

# **GRI-GT13(b) Specification Geotextile Separation for Roadways (ISO Test Method Based)**

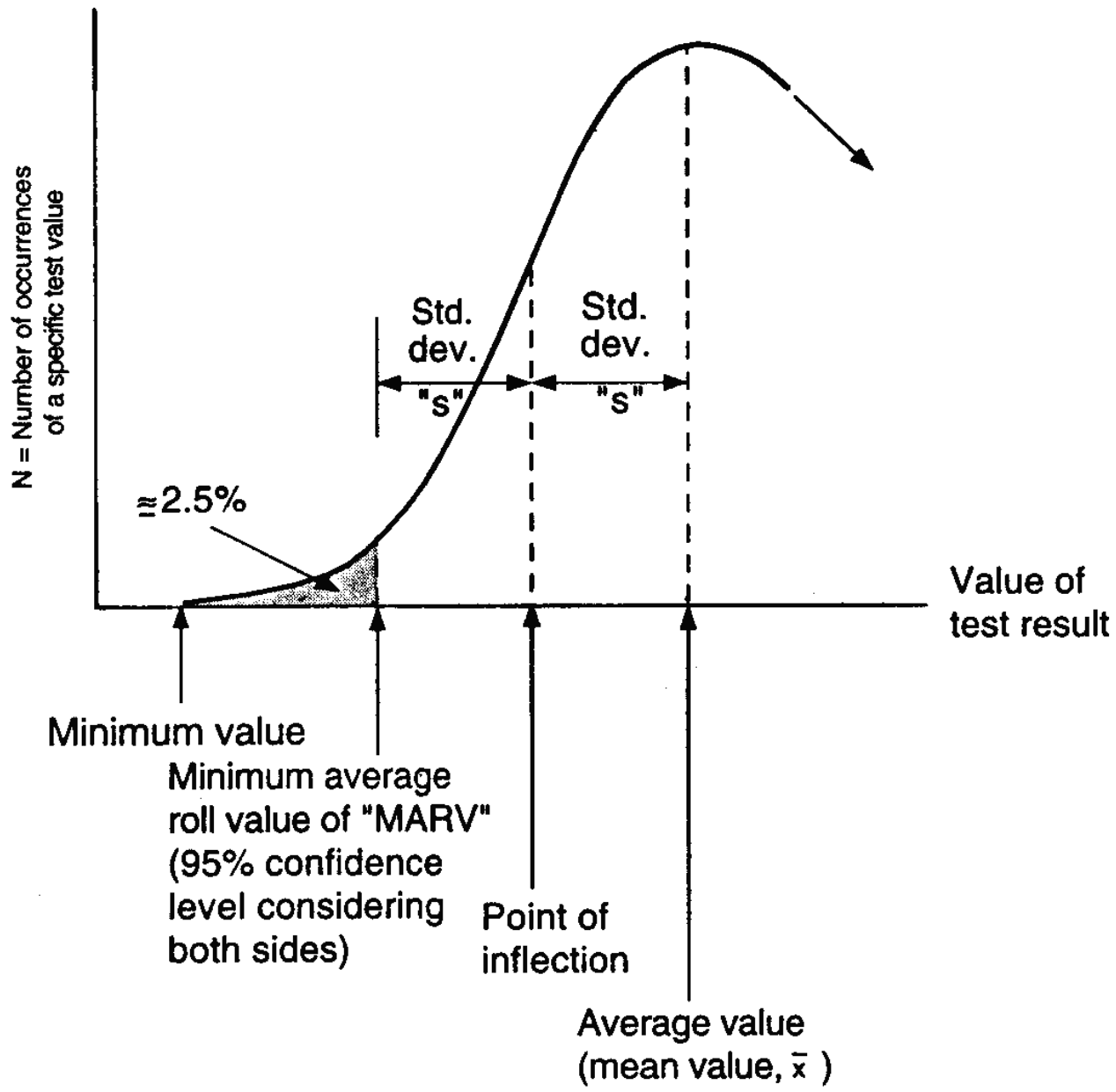
- **placed between subgrade soil and an overlying aggregate layer**
- **separation prevents mixing and intrusion**
- **meant for firm subgrades; e.g., paved roads**
- **three levels of installation survivability**
- **survivability guide is also included**
- **augments AASHTO M288 specification**

