



SKAPS INDUSTRIES

DROP-IN SPECIFICATIONS GEOTEXTILE SEPARATION/ STABILIZATION

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1. GENERAL

1.1 SECTION INCLUDES

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

1. This specification 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 ($1 < \text{Subgrade CBR} < 3$):

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 UNIT PRICES

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.

1.3 REFERENCES

A. AASHTO Test Standards:

T 88 – Standard Test Method for Particle Size Analysis of Soils

T 90 – Standard Test Method for Determining the Plastic Limit and Plasticity Index of Soils

B. 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.
- C. Federal Highway Administration (FHWA) - Geosynthetic Design and Construction Guidelines, Publication No. FHWA NHI-07-092, August 2008

1.4 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.

1.5 SUBMITTALS

A. CERTIFICATION:

1. Prior to material delivery to project site, the contractor shall provide the engineer with a written certification or manufacturers quality control data which displays that the geotextile meets or exceeds minimum average roll values (MARV) specified herein.



2. The contractor shall submit, if required by the engineer, manufacturer's quality control manual for the geotextile to be delivered to the site.
3. The Manufacturer shall demonstrate transparency of their manufacturing process by showing traceability of the product from origin of raw material through finished good.
4. 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.
5. 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.
6. Manufacturing Quality Control (MQC) test results shall be provided upon request.

1.6 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°C (160°F) and any other environmental condition that might damage the geotextile.



2. PRODUCTS

2.1 MANUFACTURERS

- A. All rolls of the geotextile shall be identified with permanent marking on the roll or packaging, with the manufacturers name, product identification, roll number and roll dimensions.

2.2 GENERAL REQUIREMENTS

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

Table 1– Required Properties, Test Methods and Values for SKAPS Nonwoven Geotextiles Used For Separation/Stabilization

Property	Test Method ASTM	Units	Use Type 1 where installation stresses are severe (Harsh Installation)			
			GT116	GT112	GT110	GT180
Grab Tensile Strength	D 4632	lbs (kN)	380 (1.690)	300 (1.334)	250 (1.112)	205 (0.911)
Elongation	D 4632	%	50	50	50	50
Trapezoidal Tear	D 4533	lbs (kN)	145 (0.644)	115 (0.511)	100 (0.444)	85 (0.378)
CBR Puncture	D 6241	lbs (kN)	1080 (4.804)	850 (3.780)	700 (3.113)	535 (2.370)
Apparent Opening Size	D 4751	U.S Sieve (mm)	100 (0.150)	100 (0.150)	100 (0.150)	80 (0.180)
Permittivity	D 4491	sec ⁻¹	0.70	1.00	1.20	1.35
Water Flow Rate	D 4491	gpm/ft ² (l/min/m ²)	50 (2035)	75 (3055)	80 (3251)	90 (3657)
UV Resistance	D 4355	%/hrs	70/500		70/500	



Property	Test Method ASTM	Units	Use Type II where installation stresses are not as severe as in Type I applications (Medium Installation)	
			GT170	GT160
Grab Tensile Strength	D 4632	lbs (kN)	180 (0.800)	160 (0.711)
Elongation	D 4632	%	50	50
Trapezoidal Tear	D 4533	lbs (kN)	75 (0.333)	60 (0.267)
CBR Puncture	D 6241	lbs (kN)	475 (2.113)	410 (1.823)
Apparent Opening Size	D 4751	U.S Sieve (mm)	70 (0.212)	70 (0.212)
Permittivity	D 4491	sec ⁻¹	1.40	1.50
Water Flow Rate	D 4491	gpm/ft ² (l/min/m ²)	100 (4074)	110 (4480)
UV Resistance	D 4355	%/hrs	70/500	

Property	Test Method ASTM	Units	Use Type III where installation stresses are not as severe as in Type II applications (Less Severe Installation)	
			GT142	
Grab Tensile Strength	D 4632	lbs (kN)	120 (0.533)	
Elongation	D 4632	%	50	
Trapezoidal Tear	D 4533	lbs (kN)	50 (0.222)	
CBR Puncture	D 6241	lbs (kN)	340 (1.512)	
Apparent Opening Size	D 4751	U.S Sieve (mm)	70 (0.212)	
Permittivity	D 4491	sec ⁻¹	1.70	
Water Flow Rate	D 4491	gpm/ft ²	120 (4885)	
UV Resistance	D 4355	%/hrs	70/500	



2.3 GEOTEXTILE QUALITY ASSURANCE

A. Product Marking

1. 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 in-house testing facilities as per required standard.
2. All supplied geotextiles shall include certificates of analysis for all specified properties.
3. Geotextile properties, other than Ultraviolet Stability shall be tested by NTPEP to verify conformance with this specification.
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. 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. Pre-tensioning 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