SPECIFICATION 511

MATERIALS FOR BITUMINOUS TREATMENTS

REVISION REGISTER			
Clause Number	**Description of Revision**	**Authorised By**	**Issue Date**
Table 511.3 Table 511.5 511.14	Included Test Methods reference Included new binder A10R Included Ravasol Bitcel Fibres	BPC	06/02/2025
Whole Document	Fixed error in header	SCO/A	25/05/2023
511.06.01 511.07.03 511.22 Whole Document	Updated with Batch definition and sampling location Included tack coat for dilution Width requirements for paving tapes amended General formatting	BPC	21/12/2021
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511.02 511.03 511.05 511.06 511.06.04 511.07.02 511.07.03 Table 511.4 511.08.03.02 511.09 511.10.02 Table 511.8 511.10.07 511.13 511.16 511.19 511.21 511.22 Guidance Note Whole Document Whole Document	Formatting and terminology updates Formatting into Table to align to other Specifications New clause Sustainability Updated to included process of blended bitumen for level 2 and 3 RAP, and reference to AS2008 binders New clause for EME2 binder properties Inclusion of testing to AS 2341.29 with local granite Updated dilution of emulsion Updated to match ATS 3110 and S45R Stiffness removed New Clause for crumb rubber asphalt binder properties Updated for Level 2 and 3 RAP requirements and RAP management plan Removed ambiguity Additional ALD Test Method and requirement for 7mm LA New clause on asphalt filler Removed ambiguity, double table and approval process Updated crumb rubber source Bitumen paper type removed New clause on Workability Additives New clause on Paving Tape Custodian updated Table numbers and formatting as per MRWA Guidelines Specification Development for Custodians Primerseal charged to initial seal where applicable	BPC	26/10/2021
Table 511.2 511.16	First sentence in Note 2 on supplier of crumb rubber deleted Updated to require a supplier of crumb rubber be accredited or approved	MME	24/02/2020

CONTENTS

Clause **Page No**

GENERAL 4
511.01 Scope 4
511.02 References 4
511.03 Definitions 6
511.04 NOT USED 6
511.05 Sustainability Considerations 6

PRODUCTS AND MATERIALS 7
511.06 Bitumen 7
511.07 Bitumen Emulsion 10
511.08 Polymer Modified Binders 12
511.09 Reclaimed Asphalt Pavement 17
511.10 Aggregates 18
511.11 Cutting Oils 23
511.12 Precoat Fluid 25
511.13 Adhesion Agent 25
511.14 Fibres 26
511.15 NOT USED 26
511.16 Crumb Rubber 26
511.17 Pigment 27
511.18 Mineral Filler 27
511.19 Protective Paper 27
511.20 Geotextile Fabric 27
511.21 Workability Additive 29
511.22 Paving Tape 29
511.23 – 511.80 NOT USED 29

AS BUILT AND HANDOVER REQUIREMENTS 29
511.81 – 511.90 NOT USED 29

CONTRACT SPECIFIC REQUIREMENTS 29
511.90 – 511.99 NOT USED 29

SPECIFICATION 511

MATERIALS FOR BITUMINOUS TREATMENTS

GENERAL

511.01 SCOPE

1. The work under this specification consists of the supply and use of materials for sprayed bituminous surfacings and asphalt. Materials used for the enrichment of seals are addressed in Specification 506 ENRICHMENT and materials used for microsurfacing are addressed in Specification 507 MICROSURFACING.

2. The works shall include the supply, storage, transport, and handling of materials.

511.02 REFERENCES

1. Australian Standards, Austroads Test Methods, ASTM International Test Methods, Main Roads Western Australia Test Methods and Main Roads Western Australia Specifications are referred to in abbreviated form (e.g. AS 1234, AG:PT/T001, ASTM A123, WA 123 or Specification 001). For convenience, the full titles are given below:

Australian Standards

AS 1141	Methods for Sampling and Testing Aggregates
AS 1160	Bituminous Emulsions for the Construction and Maintenance of Pavements
AS 1289.3.4.1	Determination of the linear shrinkage of a soil – Standard method
AS 1672.1	Limes for Building
AS 1726	Geotechnical Site Investigations
AS 2008	Bitumen for Pavements
AS 2106	Determination of the Flashpoint of Flammable Liquids (Closed Cup)
AS 2341	Methods of Testing Bitumen and Related Road Making Products
AS 2809	Road Tank Vehicles for Dangerous Goods
AS 3706	Geotextiles – Methods of Test

Austroads Test Methods

AG:PT/T101	Method of Sampling PMBs, Polymers and Crumb Rubber

AG:PT/T103	Pre-treatment and Loss on Heating of Bitumen and Multigrade
AG:PT/T108	Segregation of Polymer Modified Binders
AG:PT/T111	Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)
AG:PT/T112	Flash Point of Polymer Modified Binders
AG:PT/T121	Elastic Recovery, Consistency & Stiffness of PMBs
AG:PT/T122	Torsional Recovery of Polymer Modified Binders
AG:PT/T131	Softening Point of Polymer Modified Binders
AG:PT/T132	Compressive Limit of Polymer Modified Binders
AG:PT/T143	Particle Size and Properties of Crumb Rubber
AG:PT/T144	Morphology of crumb rubber – Bulk Density Test