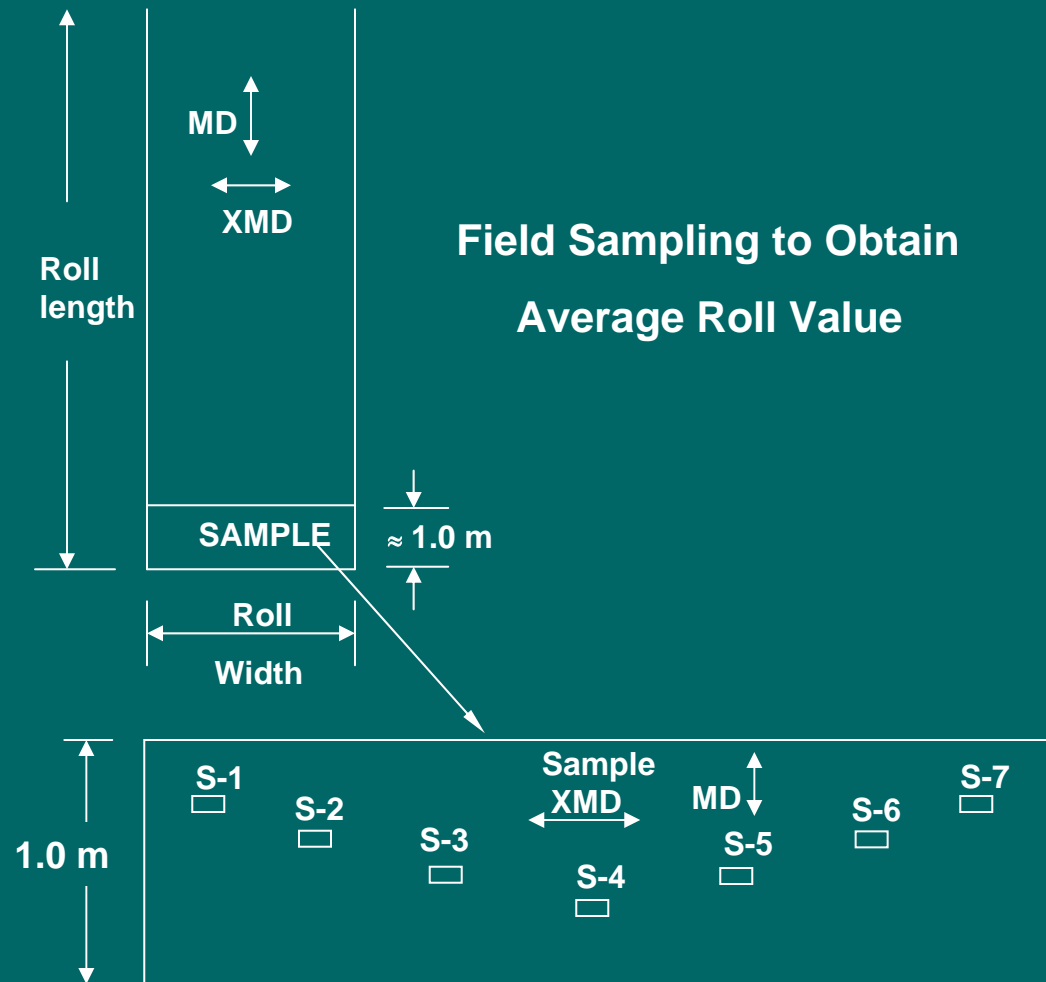
# Preliminary Comments

- includes wovens and nonwovens
- silent on type of polymer
- subgrade evaluated using CBR-test value; i.e., CBR > 3.0 (soaked) or CBR > 8.0 (unsoaked)
- values are MARV; except AOS (its MaxARV) and UV (its min. ave.)

