

## **RTA QA SPECIFICATION R63**

### **GEOTEXTILES (SEPARATION AND FILTRATION)**

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## RTA QA SPECIFICATION R63

### GEOTEXTILES (SEPARATION AND FILTRATION)

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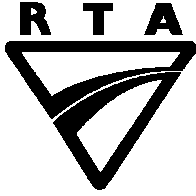
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#### REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 0		New specification. Issue for industry comment and trials.	GM, PSP	04.02.97
Ed 1/Rev 1	1.3, 2.1, 2.2, 2.3 2.3, 3 Tables R63.1 to .6 3, Annexure R63/1 5	Minor editorial changes  Woven types, other than slit film woven types permitted.  Tables relocated to provide for RTA to specify classes.  Applies where classes are not specified.  Location for each class to be notified.	GM, RNIC (W Ho)	13.03.97
Ed 1/Rev 2	7.2	"R63.5" changes to "R63.2" in paragraphs 1 and 7.	GM, RNIC (J Woodward)	08.01.98

<b>Ed/Rev Number</b>	<b>Clause Number</b>	<b>Description of Revision</b>	<b>Authorised By</b>	<b>Date</b>
Ed 1/Rev 3	1.2, 5 5 7.2	ASTM D5261-96 added. Production control testing changed. Minimum frequency of testing reduced.	GM, RNIC	13.03.98
Ed 1/Rev 4	1.2, 1.4 1.4, 2.3 2.3, 3 2.3 3, Anx 63/1 Annex R63/4	AS1289.C6.1 now AS1289.3.6.1 D50s changed to D15s Filtration Class 5 added NOTE 5 added Changes to G1, G2(A&B), G3 New annexure listing Identified Records	GM, RNIC	28.09.99
Ed 1/Rev 5	Table R63.3	Note 1 added.	GM, RNIC	25.09.01
Ed 2/Rev 0	1.1 1.2 1.4 2.1 2.2 2.3	New Edition Scope expanded NFG 38017 Hydrodynamic Sieve Test deleted and replaced by ISO 12956 Coefficient of Uniformity (Cu) defined Particle Sieve Size ( $D_n$ ) defined Recycled materials permitted in geotextile manufacture complying with specification requirements Geotextile strength classes refer to survivability requirements Table R63.1 moved to Annexure R63/5 and renamed Table R63A5.2 Table R63.2 moved to Annexure R63A5 and incorporated with Table R63A5.1 Under G3 applications, filtration requirements now refer to three soil categories in Table R63A5.1	GM, RNIC	30.09.02

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 2/Rev 0 cont'd	3	<p>Table R63.3 moved to Annexure R63/1</p> <p>Application Class G2B deleted</p> <p>Filtration Classes relabelled in Table R63A5.1 for applications</p> <p>Tables R63.4 to R63.6 amalgamated with Table R63A5.1</p>		
	6.1	<p>Geotextile installation now refer to Contract Documents and Drawings</p> <p>Installation requirements to avoid damage improved</p>		
	6.2	<p>Table R63.7 renamed as Table R63.1</p> <p>Minimum layer thickness now refer to two categories of fill particle size : 150mm and 150 to 400mm</p>		
	6.3	<p>Sewing methods now permitted as an alternative to overlaps</p>		
	6.4	<p>Contractor now required to demonstrate that the construction process will not damage geotextile. Site trials may be requested.</p>		
	7.2	<p>Geotextile strength and filtration requirements to be verified by on site sampling</p>		



QA SPECIFICATION **R63**

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# GEOTEXTILES (SEPARATION AND FILTRATION)

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RNIC-QA-R63

VERSION FOR: DATE:
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# RTA QA SPECIFICATION R63

## GEOTEXTILES (SEPARATION AND FILTRATION)

### REVISIONS TO EDITION 2

This document is based on RTA Specification R63 Edition 2 Revision 0 — September 2002.

