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REPUBLIC OF THE PHILIPPINES  
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS  
OFFICE OF THE SECRETARY  
MANILA

20 March 1998

DEPARTMENT ORDER )  
NO. 54 )  
SERIES OF 1998 )

SUBJECT : DPWH Standard Specifications  
for Geotextiles

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In view of the absence of DPWH Standard Specifications for geotextile and considering its importance when used as waterproofing material and stress relieving membrane for subsurface drainage, erosion control and pavement structures, among others, the attached Standard Specifications for Geotextiles are hereby prescribed, for your guidance and strict compliance.

In no case should the material be allowed to be used without complying with the requirements as prescribed herein.

This Order shall take effect immediately.

  
GREGORIO N. VIGILAR  
Secretary

Attachment : As stated.

## DPWH SPECIFICATIONS FOR GEOTEXTILE

### 1. Scope

This specification covers geotextile fabrics for use in subsurface drainage, hydraulic filter, erosion control, sediment control, pavement structures as a waterproofing and stress relieving membrane, and as a permeable separator to prevent mixing of dissimilar materials such as foundations and select fill materials.

### 2. Physical and Chemical Requirements

2.1 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 85 percent by mass polyolefins, polyesters, or polyamids. They shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvages. These materials shall conform to the physical requirements of Table 1 for the indicated application. Guidelines for the survivability levels referred to under "Separation" in Table 1 are included in Table 2.

### 3. Sampling and Testing

3.1 The product shall be subject to sampling and testing. Sampling shall be in accordance with ASTM D 4354, and testing procedures shall be in accordance with the methods given in Table 1.

### 4. Certification

4.1 Manufacturer's Certificate. The manufacturer shall file with the purchaser a certificate stating the name of the manufacturer, the chemical composition of the filaments or yarns, and other pertinent information so as to fully describe the geotextile. The manufacturer shall include in the certificate a guarantee stating that the geotextile that is furnished meets the requirements of the specification. The certificate shall be attested to by a person having legal authority to bind the company. Either mismarking or misrepresentation by the manufacturer shall be reason to discontinue acceptance under these specifications. Notice sent to the manufacturer by the purchaser regarding the discontinuance of acceptance will be considered to be notice to all wholesalers, jobbers, distributors, agents and other intermediaries handling the manufacturer's product.

## 5. Quality Control

5.1 The geotextile manufacturer is responsible for establishing and maintaining a quality control program so as to assure compliance with the requirements of this specification.

## 6. Shipment and Storage

6.1 During periods of shipment and storage, the fabric shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 60°C (140°F), mud, dust, and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy-duty protective covering. Each shipping document shall include a notation certifying that the geotextile is in accordance with the manufacturer's certificate and guarantee previously filed with the purchaser.

6.2 Product Marking. Label the fabric and its container with the manufacturer's name fabric type or trade name, lot number and quantity.

## 7. Installation

7.1 Separation Geotextile - The geotextile shall be unrolled as smoothly as possible on the prepared subgrade in the direction of construction traffic. Adjacent geotextile rolls shall be overlapped in the direction of subbase placement using the guidelines in Table 3. Sewing is recommended where subgrade soils have a CBR value less than 1. The geotextile maybe held in place prior to subbase placement by pins, staples, or piles of fill or rock. On curves, the geotextile maybe folded or cut to conform to the curve as illustrated in Figure 1. The fold or overlap shall be in the direction of construction and held in place as prescribed above.

7.2 Drainage Geotextile - In trenches, after placing the backfill material, the geotextile shall be folded over the top of the filter material to produce a minimum overlap of 12 inches for trenches greater than 12 inches wide. In trenches less than 12 inches in width, the overlap shall be equal to the width of the trench. The geotextile shall then be covered with the subsequent course. Successive sheets of geotextile shall be overlapped a minimum of 12 inches in the direction of flow.

7.3 Erosion Control Geotextile - The geotextile shall be placed 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 fabric. 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 slope. In certain applications to expedite construction, 18 inch long anchoring pins placed on 2 to 6 feet centers depending on the slope of the covered area have been used successfully.

7.4 Paving Fabric - The fabric shall be placed into the asphalt sealant with minimum wrinkling prior to the time the asphalt has cooled and lost tackiness. As directed by the engineer, wrinkles or folds in excess of 1 inch shall be slit and laid flat. Brooming and/or pneumatic rolling will be required to maximize fabric contact with the pavement surface. Overlap of fabric joints shall be sufficient to ensure full closure of the joint, but should not exceed 6 inches. Transverse joints shall be lapped in the direction of paving to prevent edge pickup by the paver. A second application of asphalt sealant to fabric overlaps will be required if in the judgment of the engineer additional asphalt sealant is needed to ensure proper bonding of the double fabric layer.