# Regarding MARV

- minimum average roll value
- accommodates variation in GT manufacturing properties
- statistically it's the " $\mu-2\sigma$ " value
- MaxARV is the " $\mu+2\sigma$ " value
- procedure shown in next screens





Take Specimens from above Sample and Test as Required

Test Number	Roll Number					
	1	2	3	4	5	6
1	643N	627N	637N	642N	652N	637N
2	627	615	643	646	641	624
3	652	621	628	658	639	631
4	629	616	662	641	657	620
5	632	619	646	635	642	618
6	641	621	633	642	651	633
7	<u>662</u>	<u>622</u>	<u>619</u>	<u>658</u>	<u>641</u>	<u>641</u>
Average =	641	<b>620</b>	638	646	646	629

↑ This is MARV Value!

# Test Properties Included

1. grab tensile strength
2. trouser tear strength
3. CBR puncture strength
4. permeability (flow rate)
5. apparent opening size
6. UV stability by Xenon Arc

# 1. Grab Tensile Response

- follows ISO 13934-2
- 10 specimens MD & XMD across width
- 100 mm wide; gripped in center 25 mm
- must avoid slippage or grip failure
- record maximum strength in kN
- elongation is not included
- develop MARV for strength and compare to spec





**ISO 13934-2- Grab Tensile Test  
[Evaluates Strength (and Elongation) at Failure]**

## 2. Trouser Tear Strength

- follows ISO 13937-2
- tear propagates across specimen
- maximum value is recorded
- 10 specimens in MD and XMD across roll width
- take average value of lowest
- develop MARV and compare to specification value



**ISO 13937-2 Trouser Tear**

## 3. CBR Puncture Strength

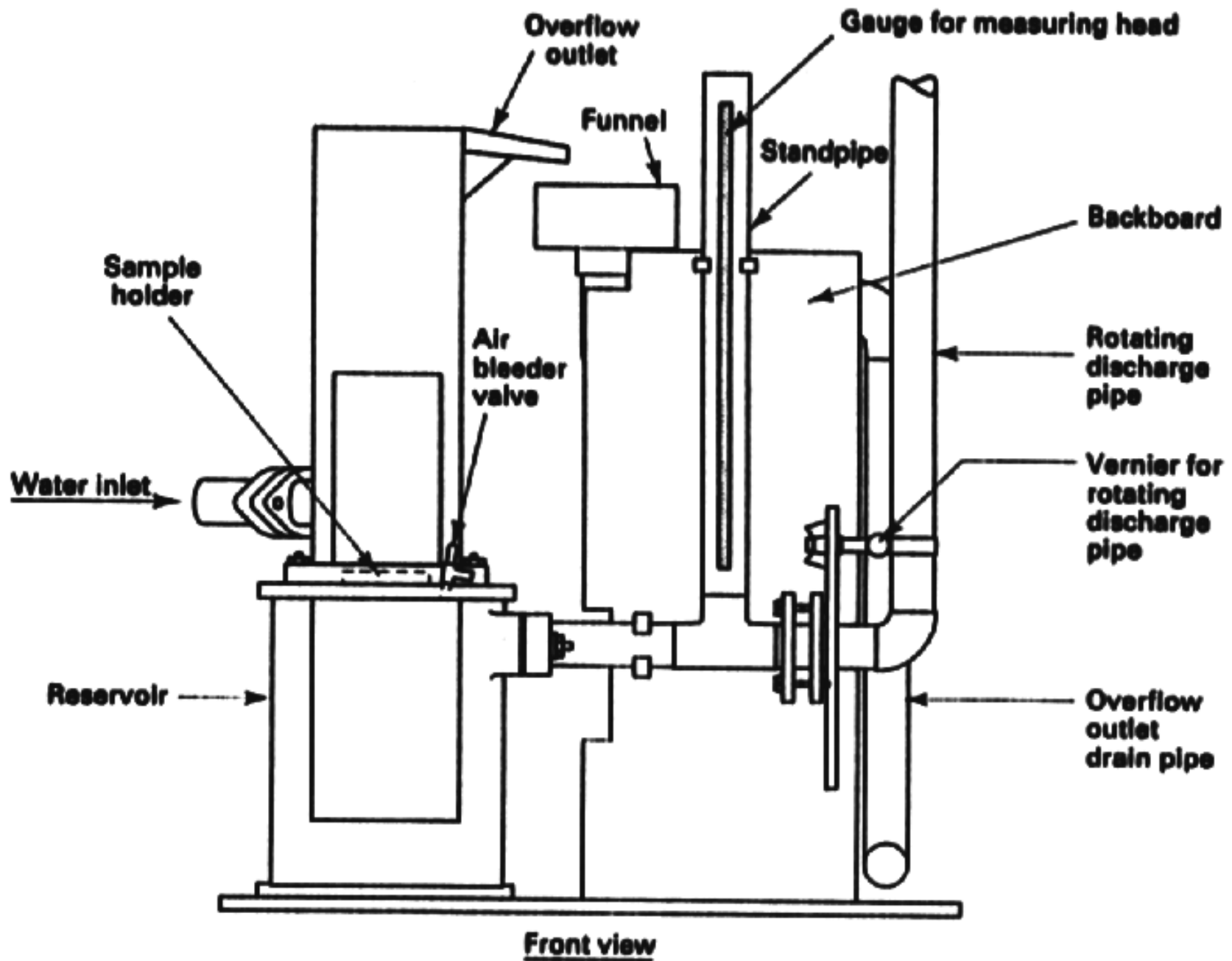
- California Bearing Ratio (CBR) is a soil strength test adopted for geosynthetics
- follows ISO 12236 using the same device.... modified with flanges
- probe is 50 mm diameter
- container is 150 mm diameter
- 10 specimens across roll width
- puncture strength is obtained
- develop MARV and compare to spec



