

This guide specification has been prepared by Propex Operating Company, LLC. (Propex) to assist design professionals in the preparation of a specification section covering woven geotextile for separation and stabilization between a base or subbase course and the underlying subgrade. It may be used as the basis for developing either a project specification or an office master specification. Since it has been prepared according to the principles established in the Manual of Practice published by The Construction Specifications Institute (CSI) including the use of section numbers and titles from the 2004 Edition of MasterFormat, this guide specification may be used in conjunction with most commercially available master specifications sections with minor editing.

The following should be noted in using this guide specification:

•Optional text requiring a selection by the user is enclosed within brackets, e.g.: “Section [01 33 00] [____].”

•Items requiring user input are enclosed within brackets, e.g.: “Section [____ - ____].”

•Optional paragraphs are separated by an “OR” statement, e.g.:

**** OR ****

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1 GENERAL

1.1 SECTION INCLUDES

A. Separation Geotextile (Subgrade CBR \geq 3):

1. This section is applicable to the use of a geotextile to prevent mixing of subgrade soil and an aggregate cover material (subbase, base, select fill, etc.).
2. This section may also apply to situations other than beneath pavements where separation of two dissimilar materials is required, but where water seepage through the geotextile is not a critical function.

B. Stabilization Geotextile (1 < Subgrade CBR < 3):

1. This section is applicable to the use of a geotextile in wet, saturated conditions to provide the coincident functions of separation and filtration. In some installations, the geotextile may also provide reinforcement.

1.2 RELATED SECTIONS

Edit the following paragraphs to coordinate with other sections of the Project Manual.

- A. Section [31 20 00 – Earth Moving] [_____].
- B. Section [32 12 16 – Asphalt Paving] [32 13 13 – Concrete Paving] [_____].

1.3 UNIT PRICES

Include the following article only for unit price contracts or lump sum contract with unit price adjustments. Delete for lump sum contracts.

- A. Method of Measurement: By the square meter (or square yard as indicated in contract documents) including seams, overlaps, and wastage.
- B. Basis of Payment: By the square meter (or square yard - as indicated in contract documents) installed.

1.4 REFERENCES

The following article assumes that the date of each reference standard will be the latest edition as of the date of the project specification. This provision must be defined in Division 1; coordinate with Division 1 statements.

- A. American Association of State Highway and Transportation Officials (AASHTO) “Standard Specification for Geotextile Specification for Highway Applications” Designation M 288-06
- B. AASHTO Test Standards:
 - 1. T 88 – Standard Test Method for Particle Size Analysis of Soils
 - 2. T 90 – Standard Test Method for Determining the Plastic Limit and Plasticity Index of Soils
 - 3. T 99 – Standard Practice for Determination of the Moisture Density Relations of Soils Using a 5.5 lb hammer and 12 in drop (Standard Proctor)
- C. American Society for Testing and Materials (ASTM):
 - 1. D 123 – Standard Terminology Relating to Geotextiles
 - 2. D 276 – Standard Test Method for Identification of Fibers in Textiles
 - 3. D 4354 - Practice for Sampling of Geosynthetics for Testing.
 - 4. D 4355 - Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
 - 5. D 4439 - Terminology for Geotextiles.
 - 6. D 4491 - Test Methods for Water Permeability of Geotextiles by Permittivity.
 - 7. D 4533 - Test Method for Index Trapezoid Tearing Strength of Geotextiles.
 - 8. D 4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - 9. D 4759 - Practice for Determining the Specification Conformance of Geosynthetics.
 - 10. D 4751 - Test Method for Determining Apparent Opening Size of a Geotextile.
 - 11. D 4873 - Guide for Identification, Storage, and Handling of Geotextiles.
- D. Federal Highway Administration (FHWA) - Geosynthetic Design and Construction Guidelines, Publication No. FHWA NHI-07-092, August 2008.
- E. Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).

