

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS57 Geotextiles for Paving Applications**

July 2017

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1 Introduction

This Technical Specification applies to the physical, material and construction requirements for geotextiles used in paving applications.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Further definitions are defined in Table 2. Where indicated in Table 2, a more complete definition is contained in the referenced clause.

Table 2 – Definition of terms

Term	Definition
Asphalt interlayer	A geotextile reinforced seal specifically designed for use under asphalt.
Calendering	Calendering is a process that passes the geotextile through one or more heated rollers during the manufacturing process. The surface of the geotextile is modified during this process. Calendering may reduce the ability of the geotextile to absorb bitumen on the calendered side.
Geotextile	A planar, permeable, polymeric (synthetic or natural) textile material, which may be non-woven, knitted or woven, used in contact with soil/rock and/or any other geotechnical or pavement material in civil engineering applications.
Geotextile reinforced seal	A bitumen-impregnated paving grade geotextile placed on the surface of a pavement layer that is covered with aggregate to form a running surface suitable for vehicular traffic. This may become the finished wearing surface or, ultimately, an interlayer between pavement layers (e.g. under a new asphalt overlay).
G-rating	$G\text{-rating} = \sqrt{L \times H_{50}}$ Where: H ₅₀ = Drop cone puncture resistance of the geotextile material determined in accordance with AS 3706.5, and L = Burst strength of geotextile material determined in accordance with AS 3706.4, except, that, if the strain at failure exceeds 80%, the burst strength at 80% shall be used.
Non-woven geotextile	A geotextile in the form of a manufactured sheet, web or batt of directionally or randomly orientated fibres, filaments or other elements, mechanically and/or thermally and/or chemically bonded.
Paving geotextile	See 'Paving grade geotextile'
Paving grade geotextile	A non-woven, synthetic, needle punched geotextile formed from mechanically entangled filaments complying with the requirements of Clause 6.

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
AS 3706.1	<i>Geotextiles – Methods of test – General requirements, sampling, conditioning, basic physical properties and statistical analysis</i>
AS 3706.2 Method A	<i>Geotextiles – Methods of test – Determination of tensile properties – Wide-strip and grab method</i>
AS 3706.4	<i>Geotextiles – Methods of test – Determination of burst strength – California Bearing Ratio (CBR) – Plunger method</i>
AS 3706.5	<i>Geotextiles – Methods of test – Determination of puncture resistance – Drop cone method</i>
AS 3706.11	<i>Geotextiles – Methods of test – Determination of durability – Resistance to degradation by light, heat and moisture</i>
ASTM D276-00a	<i>Standard Test Methods for Identification of Fibers in Textiles</i>
ASTM D6140-00	<i>Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications</i>
PRM	Transport and Main Roads <i>Pavement Rehabilitation Manual 2012</i>

3.1 Standard Drawings

There are no Standard Drawings referenced in this document.

4 Standard test methods

The standard test methods listed in Table 4 shall be used in this Technical Specification. Further testing details and requirements are given in Clauses 6 to 10.

Further details of Test Method Numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Specifications*.

Table 4 – Standard test methods

Property to be tested	Method No.
Sample preparation	AS 3706.1
Mean weight	AS 3706.1
Thickness	AS 3706.1
Wide strip tensile strength	AS 3706.2 Method A
Elongation	AS 3706.2
Burst strength	AS 3706.4
Drop cone puncture resistance	AS 3706.5
Bitumen retention	ASTM D6140-00
Melting point	ASTM D276-00a
Ultra-Violet (UV) resistance	AS 3706.11

5 Quality system requirements

5.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 5.1.

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2	1. Approval of construction procedures		Supply of the construction procedures (14 days)
8.2	2. Ordering of geotextile		Supply of technical data sheet and sample (14 days)
8.4			Supply of geotextile to the Site (14 days)
9.3		1 Pavement surface temperature prior to spraying bitumen	
10.2		2 Site sampling of geotextile	
10.4	3. Acceptance of delivered geotextile.		

5.2 Construction procedures

The Contractor shall prepare documented procedures for all construction processes in accordance with the quality system requirements of the Contract. The construction procedure described in this Clause shall be submitted to the Administrator.

A construction procedure detailing all work described in this Technical Specification shall be prepared.

The construction procedure shall be consistent with the guidelines set out in the Transport and Main Road's *Pavement Rehabilitation Manual* April 2012, Sections 4.4.6 to 4.4.6.8.

