

Geotextile Separation Interlayer Guide Specification

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Geotextile technology has become an engineering option for use in concrete pavement as a cost-effective replacement for other interlayer materials, such as thin asphalt layers. This document provides guideline specifications useful for developing project specifications for the use of a Geotextile material as a bond breaker, drainage and separation interlayer for portland cement concrete pavements in new construction and unbonded overlays. Installation using two methods (adhesive and nail-down) is also specified herein. This specification may be used as the basis for developing either a project specification or an office master specification. An owner, engineer or contractor must apply these guidelines to create specifications for specific local projects by selecting from the material standards and test methods provided in these guidelines.

This document references appropriate material standards, test methods and specifications of the American Society of Testing Materials (ASTM), the Geosynthetic Accreditation Institute (GAI), and the British Standards Institution. These references assume that the contractor and the engineer will use the applicable standards or methods that are in effect when bids are solicited for the project. It also assumes that the specification writer will choose the standard or test most suitable for their agency/project.

Footnotes accompany some specification provisions. These added details describe reasoning for certain specification features, as well as choices and important references for clarity to the specification writer.

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APPLICABILITY

This guide specification is applicable to the use of a geotextile interlayer material as a bond breaker, drainage and separation interlayer for portland cement concrete pavements in new construction and unbonded overlays. Example applications are, but not limited to, existing pavement with a new concrete pavement overlay, and between a chemically treated subbase or base and a new concrete pavement.

BACKGROUND ON GEOTEXTILE SEPARATION LAYERS

Geotextile separation interlayers are used between a new concrete pavement or overlay and the underlying structure. Interlayers are used to reduce frictional stresses associated with potential bonding of a new concrete pavement/overlay to the underlying support layers and create a shear plane that relieves stress and helps prevent cracks from reflecting from the underlying layers. Geotextile interlayers can also help channel infiltrating water out of the pavement structure and into a drainage system (NCPTC 2014).

APPLICABLE TESTING STANDARDS

ASTM:

- D 903** Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
- D 4354** Practice for Sampling Geosynthetics for Testing
- D 4355** Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
- D 4533** Test Method for Index Trapezoid Tearing Strength of Geotextiles
- D 4595** Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
- D 4632** Test Method for Grab Breaking Load and Elongation of Geotextiles
- D 4759** Practice for Determining the Specification Conformance of Geosynthetics
- D 4873** Guide for Identification, Storage, and Handling of Geotextiles
- D 5199** Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
- D 5261** Test Method for Measuring Mass per Unit Area of Geotextiles
- D 5493** Standard Test Method for Permittivity of Geotextiles Under Load
- D 6241** Standard Test Method for Static Puncture Strength of Geotextiles
- D 6574** Standard Test Method for Determining the (In-Plane) Hydraulic Transmissivity of a Geosynthetic by Radial Flow
- D 8102** Standard Practice for Manufacturing Quality Control of Geotextiles

GEOSYNTHETIC ACCREDITATION INSTITUTE – Laboratory Accreditation Program (GAI-LAP)

BRITISH STANDARDS INSTITUTION:

- EN 13249:2016** Geotextiles and Geotextile-Related Products

TERMINOLOGY

Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations

Minimum Test Value (MTV): Property value reported is taken as the minimum value of all tests performed per ASTM standards.

SUBMITTALS

Product Certification

1. The Contractor shall provide the Engineer a certificate stating the name of the geotextile manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.
2. The Manufacturer shall demonstrate transparency of their manufacturing process by showing traceability of the product from origin of raw material through finished good.
3. 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.
4. The Manufacturer's certificate shall be supplied before product shipment. The certificate shall state that the furnished geotextile meets all requirements of specification as evaluated under the manufacturer's quality control program. A person having legal authority to bind the Manufacturer shall attest to the certificate.

Manufacturing Quality Control (MQC) test results for all specified properties shall be provided upon request.

DELIVERY, STORAGE, AND HANDLING

1. Ensure geotextile labeling, shipment and storage follows ASTM D 4873.
2. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
3. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
4. Wrap each geotextile roll with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
5. Maintain the protective wrapping during periods of shipment and storage. If the wrapping is damaged prior to installation, discard the outer wrap of geotextile material before installation.
6. Store geotextile rolls elevated off the ground and with adequately cover to protect them from the following: site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, surface water, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 160 deg F (71 deg C) and any other environmental condition that might damage the geotextile.

QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE

1. Geotextiles are subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.
2. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.

MATERIALS

Geotextile Separation Interlayer Fabric

The geotextile fabric shall meet the properties in Table Geotextile - 1.