ASTM International Test Methods

ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids
ASTM D1319	Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption
ASTM D86	Distillation of Petroleum Products
ASTM D276	Standard Test Methods for Identification of Fibres in Textiles
ASTM D6140	Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications

Acts and Regulations

Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007 (WA)

Other Standards and Publications

AUSTROADS Bitumen Sealing Safety Guide

Australian Asphalt Pavement Association Advisory Note No. 7 – Guide to the Heating and Storage of Binders for Asphalt Manufacture

Rock Colour Chart	Rock Colour Chart Committee, Geological Society of America, 2009.

Main Roads Test Methods

A complete list of Main Roads Test Methods is available on Main Roads' website at: Technical Library (mainroads.wa.gov.au)

Main Roads Specifications

A number of Specifications form part of the Contract and are referenced in this specification. The Contractor must refer to the Contract for details of such Specifications.

511.03 DEFINITIONS

1. The standard terminology listed in Table 511.1 shall apply to all Specifications.

TABLE 511.1 STANDARD TERMINOLOGY

Term	Definition
Durability Value	The time in days to reach the specified apparent viscosity level when determining the "Long-term effect of heat and air" in accordance with AS 2341.13 or WA 716.1.
Rolling Average Durability Value	The average of all durability values determined over the previous 12 calendar months for a source of bitumen supply OR the average of the previous six ship loads of imported bitumen, determined in accordance with this Specification.
Blended Bitumen	The final conforming bitumen product created by the blending of a low and high viscosity bitumens.
EME2	French Enrobés à Module Elevé (EME) Class 2 high modulus performance-based asphalt.
Polymer Modified Binder (PMB)	Binder comprised of polymeric material, including crumb rubber, suspended in bitumen.
Modified binder	Bituminous product created by the blending of bitumen with additives such as polymer, resin, crumb rubber, etc. for the purpose of improving the physical properties of the bitumen.
Reclaimed Asphalt Pavement (RAP)	Surplus plant mix asphalt or material reclaimed from an in situ asphalt layer, which is re-processed by crushing and/or screening for recycling into new asphalt.

511.04 NOT USED

511.05 Sustainability Considerations

1. Materials for road pavements shall be managed under the sustainability hierarchy of REDUCE, REUSE and RECYCLE.

2. Unless defined otherwise, the materials described in this specification shall be sourced from quarried or other virgin materials and shall be crushed or processed as applicable to produce a homogenous material. These materials are a finite resource and waste shall be reduced to a minimum. ***Reduce***

3. Where practical, redundant pavement materials should be recovered and reused, or otherwise recycled to the highest level use practical. Reused materials shall be processed to produce a homogenous material and shall meet the specified requirements. ***Reuse***

4. This specification also includes manufactured materials sourced from recycled materials. Recycled materials for pavement construction shall be blended, crushed or processed as applicable to produce a homogenous material by a recycling premises licensed by DWER. Recycled materials shall only be included in materials which are designated as recycled. ***Recycle***

PRODUCTS AND MATERIALS

511.06 Bitumen

511.06.01 GENERAL

1. All bitumen, either neat or used for manufacturing cutback bitumen, polymer modified bitumen, crumb rubber modified binder, multigrade bitumen or bitumen emulsion, shall be a straight run, slightly blown or blended product prepared by distillation from crude bituminous base oils.

2. The bitumen shall be homogeneous. It shall not foam when heated to 205°C. The formation of a thin layer of bubbles will not be regarded as foaming.

3. For bitumen imported to Western Australia, a batch is the quantity of a single binder class manufactured by the same process, from a single location and transported in the same enclosed vessel. Sampling shall be taken on delivery to the bulk depot.

4. For bitumen manufactured in Western Australia, a batch is the quantity of a single binder class derived from a continuous, uninterrupted production process. Sampling shall occur at the end of the manufacturing process.

5. Bitumen shall be sampled in accordance with WA 700.1.

6. Where bitumen is produced by the blending of a low and high viscosity bitumen, the following process shall be completed: ***Blended Bitumen***

   (a) a blend formulation shall be determined to manufacture the specific class of bitumen;

   (b) the blend formulation shall be assigned a unique identifier;

   (c) when a blend formulation is determined, a laboratory or plant batch shall be manufactured and tested to confirm the blend complies to all specified requirements;

   (d) when a blend formulation is determined to manufacture the bitumen at target viscosity to blend with a RAP binder. The formulation shall be calculated for each Lot of processed RAP;

   (e) when a batch of one of the constituent materials changes a new blend formulation shall be determined.

511.06.02 PROPERTIES OF BITUMEN

1. Class 170, Class 320 and Class 600 bitumen shall conform to the properties shown in Table 511.2 at the time of incorporation into the Works. ***Properties***

2. Other classes of bitumen not referenced in Table 511.2 shall conform to the requirements of AS 2008 and shall only be used for production of RAP Level 2 or Level 3 asphalt as per clause 511.06.01.