1.5 DEFINITIONS

- A. *California Bearing Ratio (CBR)*: The ratio of (1) the force per unit area required to penetrate a soil mass with a 19 sq cm (3 sq in) circular piston (approximately 51 mm (2 in) diameter) at the rate of 1.3 mm / min (.05 in/min). To (2) that required for corresponding penetration of a standard material.
- B. *Maximum Average Roll Value (MaxARV)*: Property value calculated as typical plus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will be below the value reported.
- C. *Minimum Average Roll Value (MARV)*: Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
- D. *Typical Roll Value*: Property value calculated from average or mean obtained from test data.

1.6 SUBMITTALS

<i>Edit the following to coordinate with Division 1.</i>
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- A. Submit under provisions of Section [01 33 00] [____]:
 - 1. Certification:
 - a) 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.
 - b) The Manufacturer shall demonstrate transparency of their manufacturing process by showing traceability of the product from origin of raw material through finished good.
 - c) 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.
 - d) The manufacturer's certificate shall state that the furnished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.
 - 2. Manufacturing Quality Control (MQC) test results shall be provided upon request.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Geotextile labeling, shipment and storage shall follow ASTM D 4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap of geotextile material must be discarded before installation.
- F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the geotextile.

1.8 QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE

A. Geotextile:

1. Geotextiles shall be 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.

B. Sewn Seams (if required):

1. For seams that are to be sewn in the field, the Contractor shall provide at least a 2 meter (6 ft) length of sewn seam for sampling by the Engineer before the geotextile is installed.
2. For seams that are sewn in the factory, the Engineer shall obtain samples of the factory seams at random from and roll of geotextile that is to be used on the project.
3. If seams are to be sewn in both directions, samples of seams from both directions shall be provided.
4. For seams that are field sewn, the seams sewn for sampling shall be sewn using the same equipment and procedures as will be used for the production seams.
5. The seam assembly description shall be submitted by the Contractor along with the sample of the seam. The description shall include the seam type, sewing thread, and stitch density.

C. Sewing Thread (if required)

1. Sewing thread shall consist of high strength polypropylene or polyester (Nylon shall not be used).
2. The thread shall be of a contrasting color to the geotextile.

2 PRODUCTS

2.1 MANUFACTURERS

- A.** Propex Operating Company, LLC, Chattanooga, Tennessee, 37416 USA, Phone (800) 621-1273.

Edit the following to coordinate with Division 1.

- B.** Substitutions: Under provisions of Section [01 25 00] [_____].

2.2 MATERIALS

A. GEOTEX® 401:

1. The geotextile construction shall be a nonwoven, staple fiber, needlepunched, polypropylene geotextile; the fibers are needled together to form a stable network that retains dimensional stability relative to each other.
2. The geotextile should be resistant to UV degradation and biological and chemical environments normally encountered in soils.
3. The geotextile should meet the following Minimum Average Roll Values (MARV) for nonwoven geotextile:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D 4632	N (lbs)	534 (120)
Elongation	ASTM D 4632	percent	50

SECTION 31 32 19 [02343]
NONWOVEN GEOTEXTILE STABILIZATION AND SEPARATION IN ROADWAYS

CBR Puncture	ASTM D 6241	N (lbs)	1512 (340)
Trapezoidal Tear	ASTM D 4533	N (lbs)	222 (50)
Apparent Opening Size (Maximum Avg. Roll Value)	ASTM D 4751	mm (US Std. Sieve)	0.212 (70)
Permittivity	ASTM D 4491	sec ⁻¹	1.7
Water Flow Rate	ASTM D 4491	l/min/m ² (gpm/ft ²)	5704 (140)
UV Resistance (percent retained at 500 hours)	ASTM D 4355	percent	70

**** OR ****

B. GEOTEX® 601:

- The geotextile construction shall be a nonwoven, staple fiber, needlepunched, polypropylene geotextile; the fibers are needed together to form a stable network that retains dimensional stability relative to each other.
- The geotextile should be resistant to UV degradation and biological and chemical environments normally encountered in soils.
- The geotextile should meet the following Minimum Average Roll Values (MARV) for nonwoven geotextile:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D 4632	N (lbs)	712 (160)
Elongation	ASTM D 4632	percent	50
CBR Puncture	ASTM D 6241	N (lbs)	1824 (410)
Trapezoidal Tear	ASTM D 4533	N (lbs)	267 (60)
Apparent Opening Size (Maximum Avg. Roll Value)	ASTM D 4751	mm (US Std. Sieve)	0.212 (70)
Permittivity	ASTM D 4491	sec ⁻¹	1.5
Water Flow Rate	ASTM D 4491	l/min/m ² (gpm/ft ²)	4482 (110)
UV Resistance (percent retained at 500 hours)	ASTM D 4355	percent	70