**ISO 12236 - Puncture (CBR) Strength**  
**[Evaluates Strength at Rupture (and Accompanying Deformation)]**

## 4. Permeability (Water Flow Rate)

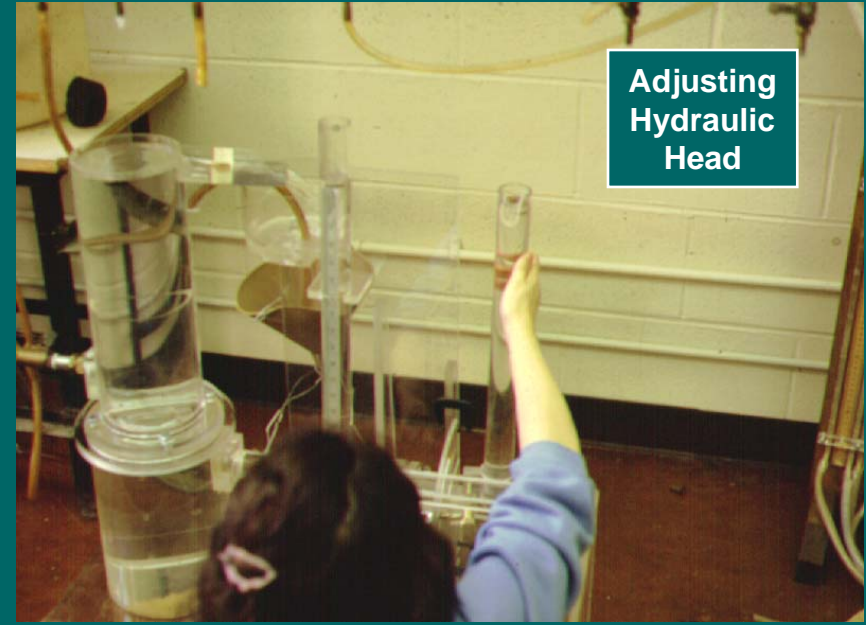
- follows ISO 11058
- uses deaired water ( $\leq 6$  ppm dissolved oxygen)
- measures flow rate/unit area
- constant head of 50 mm results in permittivity,  $\psi = (k)(t)$
- value must be  $\geq 0.01 \text{ sec}^{-1}$



