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August 8, 1995

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**INSTRUCTIONAL BULLETIN NO. 95-9**

**SUBJECT:** Selecting Geotextile for Erosion Control Under Rip Rap

**EFFECTIVE:** August 15, 1995

**SUPERSEDES:** None

**RE:** Addendum entitled "Geotextile for Erosion Control Under Rip Rap" dated September 18, 1995

Beginning with the October 1995 highway letting, the pay items for the above subject geotextile will be changed. In the future, the class and type of geotextile for use under rip rap will need to be specified. The reference addendum describes the various classes and types available. In the subsurface investigation report written by the Department's Geotechnical Materials Engineer to the Pavement Design Engineer, the AOS and Permittivity are given. Using this information with the addendum, a selection of the type of geotextile can be made. At some time in the future, the subsurface investigation report will indicate the type of geotextile to be used.

The class should be determined by the Project Engineer or Hydraulics Engineer, but in most cases will be Class 2. Type D is a site specific type in both classes of geotextile and will be used only in critical/severe applications. More site specific information will be given in the special provisions of the proposal when Type D is specified.

The new pay items and numbers are shown below:

Item No.	Description	Unit
8048100	Geotextile for Erosion Control Under Riprap (Class 1) Type A	m2(SY)
8048105	Geotextile for Erosion Control Under Riprap (Class 1) Type B	m2(SY)
8048110	Geotextile for Erosion Control Under Riprap (Class 1) Type C	m2(SY)
8048115	Geotextile for Erosion Control Under Riprap (Class 1) Type D	m2(SY)
8048200	Geotextile for Erosion Control Under Riprap (Class 2) Type A	m2(SY)
8048205	Geotextile for Erosion Control Under Riprap (Class 2) Type B	m2(SY)
8048210	Geotextile for Erosion Control Under Riprap (Class 2) Type C	m2(SY)
8048215	Geotextile for Erosion Control Under Riprap (Class 2) Type D	m2(SY)

APPROVED: \_\_\_\_\_

E. S. Eagle - Road Design Engineer

Attachment

September 18, 1995

APPROVED: July 26, 1995  
Division Administrator  
By: David B. Law  
FEDERAL HIGHWAY ADMINISTRATION

GEOTEXTILE FOR EROSION CONTROL UNDER RIP RAP

I. DESCRIPTION

This work shall consist of furnishing and placing a geotextile for use under rip rap as erosion protection of cut and fill slopes, various drainage structures, wave protection for causeways and shorelines and scour protection for structures such as bridge piers and abutments. The geotextile shall be designed to allow passage of water while retaining the in-situ soil without clogging.

II. PHYSICAL AND CHEMICAL REQUIREMENTS

- A. Fibers used in the manufacture of geotextiles and the threads used in joining geotextiles by sewing shall consist of long chain synthetic polymers, composed of at least 95% by weight polyolefins or polyesters. They shall be formed into a stable network such that the filaments or yarns retain their dimensional stability relative to each other, including selvages.
- B. All property values, with the exception of apparent opening size (AOS), in these specifications represent minimum average roll values (MARV) in the weakest principal direction (i.e., average test results of any roll in a lot sampled for conformance or quality assurance testing shall meet or exceed the minimum values provided herein). Values for AOS represent maximum average roll values. Sampling and testing shall be in accordance with ASTM D-4354.
- C. Geotextiles used for erosion control under rip rap applications shall conform to the physical requirements given below.

1. STRENGTH PROPERTY REQUIREMENTS (all fabrics)

	Class 1	Class 2
	Fabric Protected	Fabric Unprotected
Grab Strength (ASTM D-4632)	400 N (90 lbs.)	890 N (200 lbs.)
Seam Strength (ASTM D-4632)	356 N (80 lbs.)	801 N (180 lbs.)

1. STRENGTH PROPERTY REQUIREMENTS (all fabrics) (Cont)

	Class 1	Class 2
	Fabric <sup>1</sup> <u>Protected</u>	Fabric <sup>1</sup> <u>Unprotected</u>
Puncture Strength (ASTM D-4833)	178 N (40 lbs.)	356 N (80 lbs.)
Burst Strength (ASTM D-3786)	965 Kpa (140 psi)	1724 Kpa (250 psi)
Trapezoid Tear Strength (ASTM D-4533)	178 N (40 lbs.)	356 N (80 lbs.)
Elongation at Failure (ASTM D-4632)	15% min.	15% min.
Ultraviolet Degradation at 500 hours (ASTM D-4355)	50% strength retained	50% strength retained

<sup>1</sup> Fabric is said to be protected when cushioned from rock placement by a sufficient layer of sand or gravel at least 152 mm (6 inches) thick or by zero height placement. All other conditions are said to be unprotected.

<sup>2</sup> Values apply to both field and manufactured seams. Seams should be sewn upwards for inspection.

2. PIPING RESISTANCE (soil retention) & PERMITTIVITY REQUIREMENTS

TYPE A. AOS (ASTM D-4751)  $\leq$  0.6 mm opening size  
(  $\geq$  30 US Std Sieve No.)  
Permittivity (ASTM D-4491)  $\geq$  0.7 sec.