The proposed construction procedure shall be submitted to the Administrator at least 14 days prior to the commencement of any works related to the placement of paving geotextile(s). **Milestone**

No works related to the placement of paving geotextile(s) shall commence until the construction procedures have been approved by the Administrator and the Administrator has given the Contractor permission to proceed. **Hold Point 1**

5.3 Conformance requirements

The conformance requirements that apply to materials covered by this Technical Specification are given in Clauses 6 to 10.

5.4 Testing frequencies and lot sizes

The minimum testing frequencies for work covered by this Technical Specification shall be as defined in Clause 10.

6 Material

6.1 General

Geotextiles used in paving applications shall be manufactured from either polyester or polypropylene. Further, the material(s) used shall comply with this Technical Specification.

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

Geotextiles shall be free of any flaws which may have an adverse effect on the physical and mechanical properties of the geotextile. Only geotextiles that are non-woven, needle punched and formed from mechanically entangled filaments shall be used for paving applications. Geotextiles that are knitted, woven and/or heat or resin bonded are not suitable and shall not be used.

With regard to calendering:

- a) geotextiles without calendering on any side can be used in all applications
- b) geotextiles with calendering on both sides shall not be used
- c) geotextiles used in geotextile reinforced seal applications shall comply with the requirements of Clauses 6.2 and 8.3, and
- d) geotextiles used as an asphalt interlayer shall comply with the requirements of Clauses 6.2 and 8.3.

Geotextiles shall be stabilised against Ultra-Violet (UV) radiation such that when tested in accordance with AS 3706.11 using a xenon arc UV light source, they shall have retained strength of at least 50% after 500 hours of test exposure.

Geotextiles used in the Contract shall be new and not have been exposed to UV radiation (e.g., prior to or during supply).

Geotextiles used in the Contract shall be completely dry when they are laid. Further, they shall not have been exposed to water (e.g. prior to or during supply, during storage).

A certificate demonstrating compliance with this Technical Specification shall be provided by the Contractor to the Administrator for each geotextile used, and proposed to be used, in the Contract. In addition, all test results on which the certificates are based shall not more than one-year old, measured from the date of supply to the site.

6.2 Paving grade geotextile classes

Geotextiles shall meet the requirements of the specified class defined in Table 6.2.

Table 6.2 – Paving grade geotextile requirements

Property	Test Method	Application		
Application	-	Geotextile reinforced seal over a pavement without a soft or clay subgrade and without a soft or clay material within it.	Geotextile reinforced seal over a pavement with a soft or clay subgrade, or with a soft or clay material within it.	Asphalt interlayer
Material	-	Polyester	Polyester	Polyester or polypropylene
Calendering	-	Refer to Clauses 6.1 and 8.3	Refer to Clauses 6.1 and 8.3	Refer to Clauses 6.1 and 8.3
Wide strip tensile strength (kN) † ¹	AS 3706.2	≥ 6.0	≥ 9.0	≥ 6.0
Elongation (%)	AS 3706.2	40% to 70%	40% to 70%	40% to 70%
G-rating † ²	AS 3706.4			G-rating † ²
Mass per unit area (g/m ²)	AS 3706.1	130 to 160	170 to 200	130 to 160
Thickness (mm)	AS 3706.1	≥ 0.8	≥ 1.2	≥ 0.8
Melting point (°C)	ASTM D276-00a	≥ 200	≥ 200	≥ 160
Bitumen retention (loaded) L/m ² † ³	ASTM D6140-00	≥ 0.9	≥ 1.1	≥ 0.9

†¹ The characteristic value of wide strip tensile strength shall be used in the calculation of tensile strength. Also refer to Clause 10.3.

†² The characteristic values of the burst strength (L) and the drop cone puncture resistance (H50) shall be used in the calculation of G-rating. Also refer to Clause 10.3.

†³ Testing shall be completed in accordance with ASTM D6140-00 with the following amendment. Class 170 bitumen complying with MRTS17 *Bitumen* shall be used for determination of bitumen retention.

7 Storage, packaging and identification

All geotextile delivered to the site shall comply with AS 3706.1 for storage, packing and identification requirements.

In addition to the requirements of AS 3706.1, geotextiles shall be stored under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid any damage prior to installation. At all times, the contractor shall make the necessary arrangements to reduce the risk of deterioration of the geotextile material under the action of ultraviolet light.