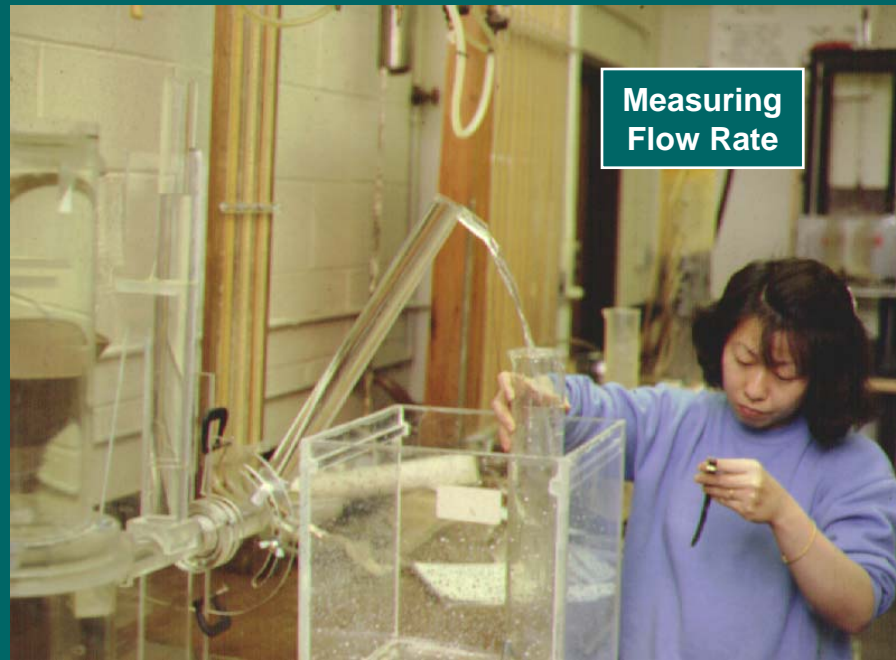
ISO 11058 – Water Flow Rate (Permeability) Device



Specimen  
Being  
Placed



Adjusting  
Hydraulic  
Head



Measuring  
Flow Rate



## 5. Apparent Opening Size

- its dry bead sieving, per ISO 12956
- AOS is often called EOS
- it's a maximum value, i.e., "MaxARV"
- converted to either  $O_{95}$  in mm, or equivalent U. S. sieve size
- values must be  $\leq 0.50$  mm
- this is equivalent to #30 sieve size



**Bottom  
Pan With  
Beads That  
Passed Fabric**

## 6. Ultraviolet Resistance

- follows EN 12224 (Xenon Arc)
- 500 hours exposure
- cycled at 90 min. light; 30 min. light and water spray
- 50 mm strip tensile
- 5 MD and 5 XMD and values averaged together
- min. ave.  $\geq 50\%$  strength retained



Typical  
Xenon Arc  
Weatherometer



Interior Chamber  
of Xenon Arc  
Weatherometer

**SI METRIC UNITS**

**Table 1(a) – Geotextile Properties Class 1 (High Survivability)**

Property <sup>(1)</sup>	ISO Test Method	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	13934-2	N	1250	800
Trouser Tear Strength	13937-2	N	425	300
CBR Puncture Strength	12236	N	2800	2000
Permeability	11058	m/sec	0.01	0.01
Apparent Opening Size	12956	micron	500	500
Ultraviolet Stability <sup>(2)</sup>	EN 12224	% Ret. @ 500 hrs	80	80

**Table 1(b) – Geotextile Properties Class 2 (Moderate Survivability)**

Property <sup>(1)</sup>	ISO Test Method	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	13934-2	N	1000	630
Trouser Tear Strength	13937-2	N	340	210
CBR Puncture Strength	12236	N	2250	1400
Permeability	11058	m/sec	0.01	0.01
Apparent Opening Size	12956	micron	500	500
Ultraviolet Stability <sup>(2)</sup>	EN 12224	% Ret. @ 500 hrs	70	70

**Table 1(c) – Geotextile Properties Class 3 (Low Survivability)**

Property <sup>(1)</sup>	ISO Test Method	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	13934-2	N	750	450
Trouser Tear Strength	13937-2	N	250	150
CBR Puncture Strength	12236	N	1700	1000
Permeability	11058	m/sec	0.01	0.01
Apparent Opening Size	12956	micron	500	500
Ultraviolet Stability <sup>(2)</sup>	EN 12224	% Ret. @ 500 hrs	60	60

Notes:

- (1) All values are minimum average roll values (MARV) except AOS which is a maximum average roll value (MaxARV) and UV stability which is a minimum average value.
- (2) Evaluation to be on 50 mm strip tensile specimens after 500 hours exposure.