Table Geotextile - 1

Property	Test Method	Units	Property Requirement
Geotextile Type	EN 13249 Annex F	---	Nonwoven, needle-punched geotextile, no thermal treatment (calendering or IR heat)
% U.S. Manufactured	(Manufacturer Certification of Production)	%	100
Color ¹	Visual Inspection	---	Uniform/nominally same color (black or white) ¹
Mass/Unit Area ^{2,3}	ASTM D 5261	oz/yd ²	15.0
Thickness @ 2 kPa Pressure ⁴	ASTM D 5199	mil	120
Thickness @ 20 kPa Pressure ⁴	ASTM D 5199	mil	100
Thickness @ 200 kPa Pressure ⁴	ASTM D 5199	mil	40
Ultimate Wide Width ² Tensile Strength	ASTM D 4595	lb/ft	685
Ultimate Wide Width ² Elongation (max.)	ASTM D 4595	%	130

Property	Test Method	Units	Property Requirement
Water Permeability in Normal Direction @ 20 kPa Pressure ⁴	ASTM D 5493	ft/sec	3.3 x 10 ⁻⁴
In-Plane Water Permeability @ 20 kPa Pressure ⁴	ASTM D 6574	ft/sec	1.6 x 10 ⁻³
In-Plane Water Permeability @ 200 kPa Pressure ⁴	ASTM D 6574	ft/sec	6.6 x 10 ⁻⁴
Weather Resistance ⁴	ASTM D 4355	% Strength Retained @ 500 hrs	70
Alkali Resistance ⁵	EN 13249, Annex B	%	> 97% Polyolefin
Peel Strength Geotextile to Concrete ^{4,6}	ASTM D 903	lbs per linear inch	4.2
Peel Strength Geotextile to Geotextile ^{4,6}	ASTM D 903	lbs per linear inch	4.2

Notes:

1. Specify color preference as desired. Note: Geotextile surface temperature should be below 90 degrees Fahrenheit (32 degrees Celsius) at time of paving (see Installation Using Adhesive 2.j on page 7 and Installation Using Nails With Washers 2.n on page 9). When paving during periods of warm or hot temperatures, selection of a white geotextile may eliminate the need for water misting to reduce geotextile surface temperature.
2. MARV – Minimum Average Roll Value
3. For overlays ≥ 5 inch thick. For overlays < 5 inches, geotextile interlayer weight may be evaluated at 13.3 oz/yd²
4. MTV – Minimum Test Value
5. Manufacturer Certification
6. Specification applicable when geotextile interlayer is being placed using an adhesive

Quality Control

- A. Manufacturing Quality Control (MQC): Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geotextile, at frequency in accordance with ASTM D 8102.
- B. All supplied geotextiles shall include certificates of analysis for all specified properties.

- C. Testing laboratories shall be compliant and certified to the ISO 9001:2008 quality system standards.

INSTALLATION

Installation of the geotextile fabric can be performed by using an adhesive, or nails with washers to ensure the geotextile remains in place and does not come loose, fold, or bulge.

Site Preparation

1. For new pavements on stabilized substructures and unbonded overlays, sweep the surface clean before placing geotextile interlayer and/or adhesive. Excessive debris may damage geotextile during installation and service.
2. For unbonded overlays:
 - a. Replace isolated areas of pavement where subgrade/subbase show evidence of active movement in the existing pavement. Repair the subgrade/subbase as necessary.
 - b. Fill any substantial voids greater than 2 in (5 cm) deep on the pavement surface with an approved material.
 - c. Joint deterioration with little or no faulting can be bridged with the overlay.
 - d. Use full-depth repairs at isolated spots where structural integrity needs restoring.

Installation Using Adhesive

1. Geotextile Interlayer Adhesive Application
 - a. Apply the adhesive to the existing pavement surface or milled surface before the placement of the geotextile.
 - b. Apply the adhesive continuously to the pavement around the perimeter of each geotextile roll/panel with a desired spray width of approximately 6 in (15 cm), or as specified.
 - c. Apply the adhesive to the edge of previously laid geotextile for all roll end and panel overlaps with a desired spray width of 6-8 in (15-20 cm), or as specified.
 - d. Spray a test pattern to determine the best distance from the surface required to achieve the desired spray width. Adjust/open the applicator spray flare fitting until the spray pattern is wide enough to achieve the desired width.
 - e. Apply a single, continuous coat of the adhesive in front of the installation of geotextile at a pace necessary to achieve the desired spray width.
 - f. When ambient temperatures are above 68 degrees Fahrenheit (20 degrees Celsius), allow adhesive to dry properly before bonding to geotextile. Dry time can vary depending on temperature, humidity and coat weight. Typical dry time is 1 to 5 minutes. To check for dryness, use the back of your fingernail to press into the adhesive and lift up. Any adhesive transfer or viscous stretching of the adhesive indicates that the adhesive requires more time to dry. If the adhesive feels tacky, but there is no transfer or stretching, the adhesive is ready for bonding geotextile. The adhesive should be covered and rolled with geotextile within one hour of application. Position geotextile carefully as a strong bond is made instantly upon contact.