**** OR ****

C. GEOTEX® 701:

- The geotextile construction shall be a nonwoven, staple fiber, needlepunched, polypropylene geotextile; the fibers are needed together to form a stable network that retains dimensional stability relative to each other.

2. The geotextile should be resistant to UV degradation and biological and chemical environments normally encountered in soils.
3. The geotextile should meet the following Minimum Average Roll Values (MARV) for nonwoven geotextile:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D 4632	N (lbs)	801 (180)
Elongation	ASTM D 4632	percent	50
CBR Puncture	ASTM D 6241	N (lbs)	2113 (475)
Trapezoidal Tear	ASTM D 4533	N (lbs)	334 (75)
Apparent Opening Size (Maximum Avg. Roll Value)	ASTM D 4751	mm (US Std. Sieve)	0.212 (70)
Permittivity	ASTM D 4491	sec ⁻¹	1.4
Water Flow Rate	ASTM D 4491	l/min/m ² (gpm/ft ²)	4278 (105)
UV Resistance (percent retained at 500 hours)	ASTM D 4355	percent	70

**** OR ****

D. GEOTEX® 801:

1. The geotextile construction shall be a nonwoven, staple fiber, needlepunched, polypropylene geotextile; the fibers are needed together to form a stable network that retains dimensional stability relative to each other.
2. The geotextile should be resistant to UV degradation and biological and chemical environments normally encountered in soils.
3. The geotextile should meet the following Minimum Average Roll Values (MARV) for nonwoven geotextile:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D 4632	N (lbs)	912 (205)
Elongation	ASTM D 4632	percent	50
CBR Puncture	ASTM D 6241	N (lbs)	2380 (535)
Trapezoidal Tear	ASTM D 4533	N (lbs)	356 (80)
Apparent Opening Size (Maximum Avg. Roll Value)	ASTM D 4751	mm (US Std. Sieve)	0.180 (80)
Permittivity	ASTM D 4491	sec ⁻¹	1.4
Water Flow Rate	ASTM D 4491	l/min/m ² (gpm/ft ²)	4074 (100)

UV Resistance (percent retained at 500 hours)	ASTM D 4355	percent	70
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2.3 GEOTEXTILE QUALITY ASSURANCE

A. Product Marking

1. All geotextile products shall be printed at a minimum frequency of once per every 5 meters.
2. Printing shall include:
 - a) Name of source manufacturing facility
 - b) Geotextile product name as listed with AASHTO/NTPEP
 - c) AASHTO M288 class(es) that product meets
3. Additionally, labels should be affixed to the exterior of the packaged roll to include:
 - a) Name of source manufacturing facility
 - b) Geotextile product name as listed with AASHTO/NTPEP
 - c) AASHTO M288 class(es) that product meets
 - d) Date of manufacture

B. Quality Control Testing

1. All supplied geotextiles shall be tested for quality control in a tested laboratory accredited through the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP)
2. All supplied geotextiles shall include certificates of analysis for all specified properties.
3. All testing laboratories shall maintain Quality Management Systems (QMS) certified compliant to the AASHTO/GTX Work Plan for Evaluation of Geotextile Materials for Highway Applications
4. Testing laboratories shall be compliant and certified to the ISO 9001:2008 quality system standard.