TABLE 511.2 PROPERTIES OF BITUMEN

Property	Method of Test	Class 170		Class 320		Class 600	
		Min	Max	Min	Max	Min	Max
Viscosity at 60°C, Pa.s	AS/NZS 2341.2 or AS 2341.3	160	230	260	380	550	650
Viscosity at 135°C, Pa.s	AS/NZS 2341.2 or AS 2341.3 or AS/NZS 2341.4	0.30	0.50	0.40	0.65	0.60	0.85
Penetration at 25°C, (100g, 5s), pu (1 pu = 0.1 mm)	AS 2341.12	55	-	40	-	20	-
Density at 15°C, kg/m³	AS 2341.7	1000	-	1000	-	1000	-
Flash Point, °C	AS 2341.14	250	-	250	-	250	-
Matter insoluble in toluene (%)	AS/NZS 2341.8	-	1.0	-	1.0	-	1.0
Rolling Thin Film Oven Test (AS/NZS 2341.10)							
Viscosity of residue at 60°C as percentage of original	AS/NZS 2341.2 or AS 2341.3	-	300	-	300	-	300
Ductility at 15°C, mm	AS 2341.11	400	-	Not Applicable			
Durability Value	AS/NZS 2341.13 or WA 716.1	Refer Clause 511.06.03		Not Applicable			

511.06.03 BITUMEN DURABILITY

1. In addition to the properties specified in Table 511.2, Class 170 bitumen shall conform to the following requirements: ***Durability***

   (a) The Rolling Average Durability Value for the month of bitumen supply shall be 9 days or greater.

   (b) The method for determining the Monthly Average Durability Value is detailed below:

      (i) Where supply is from a bulk storage depot with bitumen sourced from outside of Western Australia, at least one sample shall be taken from any delivery to the bulk depot. The sample shall be tested in full to demonstrate compliance with the properties shown in Table 511.1 including a durability test. A Rolling Average Durability Value shall be determined for each bulk storage depot.

(ii) The rolling average is the mean of all durability values reported during the previous 12 calendar months including values reported by both the bitumen supplier and Main Roads Western Australia. The rolling average value shall be calculated on the first day of each month by determining the average of ALL durability values reported during the preceding 12 calendar months. The average is the sum of all of the durability values divided by the number of reported values during the 12 month period.

(iii) The Durability Values used to determine the Rolling Average Durability Value must be traceable to all batches of Class 170 bitumen. The rolling average shall be determined on the first day of each month as a single value rounded to the nearest 0.1 day.

511.06.04 PROPERTIES OF EME2 BINDER

1. Binder used in the design and production of EME2 asphalt shall conform to the properties shown in Table 511.3. ***EME2***

TABLE 511.3 PROPERTIES OF EME2 BINDER

Property	Test Method	Grade 10/20		Grade 15/25	
		Min	Max	Min	Max
Penetration at 25°C (100g, 5s) pu (Note 1)	AS 2341.12	10	20	15	25
Softening point °C	AS 2341.18	59	79	56	72
Viscosity at 60°C (Note 2) Pa.s	AS/NZS 2341.2	10000	-	9000	-
Viscosity at 60°C at production (Note 2) Pa.s	AS/NZS 2341.2	8000	-	7000	-
Mass change %	AS/NZS 2341.10			-	0.5
Retained penetration (Note 3) %	AS/NZS 2341.10 and AS 2341.12			55	-
Increase in softening point after RTFO treatment (Note 4) °C	AS/NZS 2341.10 and AS 2341.18	-	10	-	8
Viscosity at 135°C°Pa.s	AS/NZS 2341.2, AS/NZS 2341.3, AS/NZS 2341.4 or AG:PT/T111	0.7	-	0.6	-
Matter insoluble in toluene % mass	AS/NZS 2341.8			-	1.0
Penetration index	N/A	Report		Report	
Viscosity at 60°C after RTFO (Note 2) Pa.s	AS/NZS 2341.10 and AS/NZS 2341.2	Report		Report	

Property	Test Method	Grade 10/20		Grade 15/25	
		Min	Max	Min	Max
Viscosity at 60°C, percentage of original after RTFO treatment %	AS/NZS 2341.10 and AS/NZS 234.2	Report		Report	

Note 1: One pu equals 0.1 mm.

Note 2: Test shall be performed using an Asphalt Institute viscosity tube.

Note 3: Retained penetration shall be calculated using the equation:
(Penetration at 25°C after RTFO x 100) / (Penetration at 25°C before RTFO).

Note 4: Increase in softening point after RTFO treatment shall be calculated using the equation:
Increase = Softening point after RTFO – softening point before RTFO.

$$PI = \frac{(20 \times SP) + (500 \times logPen) - 1952}{SP - (50 \times logPen) + 120}$$

Where:

SP = Softening point determined in accordance with AS 2341.18

Pen = Penetration determined in accordance with AS 2341.12

511.06.05 HANDLING AND TRANSPORT

1. In respect to the loading, transporting, heating, circulation, blending, transfer and sampling of bitumen and cutback bitumen, procedures as detailed in the Austroads publication “Bitumen Sealing Safety Guide” shall be followed. The supplier and carrier shall also observe the provisions and be licensed to perform delivery and heating in accordance with the D*angerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007* (WA) in respect to the transport of Dangerous Goods including Flammable Liquids.