7.5 Geotextile Silt Fence - Fence construction shall be adequate to handle stress from sediment loading. Geotextile at the bottom of the fence shall be buried a minimum of 6 inches in a trench so that no flow can pass under the barrier. The trench shall be backfilled and the soil compacted over the geotextile. Fence height shall be as specified by the Engineer but in no case shall exceed 36 inches above ground surface. The geotextile shall be spliced together only at a support post with a minimum 6-inches overlap.

7.6 Hydraulic Filter - The geotextile shall be laid lengthwise down slopes and appropriately anchored along the top edge. Installation horizontally along slopes will not be accepted. Overlaps shall be sufficient to prevent parting of laps during the initial construction or fill stage. On soft soil subgrades the overlap shall not be less than 400mm. Alternatively the geotextile shall be sewn using a double-stitch portable sewing machine and appropriate thread.

## 8. Method of Measurement

8.1 The geotextile shall be measured by the number of square meters from the payment lines shown on the plans, or from the payment lines established in writing by the Engineer.

8.2 Temporary silt fence will be measured in linear meter.

8.3 Removed sediment will be measured by the cubic meter.

8.4 Excavation, backfill, bedding, and cover material are separate pay items.

**Table 2 Construction Survivability Levels**

Site Soil CBR Installation	<1		1-2		>2	
Equipment Ground Contact Pressure (KPa)	>345	<345	>345	<345	>345	<345
Cover Thickness (mm) <sup>1</sup> (Compacted)						
102 <sup>2,3</sup>	NR	NR	H	H	M	M
152	NR	NR	H	M	M	M
305	NR	H	M	M	M	M
457	H	M	M	M	M	M

H = High  
M = Medium  
NR = Not recommended

- <sup>1</sup> Maximum aggregate size not to exceed one-half the compacted cover thickness  
<sup>2</sup> For low volume unpaved road (ADT<200 vehicles)  
<sup>3</sup> The 102 mm minimum cover is limited to existing road bases intended for use in new construction

**Table 3 Recommended Overlaps**

Soil Strength (CBR)	Overlap Unsewn (mm)	Overlap Sewn (mm)
Less than 1	-	229
1-2	965	203
2-3	762	76
3 and above	610	-

## 9. Basis of Payment

9.1 The quantities, determined as provided above shall be paid for at the contract price per unit of measurement respectively, for each pay item listed below.

9.2 Payment shall be made under:

Pay Item	Pay Unit
Separation Geotextile	Square Meter
Drainage Geotextile	Square Meter
Paving Fabric	Square Meter
Hydraulic Filter	Square Meter
Silt Fence	Linear Meter
Removing Sediment	Cubic Meter

## 10. References

- 10.1 AASHTO M 288-92
- 10.2 ASTM D 4354
- 10.3 AASHTO -AGC-ARTE Joint Committee  
(Guide Specifications & Test Procedures  
for Geotextiles)
- 10.4 Engineering with GEOSYNTHETICS: G. Venkatappa Rao
- 10.5 Polyfelt Filter Fabrics - General Functions,  
Specifications and Applications

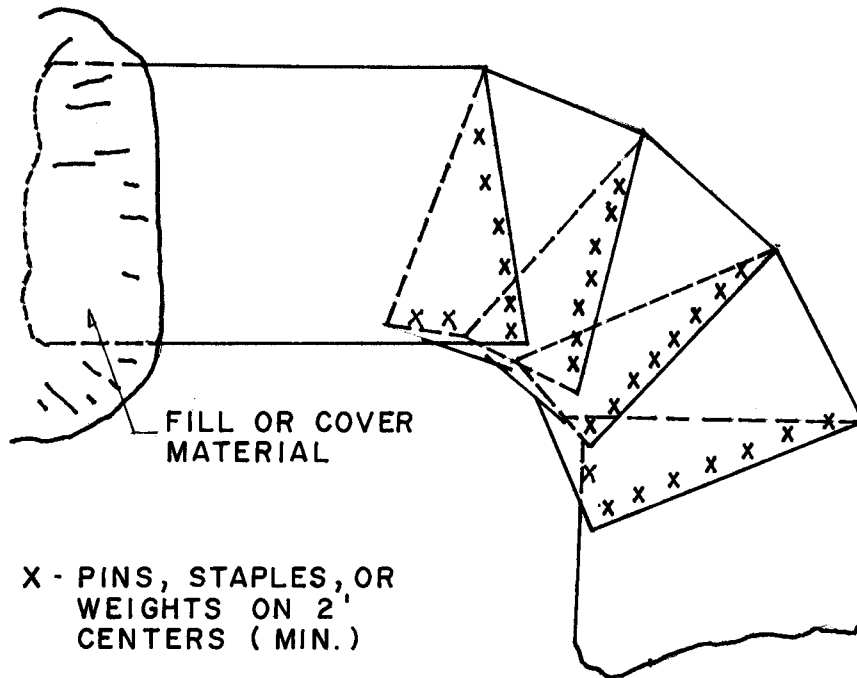
## Notations:

- <sup>1</sup> Acceptance of geotextile material is to be based on ASTM D 4759, Standard Practice for determining the Specification Conformance Geotextiles.
- <sup>1A</sup> Contracting agency may require a letter from the supplier certifying that its geotextile meets specification requirements.
- <sup>2</sup> Minimum - Use value in weaker principal direction. All numerical values represent minimum average roll value (i.e., test results from any sampled roll in a lot shall meet or exceed the minimum values in the table). Stated values are for non-critical, non-severe conditions. Lot sampled according to ASTM D 4354.
- <sup>3</sup> Class A Drainage applications for fabrics are where installation stresses are more severe than Class B applications, i.e., very coarse, sharp, angular aggregate is used, a heavy degree of compaction (greater than 95 percent AASHTO T99) is specified, or depth of trench is greater than 3 meters.
- <sup>4</sup> Class B Drainage applications are those where fabric is used with smooth graded surfaces having no sharp angular projections, no sharp angular aggregate is used; compaction requirements are light (less than 95 percent ASHTO T99) and trenches are less than 3 meters in depth.
- <sup>5</sup> Values apply to both field and manufactured seams. See Table 3 for Recommended overlaps.
- <sup>6</sup> A nominal coefficient of permeability maybe determined by multiplying permittivity value by nominal thickness. The k value of the fabric should be greater than the k value of the soil.
- <sup>7</sup> Soil with 50 percent or less particles by mass passing 0.075 mm (No. 200) sieve, AOS less than 0.6 mm (greater than 0.600 mm (No. 30) sieve).
- <sup>7A</sup> Soil with more than 50 percent by mass passing 0.075 mm (No. 200) sieve. AOS less than 0.297 mm (greater than 0.300 mm (No. 50) sieve).
- <sup>8</sup> Permittivity & Apparent Opening Size (AOS) do not relate directly to filtration performance of silt fence fabrics. Values presented reflect minimum criteria of products currently used. Performance tests such as VTM-51 (from Virginia Highway Research Council) maybe used to evaluate silt fence performance if deemed necessary by the Engineer.
- <sup>9</sup> Class A Erosion Control applications are those where fabrics are used under conditions where installation stresses are more severe than Class B. i.e., stone placement height should be less than 0.9m and stone mass should not exceed 113.5 kg.
- <sup>10</sup> Class B Erosion Control applications are those where fabric is used in structure or under conditions where the fabric is protected by a sand cushion or by "zero drop height" placement of stone.
- <sup>11</sup> This specification is applicable to fabric membranes used for full coverage of the payment, or as strips over transverse and longitudinal pavement joints. It is not intended to describe membrane systems specifically designed for pavement joints and localized (spot) repairs.
- <sup>12</sup> Values of geotextile elongation do not imply the allowable consolidation properties of the subgrade soil - they must be determined by a separate investigation, but are intended to show that for fabrics with percent elongation less than 50 percent, a higher strength is required.