- k. Place concrete pavement/overlay directly on top of the placed geotextile. If geotextile becomes wet, it may be paved over provided there is no ponded water. Care should be taken not to displace geotextile while trucks drive on it, dump concrete into the paving apparatus, or onto the geotextile. Trucks should release the emergency parking break when dumping into an advancing paver to prevent damage to geotextile. Trucks should avoid sharp turns, hard braking, and quick acceleration at all times. The concrete overlay should be placed according to the project plans.
- l. Place geotextile no more than five days before the paving process. Prolonged exposure to the elements may cause damage to geotextile. Do not allow construction equipment to track soil onto the geotextile. Clean off any excess sediment as it can impact drainage. Ensure water does not pond or deposit sediment on geotextile before concrete placement. Geotextile may be damp, but not soaked, during concrete placement.

Installation Using Nails With Washers

- 1. Geotextile Placement
 - a. Proceed with placement only after the surface is properly prepared and cleaned.
 - b. Roll the geotextile material onto the base or existing pavement surface, keeping the roll tight and minimizing wrinkles, kinks, and folds.
 - c. Overlap the edges of the geotextile by 8 inches +/- 2 inches (20 cm +/- 5 cm). No more than three layers should overlap at any point.
 - d. Extend geotextile past both edges of the pavement a minimum of 6 inches (15 cm), and may be tied into a longitudinal underdrain system to provide positive drainage.
 - e. Roll the geotextile out in a sequence that facilitates good overlapping, prevents folding or tearing by construction traffic, and minimizes the potential that the material will be disturbed by the paver.
 - f. Utilize temporary gaps in geotextile where trucks are crossing and making sharp turns.
- 2. Geotextile Fastening
 - a. Secure the geotextile to the underlying layer with nails placed through 2 to 2.75 inch (5-7 cm) galvanized washers or disks.
 - b. Secure initial geotextile roll end with nails with washers at 3 foot spacing (0.9 m).
 - c. Secure geotextile at 6 foot (1.8 m) centers or less in both transverse and longitudinal directions. Longitudinal edges may require 3 foot spacing for extra security, especially in windy conditions.
 - d. Secure geotextile roll end overlaps with nails with washers at 3 foot (0.9 m) spacings.
 - e. Verify all nail lengths for the type of existing pavement before installation begins. Normally, 0.75 inch (19 mm) nails for existing concrete pavements and 1.5 inch (38 mm) nails for asphalt or Cement Treated Base (CTB) substructures.
 - f. Test fastening guns and nails on the existing pavement prior to fabric installation to ensure the nails can be driven to their full depth.

- g. After evaluation, choose the fastener device that provides enough power to drive the selected nail into the existing pavement on a consistent basis.
- h. If a nail does not fully penetrate the existing pavement, drive another nail and washer next to it. Remove loose nails to avoid truck tire punctures.
- i. Use additional nails with washers as needed to ensure that the geotextile does not shift or fold before or during paving.
- j. If vehicle traffic is present on the road or slow paving is expected, place geotextile no more than 650 ft (200 m) before the paving process.
- k. If construction traffic is expected to travel on geotextile, avoid tight turns, sudden braking and acceleration, as this could damage or disturb the placed geotextile. Any public traffic should be controlled by flaggers or pilot cars and kept to a minimum.
- l. If geotextile is being placed through an intersection or other area of higher traffic volume, place geotextile immediately before the paving process. This eliminates damage due to the heavy traffic directly on geotextile. Repair any traffic damage to the geotextile using a new piece of geotextile.
- m. If damage due to wind uplift or haul trucks occurs, cut out and replace the geotextile with adequate nails with washers.
- n. Ensure the geotextile surface temperature is below 90 degrees Fahrenheit (32 degrees Celsius) at time of concrete placement to avoid heat stress and differential curing. Water misting can be used to reduce temperature.
- o. Place concrete pavement/overlay directly on top of the placed geotextile. If geotextile becomes wet, it may be paved over provided there is no ponded water. Care should be taken not to displace geotextile while trucks drive on it, dump concrete into the paving apparatus, or onto the geotextile. Trucks should release the emergency parking brake when dumping into an advancing paver to prevent damage to geotextile. Trucks should avoid sharp turns, hard braking, and quick acceleration at all times. The concrete overlay should be placed according to the project plans.
- p. Place geotextile no more than five days before the paving process. Prolonged exposure to the elements may cause damage to geotextile. Do not allow construction equipment to track soil onto the geotextile. Clean off any excess sediment as it can impact drainage. Ensure water does not pond or deposit sediment on geotextile before concrete placement. Geotextile may be damp, but not soaked, during concrete placement.

Measurement and Payment

Method of Measurement: The amount of pavement, shoulder, and/or base/subbase surface area covered in accordance with the specifications in square yards.

By the square yard, including overlaps, adhesive or nails with washers for fastening to the existing pavement, and wastage.

Basis of Payment: By square yard covered, including all overlaps, adhesive or nails with washers for fastening to the existing pavement, wastage, and all furnishing labor and equipment.

References

- NCPTC 2014, *Guide to Concrete Overlays: Sustainable Solutions for Resurfacing and Rehabilitating Existing Pavements (3rd Edition)*, National Concrete Pavement Technology Center, http://www.cptechcenter.org/technical-library/documents/Overlays_3rd_edition.pdf.