2. Bitumen shall be loaded into road tankers at temperatures between 185°C and 205°C or in accordance with the safe loading requirements of the facility at which the bitumen is being loaded.

511.07 BITUMEN EMULSION

511.07.01 GENERAL

Emulsion

1. The bitumen used for the manufacture of the bitumen emulsion shall comply with the requirements of Clause 511.06. Bitumen to be used to manufacture bitumen emulsion shall be sampled in accordance with WA 700.1.

511.07.02 PROPERTIES

1. Bitumen emulsion shall be manufactured and conform to the properties in AS 1160.

2. When tested to AS 2341.29, emulsions shall meet AS 1160 criteria using local WA sourced aggregate.

3. Cationic emulsions shall meet or exceed the following criteria when tested in accordance with WA 756.2:

(a) Dry Aggregate 80% coated

(b) Wet Aggregate 60% coated

4. Bitumen emulsion shall be sampled in accordance with AS 1160, except that only one sample shall be taken from a prepared batch. The single sample shall be representative of the properties of the emulsion in the storage tank.

511.07.03 DILUTION OF BITUMEN EMULSION

1. Bitumen emulsion shall only be diluted when used for enrichment seals as per Specification 506 ENRICHMENT SEALS.

2. Bitumen emulsion to be used as tack coat shall be Cationic Slow Setting emulsion grade CSS/170-60 or Cationic Rapid Setting emulsion grade CRS/170-60, mixed 50:50 by volume with compatible water.

3. Water used to dilute bitumen emulsion shall be compatible with the emulsion. The water shall be added to the emulsion at a suitable temperature. Emulsion SHALL NOT be added to the water.

511.07.04 HANDLING AND TRANSPORT

Road Tanker

1. Bitumen emulsion shall be loaded into road tankers at a temperature that ensures the product remains stable and in accordance with the manufacturer's written instructions. Road tankers shall be lagged and shall have thermometers suitably located to give a representative temperature reading of the product in the tanker. The tanker shall be provided with facilities to enable circulation and mixing of bitumen emulsion prior to unloading.

2. Bitumen emulsion is not classified as a Dangerous Good, however, it should be transported and handled only by competent and experienced personnel, preferably in possession of a current Dangerous Goods licence.

511.07.05 HEATING AND CIRCULATION

1. Operations involving heating and circulating of bitumen emulsion shall be done by appropriately trained personnel. The circulating rate and heating rates shall be such that no premature breaking of the bitumen emulsion occurs. Circulating shall be continuous while heating is in progress.

2. Circulating shall continue for at least ten minutes after heating ceases. Burners shall not be used unless the level of the material in the heating tank is at least 150 mm above the tops of the heating tubes. The circulatory pipework shall be such that no foaming or air entrapment occurs during circulation.

3. Any bitumen emulsion heated in excess of 80°C (60% or 70% standard emulsion) or 100°C (PMB emulsion), after leaving the place of manufacture, shall not be used and shall be removed from site. The quantity of bitumen emulsion heated shall be that quantity that is to be applied to the pavement within six (6) hours of the heating being carried out. If bitumen emulsion is held in site storage for prolonged periods, then such heating as may be

necessary to prevent the bitumen emulsion temperature falling below 10°C shall be permitted.

4. A record of the heating locations and times is to be recorded by the driver on the delivery or despatch documentation or other traceable documentation.

511.08 POLYMER MODIFIED BINDERS

511.08.01 GENERAL

Polymer Modified Binder

1. The bitumen used for the manufacture of polymer modified binders (PMB) shall comply with the requirements of Clause 511.06. Bitumen to be used to manufacture PMB shall be sampled in accordance with WA 700.1. PMB shall be sampled in accordance with AG:PT/T101.

2. The Contractor shall test the PMB for conformance to the properties in Clause 511.08.02 and at the testing frequency shown in Specification 201 QUALITY MANAGEMENT. Tests required for each production batch shall be completed before release of the PMB for transport to its site of use.