FIGURE 1

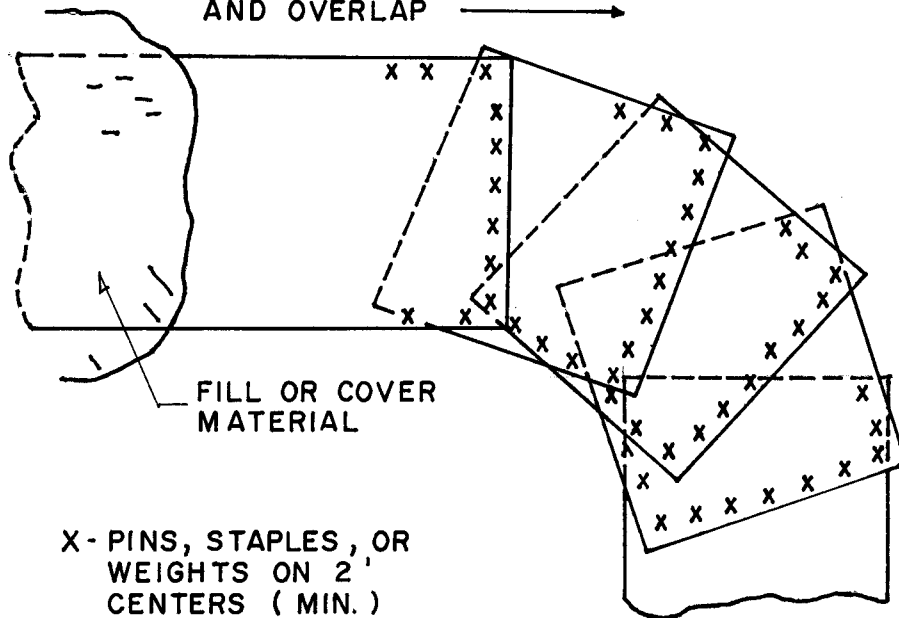
# FORMING CURVES USING GEOTEXTILES

DIRECTION OF COVERING AND OVERLAP →



## FORMING A CURVE USING FOLDS

DIRECTION OF COVERING AND OVERLAP →



## FORMING A CURVE USING CUT PIECES



Table 1 - Physical Requirement<sup>1,1A</sup>

APPLICATION													
Property	Unit	Test Method	Subsurface Drainage <sup>2</sup>		Sediment Control		Erosion Control <sup>2</sup>		Hydraulic Filter		Paving <sup>2,11</sup>	Separation <sup>1</sup>	
			Class A <sup>3</sup>	Class B <sup>4</sup>	Wire Fence Supported	Self-Supported	Class A <sup>9</sup>	Class B <sup>10</sup>	Unprotected	Protected		High Survivability Level	Medium Survivability Level
1. Grab Tensile Strength	N	ASTM D 4632 ASTM D 1682	800	355	400 <sup>2</sup>	400 <sup>2</sup>	890	400	-	-	355	1200/800	800/510
2. Elongation	Percent	ASTM D 4632 ASTM D 1682	-	-	-	50 percent Max. @ 200 N	15	15	-	-	50 percent @ Break	< 50 percent > 50 percent <sup>12</sup>	< 50 percent > 50 percent <sup>12</sup>
3. Seam Strength <sup>5</sup>	N	ASTM D 4632	710	310	-	-	800	355	-	-	-	1065/710	710/465
4. Puncture Strength	N	ASTM D 4833 ASTM D 751-79	355	110	-	-	355	175	355	108	-	445/335	310/175
5. Burst Strength	kPa	ASTM D 3786 ASTM D 751-79	2000	900	-	-	2220	965	2000	900	-	445/335	310/175
6. Trapezoid Tear	N	ASTM D 4533 ASTM D 1117	220	110	-	-	220	130	216	108	-	-	-
7. Permeability <sup>7</sup> (K)	cm/sec	ASTM D 4491	K Fabric > K Soil	K Fabric > K Soil	-	-	K Fabric > K Soil	K Fabric > K Soil	-	-	-	K Fabric > K Soil	K Fabric > K Soil
8. Apparent Opening Size (AOS)	(US Std.)	ASTM D 4751	Notes 7 & 7A	Notes 7 & 7A	.84 <sup>8</sup> Max.	.84 <sup>8</sup> Max.	Notes 7 & 7A	Notes 7 & 7A	-	-	-	Notes 7 & 7A	Notes 7 & 7A
9. Permittivity	Sec. <sup>-1</sup>	ASTM D 4491	-	-	.01 <sup>28</sup>	.01 <sup>28</sup>	-	-	-	-	-	-	-
10. Ultraviolet Degradation	(Percent Retained Strength)	ASTM D 4355	70 @ 150 h	70 @ 150 h	70 @ 150 h	70 @ 150 h	70 @ 150 h	70 @ 150 h	-	-	-	70 @ 150 h	70 @ 150 h
11. Asphalt Retention	L/m <sup>2</sup>	Appendix XI	-	-	-	-	-	-	-	-	0.9	-	-
12. Melting Point	°C	ASTM D 276	-	-	-	-	-	-	-	-	150	-	-