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

The protected geotextile rolls shall be clearly labelled, showing manufacturer, type of geotextile and batch number identification number. Each roll of geotextile supplied to the site shall display its product

name and strength class in permanent marking at increments no greater than 10 m along the total length of the roll.

8 Ordering, delivery and product compliance

8.1 General

Geotextiles used in paving applications shall comply with the acceptance criteria stated in Clause 10.

8.2 Ordering

At least 14 days prior to the proposed ordering date of any geotextile, the Contractor shall submit to the Administrator a copy of the proposed manufacturer's technical data sheet and a sample of the proposed geotextile from the manufacturer demonstrating compliance with this Technical Specification. **Milestone**

The Contractor shall not order any geotextile prior to the acceptance of that geotextile by the Administrator. **Hold Point 2**

8.3 Calendering requirements

In addition to the requirements of Clauses 6 and 10.3, geotextiles with calendering on one side only shall be accepted for use, providing that a laboratory and/or field trial is conducted to prove, to the Administrator's satisfaction, that sufficient bitumen penetration into, and sufficient impregnation of, the geotextile is achieved. In addition, it must also be demonstrated that there is no excess bitumen trapped beneath the geotextile or on top of the geotextile. If the trial cannot demonstrate this, the geotextile shall be removed from the trial section and the trial section rectified, so that the completed construction complies with the requirements of the Contract.

Where a geotextile with calendering on one side is used, the non-calendered side shall be placed onto the tack coat. The calendered side shall face upwards after the geotextile has been applied to the tack coat.

Geotextiles without calendering on any side can be used in all applications.

Geotextiles with calendering on both sides shall not be used.

8.4 Delivery

With each batch of geotextile incorporated in the Works, a certificate of compliance stating that the geotextile complies with all the requirements of this Technical Specification as appropriate to the application, together with test results reported on NATA endorsed test documents, shall be included in the Quality Records and submitted to the Administrator. The test results on which the certificates are based shall not be more than 12 months old, measured from the date of supply to the site.

Control testing shall be carried out by the Contractor on each batch of geotextile in accordance with the Contractor's Quality System and the requirements of Clause 10. These results shall be recorded in the quality records and reported to the Administrator. To allow time for on-site sampling and testing, geotextile shall be delivered to the site at least 14 days prior to the commencement of its installation.

Milestone

9 Construction requirements

9.1 General

Geotextile shall be installed in the locations shown on the drawings.

The area on which the geotextile is to be placed shall be prepared so that all surface defects, such as cracks wider than 2 mm and noticeable surface depressions likely to cause tearing or damage to the geotextile, are repaired or treated prior to placement of the geotextile. The surface of the pavement shall be cleaned and swept prior to application of the tack coat and geotextile.

Excess material shall be disposed of in accordance with the requirements of Clause 10 of MRTS01 *Introduction to Technical Specifications*.

9.2 Application of the tack coat

A tack coat shall be applied as shown on the drawings and in accordance with the requirements of Clause 9.7. Installation of the geotextile shall commence immediately following spraying of the tack coat. The requirements of Clause 9.7 shall also be met.

Example of a geotextile SAM (single seal) design		
Step No.	Description	Example calculation (illustrative only)
1	Determine the basic binder application rate (Bb) in accordance with the update of the Austroads Sprayed Seal Design Method (AP-T68/06)). This includes calculation of the design voids factor (VF) using the traffic volume for design, basic voids factor (Vf) and voids adjustment factors for the aggregate (Va) and for traffic effects (Vt).	Say Bb = 1.4 l/m ²
2	Determine the design binder application rate (Bd) in accordance with the update of the Austroads Sprayed Seal Design Method (AP-T68/06). This includes calculation of the allowances for surface texture (As), binder absorption (Aba) and embedment (Ae).	Say Bd = 1.8 l/m ²
3	Determine the type of geotextile that is to be used (refer to Table 4.3 of <i>Pavement Rehabilitation Manual</i> (April 2012)).	Polyester geotextile that complies with MRS57 and MRTS57
4	Obtain the Geotextile's Absorption Rate (GAR) from the manufacturer/supplier (usually 0.9 l/m ² to 1.0 l/m ² for a paving 140 g/m ² geotextile).	Say GAR = 0.9 l/m ²
5	Calculate the Total Bitumen Application Rate (TBAR).	TBAR = Bd + GAR = 1.8 + 0.9 = 2.7 l/m ²
6	Determine how to apply the TBAR.	Spray 0.7 l/m ² as a tack coat, lay the geotextile, and spray 2.0 l/m ² in the final seal.
<p>Note: It is critical that extra binder is sprayed between the geotextiles at the lap as there are two layers of geotextiles at it. Given this extra binder, additional to the TBAR and equal to the GAR, is required.</p>		