511.08.02 PROPERTIES – SPRAY SEALING BINDERS

1. PMBs for use in spray sealing shall conform to the properties shown in Table 511.4.

TABLE 511.4 PROPERTIES OF PMB FOR SPRAYED SEALING

Binder Property	Test Method	Binder Class				
		S10E	S20E	S25E	S35E	S45R (Note 2)
Stress ratio at 10 °C Minimum	AG:PT/T125	Report	Report	Report	Report	Report
Consistency 6% at 60°C (Pa.s) Minimum	AG:PT/T121 (Note 1)	300	500	900	250	800
Stiffness at 15°C (kPa) Maximum	AG:PT/T121	140	N/A	N/A	180	Report
Stiffness at 25°C (kPa) Maximum	AG:PT/T121	N/A	35	30	N/A	N/A
Compressive Limit at 70°C, 2kg mm (minimum)	AG:PT/T132	N/A	N/A	N/A	N/A	0.2
Viscosity at 165°C (Pa.s) Maximum (Note 3)	AG:PT/T111 or AS/NZS 2341.4	0.55	0.6	0.9	0.55	4.5
Flash Point (°C) Minimum	AG:PT/T112	250	250	250	250	250
Loss on Heating (% mass) Maximum	AG:PT/T103	0.6	0.6	0.6	0.6	0.6

Binder Property	Test Method	Binder Class				
		S10E	S20E	S25E	S35E	S45R (Note 2)
Torsional Recovery at 25°C, 30s (%)	AG:PT/T122	22 – 50	38 – 70	55 – 80	16 – 32	25 – 55
Softening Point (°C)	AG:PT/T131	48 – 64	65 – 95	82 – 105	48 – 56	55 – 65
Segregation Value (%) Maximum	AG:PT/T108	8	8	8	8	8

Note 1: Consistency 6% at 60 °C of S10E and S35E shall be determined using mould B (breakpoint of 5 mm and a test speed of 1.5 mm/s). Other classes shall be tested using mould A (breakpoint of 10 mm and a test speed of 1 mm/s).

Note 2: To assist users in determining the quantity of added cutter oil required for spraying, the manufacturer shall report on the concentration and type of process oil used in the formulation.

Note 3: L series Brookfield is recommended together with spindle SC4-31, except in the case of S45R where spindle SC4-29 is recommended. The shear rate involved in determining viscosity by AS/NZS 2341.4 and AG:PT/T111 shall be calculated and recorded. AG:PT/T111 has been retained to allow laboratories sufficient time to adopt AS/NZS 2341.4.

511.08.03 PROPERTIES – ASPHALT BINDERS

1. The requirements for PMBs for a range of asphalt mix types are described below.

511.08.03.01 PROPERTIES OF PMB FOR ASPHALT

1. PMB for use in hot mixed asphalt shall conform to the properties shown in Table 511.5.

TABLE 511.5 PROPERTIES OF PMB FOR ASPHALT

Binder Property	Test Method	Binder Class					
		A10E	A10R (Note 3)	A15E	A20E	A35P	A25E
Polymer Type		SBS	CRM and SBS	SBS	SBS	EVA	PBD
Consistency 6% at 60°C (Pa.s) Minimum	AG:PT/T121 (Note 2)	1000	900		500	1000	400
Stiffness at 25°C (kPa) Maximum	AG:PT/T121	30	30		35	120	45
Stress ratio at 10°C Minimum	AG:PT/T125	Report	Report		Report	Report	Report
Viscosity at 165°C (Pa.s) Maximum	AG:PT/T111 (Note 1) or AS/NZS 2341.4	1.1	0.9		0.6	0.6	0.6

Binder Property	Test Method	Binder Class					
		A10E	A10R (Note 3)	A15E	A20E	A35P	A25E
Flash Point (°C) Minimum	AG:PT/T112	250	250		250	250	250
Loss on heating (% mass) Maximum	AG:PT/T103	0.6	0.6		0.6	0.6	0.6
Torsional Recovery at 25°C, 30s (%)	AG:PT/T122	60 - 86	55 - 80		38 - 70	6 - 21	17 - 30
Softening Point (°C)	AG:PT/T131	88 - 110	82 - 105		65 - 95	62 - 74	52 - 62
Segregation Value (%) Maximum	AG:PT/T108	8	8		8	8	8

Note 1: L series Brookfield is recommended together with spindle SC4-31.

Note 2: Consistency 6% of A25E shall be determined using mould B (breakpoint of 5mm and a test speed of 1.5mm/s). Other classes shall be tested using mould A (breakpoint of 10mm and a test speed of 1mm/s).

Note 3: A10R is to meet the same Specification tolerances as A15E, with a nominal 10% crumb rubber content. A10R is only to be used in wearing course asphalt in midblock and low traffic intersections.

511.08.03.02 PROPERTIES OF CRUMBED RUBBER ASPHALT BINDER

1. The crumb rubber modified binder shall meet the requirements of Table 511.6 without the inclusion of a workability additive at production and with workability additive during asphalt manufacture.

TABLE 511.6 CRUMB RUBBER BINDER DESIGN PROFILE

Property	Test Method	Digestion Time				
		60 minutes	120 minutes	240 minutes	11 hours	Maximum (Note 1)
Penetration at 4°C, 200g, 60s, pu (minimum)	AS 2341.12	15	-	15	15	15
Resilience at 25°C, % rebound (minimum)	ASTM D5329	20	-	20	20	20
Consistency 6% at 60ºC	AG:PT/T121	Report	-	Report	Report	Report
Torsional Recovery at 25°C, 30s, (%)	AG:PT/T122	Report	-	Report	Report	Report
Softening Point, (°C) (minimum)	AG:PT/T131	55	-	55	55	55

Property	Test Method	Digestion Time				
		60 minutes	120 minutes	240 minutes	11 hours	Maximum (Note 1)
Compressive Limit at 70°C, 2kg, (mm) (minimum)	AG:PT/T132	0.2		0.2	0.2	0.2
Stiffness at 25°C (kPa) Maximum	AG:PT/T121	180	-	-	-	-
Viscosity at 175°C	ASTM D7411/ D7741M (Note 2 & 3)	1.5 - 4.0				
	AG:PT/T111	Report				

Note 1: The asphalt manufacturer is to nominate the maximum period of time it intends to store the crumb rubber modified binder beyond 11 hours. The properties of the binder must comply with the table after this period of time.