All revisions to RTA R63 Ed2/Rev 0 (other than minor editorial and project specific changes) have been indicated by a vertical line in the margin as shown here.

### PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. *Additional Text*.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

## 1 GENERAL

### 1.1 SCOPE

This specification describes the physical, material and construction requirements for geotextiles for use as separation and/or filtration elements in earthworks and road construction. These include local bridging layers and working platforms.

Applications using high strength geotextile basal reinforcement under embankments on soft ground to improve global stability are outside the scope of this specification.

Geotextile properties for the intended application require a knowledge of the engineering characteristics of site soils such as foundation strength in terms of CBR, grading and plasticity, fill particle size and placement method.

### 1.2 REFERENCES

Unless otherwise specified the applicable issue of a reference document, other than an RTA Specification, must be the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (eg AS 3706.1). For convenience, the full titles are given below:

**Australian Standards**

AS 1289.3.6.1	Soil Classification Tests - Determination of the Particle Size Distribution of a Soil - Standard Method of analysis by sieving
AS 2001.2.3.2	Physical tests - Determination of Maximum Force Using the Grab Method
AS 3706.1	General Requirements, Sampling, Conditioning, Basic Physical Properties and Statistical Analysis
AS 3706.3	Determination of Tearing Strength - Trapezoidal Method
AS 3706.4	Determination of Burst Strength - California Bearing Ratio ( CBR ) Plunger Method
AS 3706.5	Determination of Puncture Resistance - Drop Cone Method (revised 1994 )
AS 3706.7	Determination of Pore Size Distribution - Dry Sieving Method
AS 3706.9	Determination of Permittivity
AS 3706.11	Determination of Durability - Resistance to Degradation by Light and Heat
ISO 9001	AS/NZS ISO 9001 Quality management systems - Requirements

**Other Standards**

ISO 12956	Determination of Characteristic Opening Size (Wet Sieving Method)
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**RTA Specification**

RTA Q	Quality System
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**ASTM Test Methods**

ASTM D5261-96	Test method for measuring Mass per Unit Area of Geotextile
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**1.3 QUALITY SYSTEM**

The Supplier must establish and maintain a Quality System complying with ISO 9001 as a means of ensuring that the product conforms to the Specification requirements.

When directed, the Contractor must supply copies of second or third party audit reports confirming that the manufacturer's quality system complies with the specified Quality Standard and the quality system has been implemented.

The Quality System must include product certification and periodic verification of process and product conformity during production.

**1.4 DEFINITIONS**

The following definitions must apply in respect of terms used to specify the physical and mechanical properties of geotextiles :

1. EOS = Equivalent opening size defined as  $O_{95}$  taken to be the mean value of the test results in accordance with AS 3706.1 , AS 3706.7 or ISO 12956.
2.  $\Psi$  = Permittivity (  $s^{-1}$  ) determined in accordance with AS 3706.9
3.  $Q_{100}$  = Flow rate under 100 mm constant head conditions in accordance with AS 3706.9

4.  $C_u$  = Coefficient of Uniformity of Soil defined as  $D_{60s}/D_{10s}$
5.  $D_n$  = Nominal Maximum Fill or Soil Particle Size defined as the sieve through which n % by mass of the soil being sieved will pass when tested in accordance with AS 1289.3.6.1
6.  $D_{ns}$  = Nominal Maximum Soil Particle Size defined as the sieve through which n % by mass of the soil being sieved will pass when tested in accordance with AS 1289.3.6.1

## 2 MATERIAL REQUIREMENTS

### 2.1 GENERAL

The fibres of the geotextile and thread used in joining lengths must consist of long chain synthetic polymers composed of at least 95% by mass of polyolefins or polyesters.

The geotextile filaments must be rot proof, chemically stable and must have low water absorbency. Filaments must resist delamination and maintain their relative dimensional stability in the geotextile.