9.3 Ambient temperatures

Spraying of bitumen or placement of geotextile shall not commence until the temperature of the surface of the pavement is above the temperature specified in MRTS11 *Sprayed Bituminous Surfacing (Excluding Emulsions)*. **Witness Point 1**

Placement of geotextile shall cease when the pavement temperature exceeds 50°C unless otherwise directed by the Administrator.

9.4 Weather conditions

Spraying of bitumen or placement of geotextile shall not take place during periods of rain, nor if rain is likely to fall prior to the placement of geotextile, spreading and rolling of cover aggregate or the asphalt overlay is constructed.

Further spraying of bitumen or placement of geotextile shall not take place until the road surface is dry.

9.5 Placement of paving geotextiles

9.5.1 General

Geotextiles shall be installed by machine, unless the Contractor can demonstrate to the Administrator, to the Administrator's satisfaction, that the geometric configuration of the roadway is such that it is inappropriate to do so.

Where a geotextile with calendaring on one side is used, the non-calendered side shall be placed onto the tack coat. The calendered side shall face upwards after the geotextile has been applied to the tack coat.

9.5.2 Plant

Unless otherwise agreed with the Administrator (refer to Clause 9.1), the geotextile shall be dispensed and laid using a purpose-built device, specifically designed for such application (i.e. a geotextile applicator). The geotextile applicator shall consist of a lightweight frame attached to a rubber-tyred roller, or other similar plant item, with a spindle to hold the roll of geotextile. The device shall be designed and operated such that the geotextile is uniformly tensioned during application to minimise the potential for wrinkles to form in the geotextile.

9.5.3 Wrinkles and folds

Geotextile shall be installed so as to avoid folds. Wrinkles that form during the laying process shall be removed by brooming and/or cutting. Folds and wrinkles large enough to cause laps and folds of greater than 25 mm in length or height shall be cut, laid flat and lapped. Additional bitumen binder shall be sprayed over the lapped area at a rate equal to the bitumen absorption rate of the geotextile.

9.5.4 Joins

9.5.4.1 General

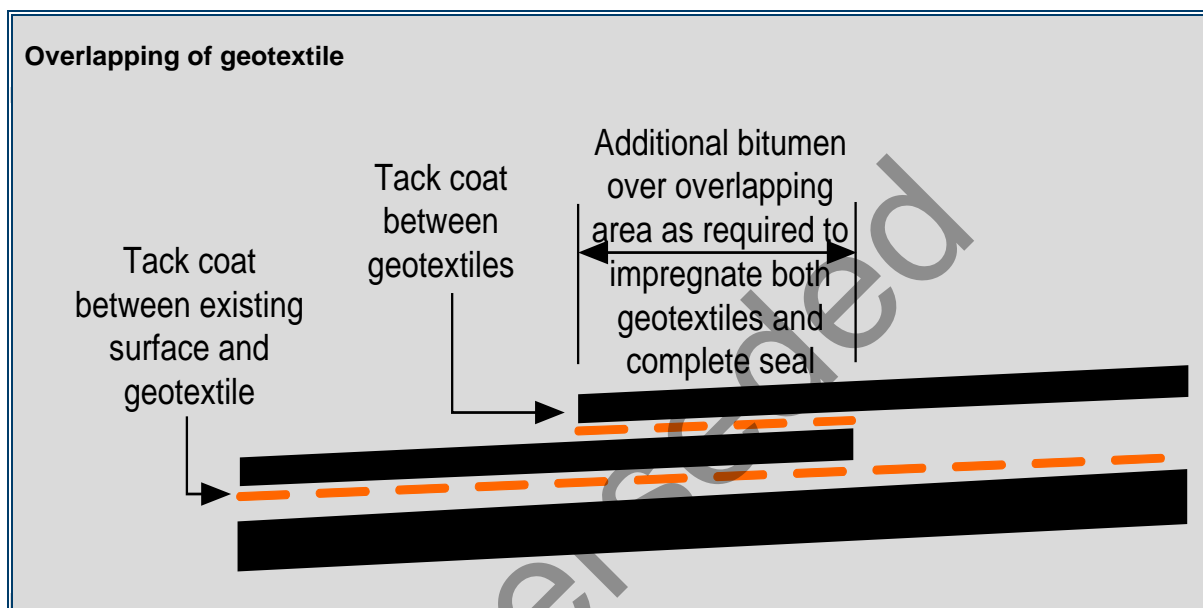
Joins shall be of the cut and lap type. All joins shall be overlapped by a minimum distance of 150 mm. After application of the first geotextile, an additional tack coat shall be applied to the top of the lower geotextile over the area of overlap. Application of the additional tack coat may be carried out using a hand-held lance or vehicle sprayer. Irrespective of the method used, the additional tack coat shall be sprayed at a rate equal to the bitumen absorption rate of the geotextile.