Note 2: For the ASTM method the viscometer used shall be a Rion Model VT-04 or VT-06 using the No. 1 rotor. The rotor shall be immersed in the binder to the marked depth for a minimum of 60 seconds to achieve temperature equilibrium. Three measurements shall be taken within a period of 1 minute with the three values not exceeding a range of 1.0 Pa.s. Compliance to be taken as the average of three values.

Note 3: NATA accreditation for the ASTM test method is not required. Good laboratory practices meeting the requirements of ISO 17025 should be used to calibrate and use the Rion viscometer.

Crumb Rubber Modified Binder

2. The manufacturer shall provide evidence that the facility can manufacture the binder to the specified requirements prior to use of the binder.

3. Crumb rubber modified asphalt binders shall be manufactured in a facility in a manner that:

   (a) The manufacturing process for crumb rubber asphalt binder shall not mechanically reduce the size of the crumb rubber particles in the binder such as may occur through a high shear mill.

   (b) All constituents of crumb rubber and binder are to be added for mixing in a single operation.

   (c) Mixing shall then continue with a reaction period of at least 1 hour. Crumb rubber floating on the surface or agglomeration of crumb rubber is evidence of insufficient mixing.

   (d) Processing oils shall not be added to the binder.

4. The temperature of the crumb rubber modified binder during the digestion period shall not exceed 190°C. Mixing shall then continue with a reaction period of at least 1 hour.

5. A minimum quantity of 18% of crumb rubber by mass of total binder shall be used in the crumb rubber modified asphalt binder.

511.08.04 HANDLING AND TRANSPORT

1. In respect to the loading, transporting, heating, circulation, blending, transfer and sampling of PMB, procedures as detailed in the AUSTROADS publication “Bitumen Sealing Safety Guide” shall be followed. The supplier and carrier shall also observe the provisions and be licensed to perform delivery and heating in accordance with the *Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007* (WA) in respect to the transport of Dangerous Goods including Flammable Liquids.

2. PMB shall be loaded into road tankers, isotainers or sprayers at temperatures not exceeding 195°C or the manufacturer’s recommended maximum temperature, whichever is the lower. Road tankers shall be equipped with internal tank circulation. The binder shall not be heated above the manufacturer’s recommended maximum temperature at any time. The binder shall be delivered at a temperature suitable for its application at the time of delivery.

511.08.05 HEATING AND CIRCULATION

1. The binder shall be kept at the lowest practical temperature during transport and shall not be heated to spraying or asphalt mixing temperatures until the time it is to be used.

2. The heating and circulating of binder shall be done only by trained personnel in accordance with a documented process. The circulating rate shall not be less than 450 litres per minute for hot PMB but may be circulated at a lesser rate for emulsified PMB. Circulating shall continue for at least twenty minutes after heating ceases. The heating rate shall not exceed 20°C per hour at any stage during the heating process. Burners shall not be used unless the level of the material in the heating tank is at least 150 mm above the top of the heating tubes.

3. When binder is heated on site the temperature shall not be heated to a temperature greater than the maximum of the manufacturer’s recommended temperature range or 195°C, whichever is the lower value. Any binder that has been reheated to a temperature greater than the manufacturer’s recommended maximum temperature, or has been otherwise contaminated, shall not be used. A record of the heating locations and times is to be recorded by the driver on the delivery or despatch documentation or other traceable documentation.

4. Guidance on the storage of PMB at elevated temperatures is provided in AAPA Advisory Note No. 7. PMB used as an asphalt binder when stored in a fixed or mobile tank at an asphalt plant shall comply with the requirements of AAPA Advisory Note No. 7. Binder held at the mixing temperature for periods of time longer than those shown in Advisory Note No. 7 shall not be used for the production of asphalt.

511.09 RECLAIMED ASPHALT PAVEMENT

511.09.01 PROPERTIES

1. RAP shall be obtained from surplus plant mix asphalt or the material reclaimed from an asphalt layer in situ. RAP shall not contain any of the following:

   (a) granular pavement materials, clay, soil or organic matter;

   (b) bricks, concrete, glass or building materials; or

   (c) laterite asphalt, tar-based products, geotextile fabrics, raised pavement markers or road surface treatments such as high friction surfacings or coloured pavement markings.