**Non woven geotextiles** must have filaments bonded by needle punching, heat or chemical bonding processes.

**Woven geotextiles** must have filaments interlaced in two sets, mutually at right angles. One set must be parallel to the longitudinal direction of the geotextile.

Geotextiles must be free of any flaws which may have an adverse effect on the physical and mechanical properties of the geotextile.

Geotextiles must be stabilised against ultraviolet radiation such that when tested in accordance with AS 3706.11 must have retained strength of at least 50% after 672 hours of test exposure.

Recycled materials may be used under controlled conditions in the manufacture of the geotextile. Each batch of geotextile must conform with the requirements of this Specification, be identified on the certificate of compliance and must be homogeneous, particularly with respect to the content of recycled material.

### 2.2 GEOTEXTILE SURVIVABILITY STRENGTH CLASS REQUIREMENTS

Geotextiles for the applications of separation and/or filtration must meet the relevant requirements of Table R63A5.2.

The geotextile survivability requirements must consider the subgrade condition against which the geotextile will be placed, fill material particle size, fill placement and construction process.

## **2.3 GEOTEXTILE FILTRATION CLASS REQUIREMENTS**

Geotextiles must meet the relevant filtration requirements of Table R63A5.1 for each application.

## **3 APPLICATION CATEGORIES**

Unless otherwise specified, the Contractor must select and use materials complying with Annexure R63/5, Table R63A5.1.

Geotextile strength and filtration requirements are set out in Table R63A5.1 and require a knowledge of site soils including gradings, plasticity and strength characteristics and the critical functions of the geotextile such as protecting proposed drainage blankets or layers.

## **4 STORAGE, PACKAGING AND IDENTIFICATION**

Geotextiles must be stored under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid any damage prior to installation.

Geotextiles must not be stored directly on the ground or in any manner in which they may be affected adversely by heat, dirt or damage. The method of storage must be in accordance with any other recommendations set by the manufacturer.

The protected geotextile rolls must be clearly labelled showing manufacturer, type of geotextile and batch number identification number.

## **5 DELIVERY & PRODUCT CERTIFICATION**

Geotextile must be delivered to the site at least 14 days prior to commencement of installation.

The Contractor must provide a certificate of compliance that the geotextile complies with all the requirements of this specification for its specified usage together with tests results reported on NATA endorsed test documents. The certificate must not be more than twelve months old.

Control testing must be carried out for each batch of geotextile in accordance with the Contractor's quality system and must include the mean weight of the geotextile determined in accordance with AS 3706.1 or the equivalent ASTM D5261-96 for the consignment delivered.

If NATA has not accredited a laboratory for a test, the test must be carried out at a laboratory:

- (a) accredited for the test by an organisation mutually recognised by NATA and approved by the Superintendent, with the test carried out and results certified in accordance with the accreditation conditions; or
- (b) approved by the Superintendent and results reported in a format approved by the Superintendent.

**HOLD POINT**

Process Held.	Supply of Geotextile
Submission Details.	Certificate of Compliance from the Supplier and nomination of where each strength and filtration class will be used.
Release of Hold Point.	The Superintendent will consider the submitted documents and may inspect the geotextile and may direct further action, such as directing site sampling and testing in accordance with Clause 7.2 prior to authorising the release of the Hold Point.

**6. CONSTRUCTION REQUIREMENTS****6.1 GENERAL**

Geotextiles must be installed as specified in the Contract Documents and as shown in the Drawings.

The site must be prepared by clearing and grading the area required. All sharp objects and large stones must be removed. Trees and shrubs must be cut flush with the ground surface. The top soil and vegetation mat may remain unless otherwise specified.

Geotextiles must be placed just ahead of associated advancing construction work and be covered by relevant construction materials or suitable protective sheeting within 48 hours of being placed. The geotextile must be placed without punctures or tears and, if these occur, they must be rectified prior to covering.

Geotextiles used in trench drains must be placed so as to conform loosely to the shape of the trenches. The geotextile must fully envelop the drainage material in the trench.