C. Manufacturing Facilities

1. The source manufacturing facility for supplied geotextiles shall maintain audited compliance through AASHTO representative auditors for Quality Management System Processes for:
 - a) Organization and Organizational Policies
 - b) Product Marking and Labeling
 - c) Manufacturing Process and Documentation Control
 - d) Quality Control of Raw Materials
 - e) Quality Control Inspection, Measurement, and Testing for Geotextile Products
 - f) Quality Control Personnel – Training and Competency Evaluation
 - g) Statistical Analysis of Test Results
 - h) Resolution of Non-Conforming Product of Test Results
 - i) Retention of Test Results and Product Traceability
 - j) Quality Control Testing Facilities
 - k) Marking, Storage, Shipping, and Handling of Finished Geotextile
 - l) Internal Quality Audits of Each Plant Producing Product
2. Source manufacturing facilities shall be compliant and certified to the ISO 9001:2008 quality system standard
3. All manufacturing facilities shall be located within the United States or US territories.

3 EXECUTION

3.1 PREPARATION

- A. Clear, grub, and excavate/fill installation site to design grade. Remove topsoil, vegetation, and other unsuitable materials.
- B. Soft spots and unsuitable areas shall be identified during site preparation or subsequent proof rolling. These areas shall be excavated and backfilled with select materials and compacted using normal procedures.

3.2 INSTALLATION

- A. The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic.
- B. Adjacent geotextiles rolls shall be overlapped, sewn or joined as required below:

Subgrade CBR	Minimum Overlap
Greater than 3	300 - 450 mm (12 - 18 in)
1 - 3	600 - 1000 mm (24 - 36 in)
0.5 - 1	1000 mm (36 in) or sewn
Less than 0.5	Sewn
All roll ends	1000 mm (36 in) or sewn

- C. When sewn seams are required, the seam strength, as measured by ASTM D4632 shall be equal to or greater than 90 percent of the specified grab strength.
- D. On curves, the geotextile may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and held in place by pins, staples, or piles of fill or rock.
- E. Prior to covering, the geotextile shall be inspected by a certified inspector of the Engineer to ensure that it has not been damaged during installation.
- F. Damaged areas, as identified by the Engineer, shall be repaired immediately by covering the damaged area with a geotextile patch that extends an amount equal to the required overlap beyond the damaged area.
- G. The subbase shall be placed by end dumping onto the geotextile, or over previously placed subbase aggregate such that at least the minimum specified lift thickness shall be between the construction equipment tires or tracks and the geotextile at all times.
- H. Pretensioning Geotextile:
 - 1. Proof roll with heavily loaded, rubber-tired vehicle. Wheel load of truck shall be equivalent to maximum expected for site. Vehicle to make at least four passes over first lift in each area of site.
 - 2. Once design aggregate has been placed, use roadway prior to paving to prestress geotextile-aggregate system in key areas.
- I. If required, staple or pin geotextile at overlaps to maintain position during construction activities. Use 250 to 300 mm (10 to 12 in) long nails placed at minimum 15 m (50 ft) on center for parallel rolls and 1.5 m (5 ft) on center for roll ends.

- J. Do not place overlaps along anticipated primary wheel path locations. Place overlaps at end of rolls in direction of aggregate placement with previous roll on top.
- K. When geotextile intersects an existing pavement area, extend geotextile to edge of old system. For widening or intersecting existing roads where geotextiles have been used, anchor geotextile at roadway edge.
- L. Compact first lift of base aggregate with a tracking dozer and then compact with smooth-drum vibratory roller to obtain minimum compacted density.
- M. Compaction of permeable bases shall meet specified requirements.
- N. Perform construction parallel to road alignment.
- O. Fill ruts formed during construction to maintain adequate cover over geotextile. Do not blade ruts down.
- P. Place remaining base aggregate in lifts not exceeding 250 mm (10 in) in loose thickness and compact to specified density.

3.3 PROTECTION

- A. Atmospheric exposure of the geotextile to the elements following laydown shall be limited to 14 days to prevent damage.
- B. Equipment may operate on roadway without aggregate for geotextile installation under permeable bases if subgrade is of sufficient strength.
 - 1. For extremely soft soils, use lightweight construction vehicles for access on first lift.
 - 2. Limit construction vehicles in size and weight to limit rutting in initial lift to 75 mm (3 in).
 - 3. If rut depths exceed 75 mm (3 in), decrease construction vehicle size or weight or increase lift thickness.
- C. Turning not permitted on first lift of base aggregate. Construct turnouts at roadway edge to facilitate construction.

END OF SECTION