511.09.02 PROCESSING AND STORAGE

1. RAP shall be maintained in a separate stockpile prior to processing for use in asphalt. ***RAP Size***

2. At a minimum, RAP incorporating fines shall be crushed and screened to produce a nominal 7 mm or 10 mm sized material with 100% of the material passing a 9.5 mm sieve. RAP excluding fines may be crushed and screened to produce a nominal 14 mm sized material with 100% of the material passing a 13.2 mm sieve and 98% of the material retained on a 6.7 mm sieve.

3. For RAP Level 3, RAP shall be crushed and screened into two fractions. A coarse fraction shall consist of RAP with 100% retained on a 4.75 mm sieve and a fine fraction shall have 100% of RAP passing a 4.75 mm sieve. ***Size Level 3***

4. All processed RAP shall be free flowing and consistent in appearance. Where the stored RAP is not free flowing it shall be screened and/or crushed again.

5. All processed RAP shall be stored under cover until it is used in asphalt production. The storage facility must be covered on the top and at least three sides and not allow rainfall or other sources of moisture to wet the RAP after processing. The floor of the storage facility shall be concrete sloping down to a drain to allow removal of excess moisture. ***Storage of RAP***

511.09.03 STOCKPILE MANAGEMENT AND TESTING

1. Processed RAP shall be maintained in Lots to ensure traceability. A RAP Management Plan (RMP) shall be prepared by the asphalt manufacturer. The RMP shall detail the following:

   (a) The process commencing at the origin of the RAP, stockpiling prior to processing, processing, storage and testing.

   (b) The capability of the plant to incorporate the specific RAP level.

   (c) The process for manufacture of asphalt containing RAP.

2. Each sample shall be tested for particle size distribution and bitumen content in accordance with WA 730.1 and moisture content in accordance with WA 212.1 or 212.2.

511.10 AGGREGATES

511.10.01 GENERAL

1. The specification for aggregates is divided into five headings.

   (a) Source rock for aggregate used for spray sealing and asphalt works.

   (b) Crushed aggregates used for spray sealing works including handling and transport of aggregate.

   (c) Crushed aggregates used for asphalt works including handling and transport of aggregate.

   (d) Natural sand for intermediate course asphalt.

   (e) Properties of crusher dust and sand for primersealing.

511.10.02 SOURCE ROCK FOR CRUSHED AGGREGATE

1. Source rock shall be selected from an approved quarry site and be fresh, hard and durable rock, free from clay, organic matter, weathered (except as allowed below) or friable material, and is consistent in appearance. A classification system for rock material weathering is defined in Table A9 of AS 1726. The proportions of weathered rock material in the source rock shall not exceed the following limits by mass:

   (a) Slightly weathered rock 10% maximum

   (b) Distinctly weathered rock 0.1% maximum

   (c) Extremely weathered rock 0.1% maximum

   (d) Residual soil 0% maximum

2. Selection of source rock shall be such that the requirements shown in Table 511.7 are satisfied.

TABLE 511.7 SOURCE ROCK PROPERTIES

Property	Limit	Method of Test
Pendulum Friction Test (PAFV)	45 min	AS 1141.40 or AS 1141.41

511.10.03 CRUSHED AGGREGATE FOR SPRAY SEALING WORKS

1. Source rock shall be processed to produce crushed and/or screened aggregate suitable for sprayed sealing works and shall conform to the requirements shown in Table 511.8. The aggregate shall be of uniform quality, clean, hard and durable and shall be free from clay, organic matter and elongated particles. The aggregate shall be of a uniform colour and appearance for the whole of the application. Other than for Flakiness Index, Moisture Content and Average Least Dimension, testing for conformance shall only be undertaken on either 10 mm or 14 mm sized aggregate.

TABLE 511.8 CRUSHED AGGREGATE PROPERTIES – SPRAYED SEAL

Property	Requirement	Test Method
Moisture Content	Dry (free of visible surface moisture)	WA 212.1 or WA 212.2
Los Angeles Abrasion Value (Note 1) Granite and other rock types Basalt	 35% maximum 25% maximum	 WA 220.1 WA 220.1
Flakiness Index (Note 1)	35% maximum (Note 2)	WA 216.1
Average Least Dimension (Note 3)	Report	AS 1141.20.1 or AS 1141.20.2 or WA 215.1
Water Absorption	2% maximum	AS 1141 6.1
Wet Strength	100kN minimum	AS 1141.22
Wet/Dry Strength Variation	35% maximum	AS 1141.22
Stripping Test Value (Note 4)	10% maximum	AS 1141.50
Degradation Factor	50 minimum	AS 1141.25.2
Secondary Mineral Content (Note 5)	25% maximum	AS 1141.26
Petrographic Examination	Statement of suitability for use as a sealing aggregate	

Note 1: Not applicable for crusher dust, sand, and 5 mm aggregate.

Note 2: Applicable to the mean of three results for each lot.

Note 3: ALD is the mean of three samples from a roadside stockpile used in calculating the Binder Application Rate as referenced in the Contract specification. Where the aggregate is supplied direct from a quarry the size of a lot for the purpose of testing must not exceed 1000 m3.