**6.2 INITIAL LAYER THICKNESS REQUIREMENTS FOR SEPARATION APPLICATIONS**

The minimum required initial layer thickness for fill material placed directly over the geotextile must meet the following requirements :

**Table R63.1 - Minimum Initial Layer Thickness**

<b>Nominal Maximum Fill Particle Size D85 (mm)</b>	<b>Minimum Initial Layer Thickness (mm)</b>
< 150	The larger of 3 times maximum fill size or 300 mm minimum.
150 to 400	Two times maximum fill size up to a total thickness of 500mm.

### **6.3 OVERLAP REQUIREMENTS.**

Unless otherwise specified in the Drawings the overlap must be 500 mm or greater where large ground deformations are expected. Sewing may be permitted provided that the seam strength, as measured in accordance with AS 2001.2.3.2 must be equal to or greater than 100% of the specified grab strength. Flat or “prayer” seams, J or Double J type or “butterfly” seams are permitted with a minimum number of two parallel rows of stitching required.

### **6.4 FILLING OVER INSTALLED GEOTEXTILE**

Equipment may only stand or travel on or above the laid geotextile with the Superintendent’s approval or after a minimum cover of 200 mm (uncompacted) of cover material is placed over the geotextile. The standing and travelling of equipment must not damage the geotextile and must be limited until cover material is compacted and stable.

Rock armour placed directly on geotextile must be placed with a drop height less than 1.5 metres and placed in such a manner so as not to damage, puncture or tear the geotextile.

Unless otherwise approved in writing by the Superintendent vibratory and heavy compaction plant must not be used on the initial lifts of filling materials. The Contractor must demonstrate that the construction process and compaction method will not damage the geotextile. The Superintendent may request a site trial to evaluate the construction process.

## **7 ACCEPTANCE CRITERIA**

### **7.1 STATISTICAL TECHNIQUES**

Statistical techniques in accordance with RTA Q must be used as the basis for compliance with strength requirements. This procedure based on the characteristic value of attribute (Q) for the lot is reproduced in Annexure R63/3 is used to assess geotextile conformity. The definition of a lot together with sampling and testing requirements in respect of geotextiles is given in Clause 7.2 of this Specification.

A lot achieves conformity if Q is equal to or greater than the specified lower limit for the characteristic value of the attribute. For geotextile conformity for the relevant strength class, the attribute Q in terms of either grab strength, tear strength or G Rating, be greater than or equal to the relevant specified limits in Table R63.1.

If Q is less than the specified lower limit for the characteristic value, the lot being examined must be resampled and retested to verify conformity. If on retesting Q is less than the specified value given in Table R63.1 then the lot represented by the sample roll must be rejected.

### **7.2 SITE SAMPLING AND TESTING**

Conformity testing on geotextile delivered on site must be undertaken by the Contractor for the range of tests specified in Tables R63A5.1 and R63A5.2 as an audit on Clause 5

certificates and verification that the geotextile in its delivered condition complies. Testing must include the mean weight of the geotextile determined in accordance with AS 3706.1.

The on site sampling scheme must be in accordance with the following requirements :

<b>Batch or order size ( sq. m ) defined as the lot size</b>	<b>Number of rolls to be sampled representing the lot</b>
Initial 10,000 or part thereof	1
Each subsequent 20,000 (maximum)	1

The lot characteristic grab and tear strength using AS 2001.2.3.2 and AS 3706.3 respectively must be determined using 10 test specimens cut from the longitudinal direction and 10 specimens cut from the transverse direction of the sampled roll of geotextile. The lot characteristic strength in the weaker direction must be used to assess lot conformity.

In the determination of CBR Burst Strength ( AS 3706.4 ) and Drop Cone Puncture Resistance ( AS 3706.5 ) a minimum of 10 test specimens is required for each test to assess lot conformity.