**Table 2(a) – Geotextile Properties Class 1 (High Survivability)**

Property <sup>(1)</sup>	ISO Test Method	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	13934-2	lb	280	180
Trouser Tear Strength	13937-2	lb	95	70
CBR Puncture Strength	12236	lb	630	440
Permittivity	11058	m/sec	0.01	0.01
Apparent Opening Size	12956	micron	500	500
Ultraviolet Stability <sup>(2)</sup>	EN 12224	% Ret. @ 500 hrs	80	80

**Table 2(b) – Geotextile Properties Class 2 (Moderate Survivability)**

Property <sup>(1)</sup>	ISO Test Method	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	13934-2	lb	225	140
Trouser Tear Strength	13937-2	lb	75	50
CBR Puncture Strength	12236	lb	500	320
Permittivity	11058	m/sec	0.01	0.01
Apparent Opening Size	12956	micron	500	500
Ultraviolet Stability <sup>(2)</sup>	EN 12224	% Ret. @ 500 hrs	70	70

**Table 2(c) – Geotextile Properties Class 3 (Low Survivability)**

Property <sup>(1)</sup>	ISO Test Method	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	13934-2	lb	170	100
Trouser Tear Strength	13937-2	lb	55	35
CBR Puncture Strength	12236	lb	380	230
Permittivity	11058	m/sec	0.01	0.01
Apparent Opening Size	12956	micron	500	500
Ultraviolet Stability <sup>(2)</sup>	EN 12224	% Ret. @ 500 hrs	60	60

Notes:

- (1) All values are minimum average roll values (MARV) except AOS which is a maximum average roll value (MaxARV) and UV stability which is a minimum average value.
- (2) Evaluation to be on 50 mm strip tensile specimens after 500 hours exposure.

**Table 3 - Required Degree of Survivability as a Function of Subgrade Conditions, Construction Equipment and Lift Thickness  
(Class 1, 2 and 3 Properties are Given in Table 1 and 2; Class 1 + Properties are Higher than Class 1 but Not Defined at this Time)**

	Low ground-pressure equipment ≤ 25 kPa (3.6 psi)	Medium ground-pressure equipment > 25 to ≤ 50 kPa (>3.6 to ≤ 7.3 psi)	High ground-pressure equipment > 50 kPa (> 7.3 psi)
Subgrade has been cleared of all obstacles except grass, weeds, leaves, and fine wood debris. Surface is smooth and level so that any shallow depressions and humps do not exceed 450 mm (18 in.) in depth or height. All larger depressions are filled. Alternatively, a smooth working table may be placed.	Low (Class 3)	Moderate (Class 2)	High (Class 1)
Subgrade has been cleared of obstacles larger than small to moderate-sized tree limbs and rocks. Tree trunks and stumps should be removed or covered with a partial working table. Depressions and humps should not exceed 450 mm (18 in.) in depth or height. Larger depressions should be filled.	Moderate (Class 2)	High (Class 1)	Very High (Class 1+)
Minimal site preparation is required. Trees may be felled, delimited, and left in place. Stumps should be cut to project not more than ± 150 mm (6 in.) above subgrade. Fabric may be draped directly over the tree trunks, stumps, large depressions and humps, holes, stream channels, and large boulders. Items should be removed only if placing the fabric and cover material over them will distort the finished road surface.	High (Class 1)	Very high (Class 1+)	Not recommended

\*Recommendations are for 150 to 300 mm (6 to 12 in.) initial lift thickness. For other initial lift thicknesses:

- 300 to 450 mm (12 to 18 in.): reduce survivability requirement one level;
- 450 to 600 mm (18 to 24 in.): reduce survivability requirement two levels;
- > 600 mm (24 in.): reduce survivability requirement three levels

Note 1: While separation occurs in every geotextile application, this pavement-related specification focuses on subgrade soils being "firm" as indicated by CBR values higher than 3.0 (soaked) or 8.0 (unsoaked).

Source: Modified after Christopher, Holtz, and DiMaggio