Type A fabric will generally be specified for soils with less than 15% particles by weight passing the 0.075 mm opening size (200 US Std. Sieve No.).

TYPE B. AOS (ASTM D-4751)  $\leq$  0.43 mm opening size  
(  $\geq$  40 US Std Sieve No.)  
Permittivity (ASTM D-4491)  $\geq$  0.2 sec.<sup>-1</sup>

Type B fabric will generally be specified for soils with 15% to 50% particles by weight passing the 0.075 mm opening size (200 US Std. Sieve No.).

TYPE C. AOS (ASTM D-4751)  $\leq$  0.25 mm opening size  
(  $\geq$  60 US Std Sieve No.)  
Permittivity (ASTM D-4491)  $\geq$  0.1 sec.<sup>-1</sup>

Type C fabric will generally be specified for soils with more than 50% particles by weight passing the 0.075 mm opening size (200 US Std. Sieve No.).

TYPE D. AOS and fabric permittivity requirements will be based on site specific design and will be indicated in the Special Provisions of the proposal.

Type D fabric will generally be specified for Critical/Severe Applications.

### III. CERTIFICATION

- A. The Contractor shall provide to the Resident Construction Engineer a certification 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, the project for which it will be used, its intended use, and the MARVs for the tests required in this specification.
- B. 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.
- C. The Manufacturer's certification shall state that the furnished geotextile meets MARV requirements of the specification as evaluated under the Manufacturer's quality control program. The certification shall be attested to by a person having legal authority to bind the Manufacturer.

- D. Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

#### IV. ACCEPTANCE

The Contractor shall supply to the Resident Construction Engineer, prior to placing the geotextile, the certification described in Section III. Acceptance will be based on the geotextile meeting all stated requirements and specifications. The Resident Construction Engineer shall submit a copy of the certified test results for the geotextile material. Certified test results shall be no more than 1 year old at the time they are furnished to the Department. No fabric will be used nor will payment be made for a fabric until the fabric certification has been received and approved by the Resident Construction Engineer. The Department reserves the right to sample and test any of the fabrics or other materials used in erosion control at any time.

#### V. SHIPMENT AND STORAGE

- A. Geotextile labeling, shipment, and storage shall follow ASTM D-4873. Product labels shall clearly show the manufacturer or supplier name, style number, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- B. Each geotextile shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight or contaminants. The protective wrapping shall be maintained during periods of shipment and storage.
- 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, temperatures in excess of 71°C (160°F), and any other environmental condition that may damage the physical property values of the geotextile.

## VI. CONSTRUCTION REQUIREMENTS

- A. The geotextile shall not be exposed to the elements more than 14 days before it is covered. If the geotextile is to be placed underwater, the geotextile and the overlying material shall be placed on the same day.
- B. The geotextile shall be placed and anchored on a smooth graded surface approved by the Engineer. Placement of the overlying material should be in such a manner that it will not excessively stretch or tear the fabric. The geotextile shall be anchored at the terminal ends using key trenches or aprons. Successive geotextile sheets shall be overlapped such that the upstream or upslope sheet is placed over the downstream or downslope sheet. The minimum overlap shall be 30.5 cm (12 inches), except when placed underwater where the minimum overlap shall be 91.5 cm (3 feet). Riprap shall not be dropped unless the geotextile is protected by a sufficient sand cushion at least 152 mm (6 inches) thick. A field trial section may be required to assess geotextile survivability.
- C. Any geotextile damaged during placement shall be repaired as directed by the Engineer. A geotextile patch shall be placed over the damaged area extending 91.5 cm (3 feet) beyond the perimeter of the damage.

## VII. METHODS OF MEASUREMENT

Geotextiles for Erosion Control Under Rip Rap shall be measured by the actual number of square meters (square yards) of ground surface protection installed and completed.

## VIII. BASIS OF PAYMENT

The accepted quantities of geotextile will be paid for at the contract unit price per square meter (square yard) for the item "GEOTEXTILE FOR EROSION CONTROL UNDER RIP RAP". The price of and payment shall be full compensation for furnishing all materials, labor, equipment, trenching to anchor the geotextile and incidentals necessary to complete the work herein prescribed as approved by the Engineer.

Payment will be made under:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
8048100	Geotextile for Erosion Control Under Rip Rap Class 1, Type A	m <sup>2</sup> (S.Y.)

8048105	Geotextile for Erosion Control Under Rip Rap Class 1, Type B	m <sup>2</sup> (S.Y.)
8048110	Geotextile for Erosion Control Under Rip Rap Class 1, Type C	m <sup>2</sup> (S.Y.)
8048200	Geotextile for Erosion Control Under Rip Rap Class 2, Type A	m <sup>2</sup> (S.Y.)
8048205	Geotextile for Erosion Control Under Rip Rap Class 2, Type B	m <sup>2</sup> (S.Y.)
8048210	Geotextile for Erosion Control Under Rip Rap Class 2, Type C	m <sup>2</sup> (S.Y.)