The Superintendent may accept test certificates, verifying compliance with this clause, for tests carried out for other projects from the same batch samples taken at site for the Principal in accordance with this clause. Acceptance is only provided where the Contractor's quality system ensures the specified minimum frequency of testing is maintained and ensures traceability of material to the same batch.

### **WITNESS POINT**

Process Witnessed      Sampling of geotextile on site.

Submission Details.      Location, date and time of sampling and person sampling.

A representative sample covering approximately 15 sq. metres of geotextile (eg 3m by 5m) must be cut from each sampled roll and not within 2 m of the start or end of the roll. Where directed, samples must also be cut and supplied to the Superintendent

Each sample must be clearly marked ( eg with large arrow ) the longitudinal direction of the geotextile. This is termed the warp direction if woven geotextiles are supplied. The directional marking is required to identify strength tests in both longitudinal and transverse directions. This applies to both woven and non woven geotextiles.

The sampled geotextile must be submitted for conformity testing to an approved NATA registered laboratory endorsed for the range of tests given in Table R63.1 and Table R63.2. Associated documentation such as geotextile supplier, geotextile type, batch identification, order represented by sample, sample date, roll directional markings must be supplied to the testing agency for their information and shown on or attached to the test reports.

Geotextile which has not been verified by the on site sampling scheme as complying with strength and filtration requirements must be rejected and removed from the site.

Where the mean of a tested characteristic differs from the mean shown on the reports submitted in accordance with Clause 5 by more than 2 standard deviations on one lot or 1 standard deviation on three succeeding lots, the testing must be deemed to be nonconforming.

**HOLD POINT**

Process Held.	Placement of Geotextile
Submission Details.	Site sampling test results referred to in Clause 7.2 at least 14 days prior to placement of geotextile.
Release of Hold Point.	The Superintendent will consider the submitted test documents for materials compliance with the specification and may inspect the geotextile. Further action may include additional testing prior to authorising the release of the Hold Point.

**ANNEXURE R63/1 - PROJECT SPECIFIC REQUIREMENTS**

PROJECT : \_\_\_\_\_

GEOTEXTILE APPLICATION (Table R63A5.1)	SITE SPECIFIC DETAILS
<p><b>G1: Separation under/within Embankments (unsaturated ground).</b> Primarily to prevent mixing of dissimilar soil types during construction appropriate for unsaturated soils where CBR &gt; 3</p>	<p>Maximum nominal fill stone size ( D<sub>85</sub>):.....mm</p> <p>Site subgrade CBR :.....</p> <p>Site soil type : Granular / Clays &amp; Silts (delete whichever is not applicable)</p>
<p><b>G2: Separation under/within Embankments (saturated ground).</b> Primarily to prevent mixing of dissimilar soil types in saturated conditions in working platform/bridging layer applications for subgrade soils where CBR ≤ 3 and where filtration is not a critical function</p>	<p>Maximum nominal fill stone size (D<sub>85</sub>):.....mm</p> <p>Site soil type : Granular / Clays &amp; Silts (delete whichever is not applicable)</p>
<p><b>G3: Trench Drains, Edge Drains, Counterfort Drains and Drainage Blankets/Layers.</b> To provide the combined functions of separation and filtration</p>	<p>Maximum nominal fill stone size (D<sub>85</sub>):.....mm</p> <p>Maximum Trench Depth ( metres ) : .....</p> <p>Site soil type : Pervious Granular/ Low to medium permeability Granular/ Clays &amp; Silts (delete whichever is not applicable)</p>
<p><b>G4: Drainage and Separation behind Retaining Structures including Rock Filled Mattresses and joints of pipes and arches.</b> To provide the combined functions of separation and filtration</p>	<p>Type of Structure: .....</p> <p>Site soil type : Granular / Clays &amp; Silts (delete whichever is not applicable)</p>
<p><b>G5: Under Rock Armour Revetment Layer in Embankments</b></p>	<p>Maximum nominal revetment stone size (D<sub>85</sub>) :.....mm</p> <p>Site soil type : Granular / Clays &amp; Silts (delete whichever is not applicable)</p>

## ANNEXURE R63/2 - SCHEDULE OF HOLD POINTS

CLAUSE	DESCRIPTION
5	Submission of Supplier's Certificate of Compliance
7.2	Site sampling test results.

