provide a minimum of 4 inches of cover on all areas on the geotextile unless otherwise specified by ENGINEER. If using large landscape rock, increase thickness of cover material over geotextile to 3 times the diameter of the largest rock material. Do not leave any portion of geotextile exposed to direct sunlight.

C. Repair: Repair immediately. Clear the damaged area plus an additional 3 feet and apply geotextile patch.

D. Maintenance: Maintain surfaces and supply additional landscape materials where necessary, including areas affected by erosion.

3.7 **FIELD QUALITY CONTROL**

A. Reject fabric at the time of installation, if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling or storage.

END OF SECTION