9.5.4.2 Longitudinal

Geotextile widths shall be selected and geotextile shall be laid such that joins of parallel rolls occur only at a centreline lane line, an edge line or in the shoulder. Joins shall not be located in any wheel path.

9.5.4.3 Transverse

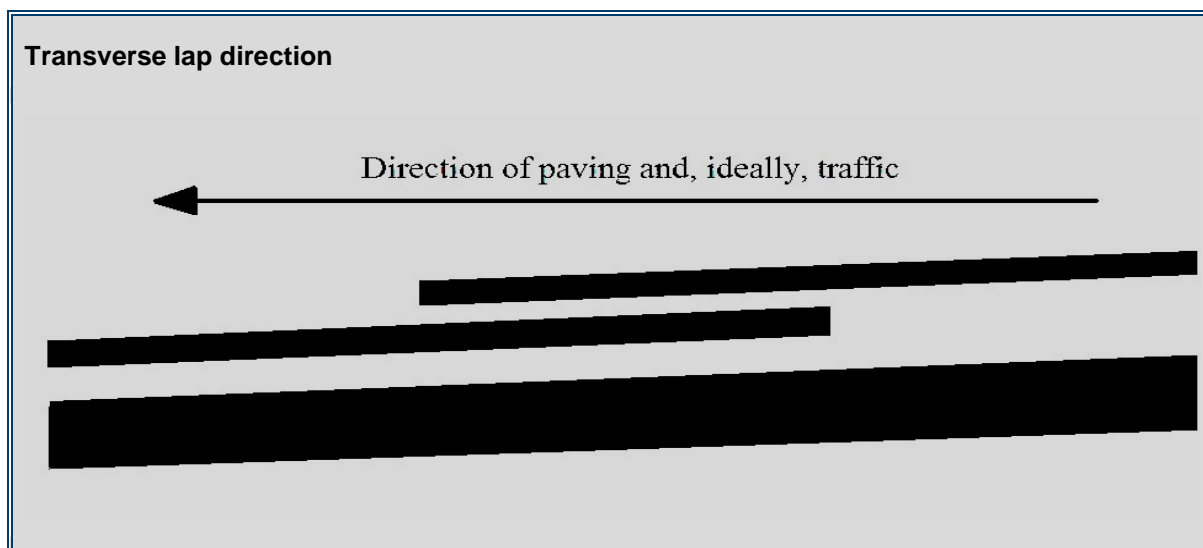
Transverse joins shall be lapped in the direction of paving to prevent edge pick-up by construction traffic and/or paver. The geotextile shall also be laid in the same direction as the traffic flow, unless the Contractor can demonstrate to the Administrator, to the Administrator's satisfaction, that it is not practical to do so.



9.5.5 Rolling

Rolling of the geotextile into the tack coat shall be carried out with a multi-tyred roller weighing less than 15 tonnes. The geotextile shall be rolled in a longitudinal direction only. Rolling shall commence along the centreline of the placed geotextile and gradually move towards the edge of the geotextile.

Rolling shall be sufficient to ensure that the tack coat is absorbed into the geotextile while being less than that required to cause bleeding of the bitumen through the geotextile and pick-up of the geotextile by rubber tyred plant.



9.6 Trafficking of geotextile

Trafficking of the installed geotextile shall be restricted to essential construction traffic only.

The pavement shall not be opened to general traffic until after the final seal or asphalt overlay has been constructed over the bitumen impregnated geotextile.