## ANNEXURE R63/3 - STATISTICAL CALCULATION FOR LOT CONFORMITY

The calculation of the characteristic value of attribute (Q) for the lot must be as follows :

$$Q = x_m - ks$$

where  $x_m$  = arithmetic mean of attribute test results for all sub-lots

s = standard deviation of sub-lot attribute test results

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - x_m)^2}{n-1}}$$

k = acceptance constant of 0.83 for a sample size of 10 tests of geotextile taken from the sampled roll representing lot. (This value of k is based on 10% producers risk.)

n = 10 (ie number of specimens cut from the sampled roll and tested)

## ANNEXURE R63/4 - IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RTA G2 Clause 19.

Clause	Description of the Identified Record
5	Certificate of Compliance from the Supplier that the geotextile complies with all the requirements of the Specification for its specified usage together with test results
7.2	Site sampling test results

## ANNEXURE R63/5 – APPLICATION CATEGORIES

**Table R63A5.1 Geotextile Survivability Strength and Filtration Requirements**

Application	Survivability Strength Requirements		Filtration Requirements (Notes 5,6,7,8,9)		
	Nominal Maximum Stone Particle Size $D_{85}$ (mm) (Note 1)	Geotextile Strength Class ( Note 13)	Filtration Class	EOS and Flow Rate Requirements for $D_{15s} \leq 75\mu\text{m}$ Predominantly Low Permeability Soils including Clays and Silts	EOS and Flow Rate Requirements for $D_{15s} > 75\mu\text{m}$ Predominantly Pervious Granular Soils
<b>G1: Separation under/within Embankments (unsaturated ground).</b> Primarily to prevent mixing of dissimilar soil types during construction appropriate for unsaturated soils where $\text{CBR} > 3$	$\leq 37.5$ $\leq 75$ $\leq 200$ $\leq 400$ $\leq 600$	A B C D E	Class 5	$\text{EOS} \leq 300\mu\text{m}$ $Q \geq 5$ $\psi \geq 0.05$	$\text{EOS} \leq 600\mu\text{m}$ $Q \geq 5$ $\psi \geq 0.05$
<b>G2: Separation under/within Embankments (saturated ground).</b> Primarily to prevent mixing of dissimilar soil types in saturated conditions in working platform/bridging layer applications for subgrade soils where $\text{CBR} \leq 3$ and where filtration is not a critical function ( Note 14)	$\leq 37.5$ $\leq 75$ $\leq 200$ $\leq 400$ $\leq 600$	C C D E (note 2) N/A (note 3)	Class 4	$\text{EOS} \leq 300\mu\text{m}$ $Q \geq 10$ $\psi \geq 0.10$	$\text{EOS} \leq 600\mu\text{m}$ $Q \geq 20$ $\psi \geq 0.20$

**ANNEXURE R63/5 – APPLICATION CATEGORIES (CONT'D)****Table R63A5.1 (continued) Geotextile Survivability Strength and Filtration Requirements**

Application	Survivability Strength Requirements		Filtration Requirements (Notes 5,6,7,8,9)				
	Nominal Maximum Stone Particle Size $D_{85}$ (mm) (Note 1)	Geotextile Strength Class (Note 13)	Filtration Class	EOS and Flow Rate Requirements for $D_{50s} < 75\mu\text{m}$ Predominantly Silt and Clay Soils (Note 10)	EOS and Flow Rate Requirements for $D_{50s} \geq 75\mu\text{m}$ and $D_{15s} \leq 75\mu\text{m}$ Predominantly Granular Soils with Low Permeability (Note 11)	EOS and Flow Rate Requirements for $D_{15s} > 75\mu\text{m}$ Predominantly Pervious Granular Soils (Note 12)	
<b>G3: Trench Drains, Edge Drains, Counterfort Drains and Drainage Blankets/Layers.</b> To provide the combined functions of separation and filtration	<b>Trench Drains</b>	<b>Depth &lt; 2 m</b>		<b>Depth &lt; 3 m</b>	<b>Class 1</b>	EOS $\leq 120\mu\text{m}$ $Q \geq 10$ $\psi \geq 0.1$	EOS $\leq 250\mu\text{m}$ $Q \geq 20$ $\psi \geq 0.2$
	$\leq 37.5$ $\leq 75$ $\leq 200$	A B C	B C D	<b>Other Applications</b> $\leq 37.5$ $\leq 75$ $\leq 200$ $\leq 400$ $\leq 600$			

**ANNEXURE R63/5 – APPLICATION CATEGORIES (CONT'D)****Table R63A5.1 (continued) Geotextile Survivability Strength and Filtration Requirements**

Application	Survivability Strength Requirements		Filtration Requirements (Notes 5,6,7,8,9)		
		Geotextile Strength Class (Note 13)	Filtration Class	EOS and Flow Rate Requirements for $D_{15s} \leq 75\mu\text{m}$ Predominantly Low Permeability Soils including Clays and Silts	EOS and Flow Rate Requirements for $D_{15s} > 75\mu\text{m}$ Predominantly Pervious Granular Soils
<b>G4: Drainage and Separation behind Retaining Structures including Rock Filled Mattresses and joints of pipes and arches.</b> To provide the combined functions of separation and filtration	Type of Structure  Conventional concrete retaining walls, segmental block walls, reinforced soil concrete panel walls	B	Class 2	EOS $\leq 120\mu\text{m}$  Q $\geq 30$  $\psi \geq 0.3$	EOS $\leq 250\mu\text{m}$  Q $\geq 50$  $\psi \geq 0.5$
	Gabion walls, crib walls, rock filled mattresses	C			
<b>G5: Under Rock Armour Revetment Layer in Embankments (Note 4)</b>	Nominal Revetment Stone Size (mm)  200 400	D E	Class 3	EOS $\leq 120\mu\text{m}$  Q $\geq 30$  $\psi \geq 0.3$	EOS $\leq 200\mu\text{m}$  Q $\geq 50$  $\psi \geq 0.5$

**Notes Accompanying Table R63A5.1**

1. Nominal maximum stone size of fill determined in accordance with AS 1289 C6
2. Not applicable for geotextiles with elongation < 30% (refer to Note 1 of Table R63A5.2)

3. Not applicable for this case. Specialist design advice should be sought. As an alternative a fill with a maximum nominal stone size less than 75 mm should be considered for the initial lift to protect the geotextile.
4. An aggregate layer with a nominal maximum stone size of less than 75 mm must be used where the maximum drop height of the rock armour exceeds 1.5 metres and should be considered as the initial layer prior to the placement of larger revetment rock armour to protect the geotextile.
5. Flow rate (  $Q$  ) under 100 mm constant head and permittivity (  $\psi$  ) determined in accordance with AS 3706.9
6.  $D_{15s}$  refers to the sieve size through which 15% by mass of the soil being drained will pass. In general granular soils ( eg silty sand, sands & gravels ) have  $D_{15s} > 75\mu\text{m}$  whilst fine grained soils ( eg silts, silt clays and clays ) would have  $D_{15s} \leq 75\mu\text{m}$
7. Equivalent opening size (EOS) defined as  $O_{95}$  taken to be the mean value of the test results in accordance with AS 3706.1, AS 3706.7 or ISO 12956. It is recognised that wet sieving generally results in lower EOS values than dry sieving.
8. The EOS, permittivity and flow rate requirements apply for soil types where water flow is predominantly unidirectional. Specialist advice is required where water flow may undergo reverse flow characteristics. Additional technical advice on EOS requirements is required for the following soil types ; highly dispersive clay soils, gap graded soils, fine silt soils or artificially derived soils such as flyash. Combined soil/geotextile testing may be required and additional granular filters may be appropriate.
9. The above criteria are based on graded soils where the Coefficient of Uniformity (  $C_u = D_{60s}/D_{10s}$  ) is greater than 3. Special consideration is required for  $C_u < 3$ .
10. More than 50% mass of in-situ soil passes the 75 $\mu\text{m}$  sieve ; Predominantly silt and clay soils.
11. Between 15% to 50% mass of in-situ soil is passes the 75 $\mu\text{m}$  sieve ; Predominantly low permeability granular soils.
12. Less than 15% mass of in-situ soil passes the 75 $\mu\text{m}$  sieve ; Predominantly pervious granular soils.
13. Geotextile Strength Class to ensure survivability for the given application. Geotextile survivability refers to the ability of the geotextile to withstand the installation stresses during construction. It is related to construction method, subgrade condition, backfill material including stone size and other factors.
14. Separation under saturated ground may encounter circumstances where filtration could become a critical function e.g. shallow height embankments where foundation pumping can occur during the life of the roadway. In these circumstances the selection of geotextile must also satisfy the filtration requirements as for Application Category G3.