9.7 Bitumen and bituminous surfacings

Bitumen emulsions shall not be used in any part of the construction of a geotextile reinforced seal or asphalt interlayer. This includes the tack coat and the bitumen sprayed on top to complete the geotextile reinforced seal or asphalt interlayer.

Cutback bitumen shall not be used for the tack coat. Cutback bitumen shall comply with MRTS20 *Cutback Bitumen*.

Sprayed bituminous surfacings shall comply with MRTS11 *Sprayed Bituminous Surfacing (Excluding Emulsions)*, MRTS22 *Supply of Cover Aggregate* and other relevant Technical Specifications.

Cover aggregate, if used, shall comply with MRTS11 *Sprayed Bituminous Surfacing (Excluding Emulsions)*, MRTS22 *Supply of Cover Aggregate* and other relevant Technical Specifications.

Notwithstanding the above, this Technical Specification takes precedence and bitumen and bituminous surfacings shall also comply with this Technical Specification.

10 Acceptance criteria

10.1 General

Conformance testing on geotextile delivered to the Site shall be undertaken by the Contractor in accordance with the requirements of Clause 10.

The Administrator may accept test certificates, verifying compliance with Clause 6, for tests carried out, in accordance with this Technical Specification, on the same materials for projects for the department other than this Contract provided that the Contractor's quality system demonstrates that the specified minimum frequency of testing has been maintained and ensures traceability of material to the same manufacturing batch. The currency of test certificates shall be no older than 12 months from the date of supply to the site.

10.2 Site sampling

Where the total required batch size for the Contract is less than 1000 m², sampling and testing need not be undertaken, provided that the nominal wide strip tensile strength of the material supplied is 20% higher than the requirements stated in Table 6.2 for the appropriate application and the geotextile manufacturer can demonstrate compliance with the remainder of this Technical Specification.

On-site sampling shall be carried out at the frequency stated in Table 10.2.

Table 10.2 – On site sampling frequency

Batch or order size defined as the lot size	Number of rolls to be sampled representing the lot
The initial 10,000 m ² or part thereof	1
Each subsequent 20,000 m ² or part thereof	1

A representative sample shall be taken from the roll(s) to be tested in accordance with AS 3706.1, Clause 4.4. The representative sample shall be no less than four linear metres along the roll for the full production width, but not within two metres of the start or end of the roll. **Witness Point 2**

Each sample shall be clearly marked with a large arrow showing the longitudinal direction of the geotextile. The directional marking shall be used to identify the direction of samples for strength tests in both longitudinal and transverse directions.

The Administrator may select additional samples to be taken at the Site for audit testing. The Administrator shall advise the Contractor who may be present and who may select additional samples when samples for audit testing are taken.

10.3 Testing of site samples

All of the following properties of the sampled geotextile shall be tested by the Contractor:

- wide strip tensile strength
- elongation
- G-rating
- mass per unit area
- thickness, and
- bitumen retention.

Identification information, including geotextile supplier, geotextile type, batch identification, details of the order represented by sample, sample date and roll directional markings, shall be shown on or attached to the test reports.

The characteristic value of the strength properties listed in Table 6.2 shall be calculated in accordance with the requirements of Clause 12 of MRTS01 *Introduction to Technical Specifications*, except that the acceptance constant k shall be taken as 0.83.

The following representative test results shall be calculated from the results of tests carried out on a minimum number of 10 test specimens cut from the sampled roll of geotextile:

- a) the mean weight and thickness of the geotextile as determined in accordance with AS 3706.1

- b) the characteristic value of the wide strip tensile strength as determined in accordance with AS 3706.2 Method A
- c) the characteristic value of the burst strength as determined in accordance with AS 3706.4
- d) the drop cone puncture resistance as determined in accordance with AS 3706.5, and
- e) the mean value of bitumen retention as determined in accordance with ASTM D6140-00, modified as described Clause 4.

10.4 Acceptance

A lot shall be deemed to achieve conformance to this Technical Specification if all samples tested comply with this Technical Specification. If a lot fails to achieve conformance, the lot may be re-sampled in accordance with Clause 10.2 and re-tested in accordance with Clause 10.3 to verify whether the lot conforms or not. If on re-testing the lot fails to achieve conformance, then the lot shall be rejected.

Geotextile shall not be placed prior to the Administrator accepting the lot conforms with this Technical Specification. **Hold Point 3**

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