**Table R63A5.2 Geotextile Survivability Strength Class Requirements**

<b>Geotextile Strength Class</b>	<b>Elongation</b> (Note 1)	<b>Grab Strength (N)</b> (Note 2)	<b>Tear (N)</b> (Note 3)	<b>G Rating</b> (Notes 4, 5)
A	≥ 30%	500	180	900
	< 30%	800	300	1350
B	≥ 30%	700	250	1350
	< 30%	1100	400	2000
C	≥ 30%	900	350	2000
	< 30%	1400	500	3000
D	≥ 30%	1200	450	3000
	< 30%	1900	700	4500
E	≥ 30%	1600	650	4500

**Notes Accompanying Table R63A5.2**

1. Elongation to differentiate wovens from non woven geotextiles must be the % CBR puncture elongation corresponding to maximum puncture strength determined in accordance with AS 3706.4. In general woven geotextiles would break at elongations less than 30% while non-wovens would break at elongations equal to or greater than 30%
2. Grab strength must be the characteristic value of grab strength for the lot tested ( ie mean grab strength - 0.83 x standard deviation ) in accordance with Clause 7.1 of the specification. Mean grab strength and the corresponding standard deviation must be determined in accordance with AS 2001.2.3.2 Method B. For anisotropic geotextiles, the characteristic grab strength in the weaker direction must be used. Ten test specimens from each direction are required to be tested to determine the characteristic grab strength (Refer to Part 7 of this specification).

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3. Characteristic value of tearing strength for the lot tested (ie mean tear strength - 0.83 x standard deviation) determined in accordance with AS 3706.3 and Clause 7.1 of this specification. For anisotropic geotextiles, the characteristic tearing strength in the weaker direction must be used. Ten test specimens from each direction are required to be tested to determine the characteristic tear strength. (Refer to Part 7 of this specification)
  4.  $G = \text{Geotextile Strength Rating determined to be } (L \times h_{50c})^{1/2}$  based on the characteristic values of the lot. A minimum of ten test specimens is required to determine the characteristic CBR and h50 values. (Refer to Clause 7.1). L is the characteristic value of CBR plunger failure load N for the lot tested determined in accordance with AS 3706.4. (ie mean CBR plunger failure load N - 0.83 x standard deviation). If the strain at failure exceeds 80% then the characteristic CBR load L<sub>80</sub> at 80% strain must be used in the calculation of G. h<sub>50c</sub> is the characteristic value of h50 for the lot (ie mean h50 - 0.83 x standard deviation), h50 must be determined in accordance with AS 3706.5 (revised 1994).
  5. Requirements for survivability class based on a 1.5m drop height of material for the corresponding maximum nominal stone size.