Note 4: The aggregate shall be tested in a clean dry condition without precoating. The binder shall include 0.5% by volume of one of the approved adhesion agents listed at Clause 511.13.

Note 5: This test is only applicable to basic igneous rock.

2. The particle size distribution of the crushed aggregate shall conform to the requirements shown in Table 511.9. The specification applies to the mean of three PSD results determined for each Lot.

TABLE 511.9 PARTICLE SIZE DISTRIBUTION (PSD)

Sieve Size (mm)	Percentage by mass passing each sieve for each nominal size of aggregate						
	20 mm	16 mm	14 mm	10 mm	7 mm	5 mm (Note 1)	3 mm
26.50	100						
19.00	80 - 100	100					
16.00	0 - 20	80 - 100	100				
13.20	0 - 2	0 - 20	80 - 100	100			
9.50		0 - 2	0 - 20	80 - 100	100		
6.70			0 - 2	0 - 20	80 - 100	100	
4.75				0 - 2	0 - 25	80 - 100	100
2.36					0 - 2	0 - 30	80 - 100
1.18	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 1.0	0 - 30
0.60							0 - 5

Note 1: Where 5 mm aggregate is not available from a regional quarry it can be produced by screening conforming 7 mm sized aggregate to remove retained 6.7 mm size and passing 2.36 mm sizes.

511.10.04 CRUSHED AGGREGATE FOR ASPHALT WORKS

1. Source rock shall be processed to produce crushed and/or screened aggregate suitable for asphalt works. The aggregate shall be of uniform quality, clean, hard and durable and shall be free from excess dust, clay, organic matter and elongated particles. The aggregate shall be of a uniform colour and appearance for the whole of the application. Coarse aggregate is defined as the material retained on a 2.36 mm sieve. Physical properties of crushed aggregates shall conform to the requirements of Table 511.10. Other than for Flakiness Index testing for conformance shall only be undertaken on either 10 mm or 14 mm sized aggregate.

Coarse Aggregate

2. In addition to the properties in Table 511.10 the following colour requirements shall apply to all wearing course asphalt mixes produced in the Perth metropolitan area. The coarse aggregate shall be uniform in colour and shall not contain diorite stones. When tested in accordance with WA 250.1 no more than 15 % by mass of the aggregate shall be darker than value (lightness) 3 on the neutral grey axis scale of the Rock Colour Chart. The value (lightness) of the aggregate after removal of the stone darker than value 3 shall not be darker than 5 on the neutral grey axis of the Rock Colour Chart.

Coarse Aggregate

TABLE 511.10 CRUSHED AGGREGATE PROPERTIES – ASPHALT

Property	Requirement	Test Method
Los Angeles Abrasion Value (Note 1) Granite and other rock types Basalt	 35% maximum 25% maximum	 WA 220.1 WA 220.1
Flakiness Index (Note 1) Specifications 502, 504 and 510 Specifications 514, 516 and 517	 35% maximum (Note 2) 25% maximum (Note 2)	WA 216.1
Water Absorption	2% maximum	AS 1141 6.1
Wet Strength	100kN minimum	AS 1141.22
Wet/Dry Strength Variation	35% maximum	AS 1141.22
Stripping Test Value (Note 3) (Note 4)	10% maximum	AS 1141.50
Degradation Factor	50 minimum	AS 1141.25.2
Secondary Mineral Content (Note 5)	25% maximum	AS 1141.26
Petrographic Examination	Statement of suitability for use as an asphalt aggregate	

Note 1: Only applicable to 10, 14 and 20 mm aggregate.

Note 2: Applicable to the mean of three results for each Lot.

Note 3: The aggregate shall be tested in a clean dry condition without precoating. The binder shall include 0.5% by volume of one of the approved adhesion agents at Clause 511.13.

Note 4: Only applicable to asphalt plants where hydrated lime cannot be used.

Note 5: This test is only applicable to basic igneous rock.

3. Fine aggregate is defined as all material retained on a 75 micron Australian Standard Sieve and passing a 2.36 mm Australian Standard Sieve and shall consist of clean, tough, durable grains, free from clay, loam or other foreign matter. Fine aggregate shall only consist of crushed rock material. When the fine aggregate is tested in accordance with AS 1141.5 the water absorption shall not exceed 2%. ***Fine Aggregate***

4. Local granite aggregates shall be used for asphalt produced in the Perth metropolitan area, with the following requirements applying to all wearing course asphalt mixes. Fine aggregate shall be uniform in colour and shall not contain excessively coloured or stained material. When tested in accordance with WA 250.1 the value (lightness) of the granite shall not be darker than 5 on the neutral grey axis of the Rock-Colour Chart. Aggregate sources shall be kept constant throughout the period of works. ***Fine Aggregate***

5. Screened or crushed laterite aggregate used for coloured mixes shall conform to the following requirements. Screened laterite aggregate when tested in accordance with WA 223.1, the percentage of stones crushed shall not exceed 5% and the percentage of stones cracked shall not exceed 5%. Crushed laterite aggregate when tested in accordance with WA 223.1, the percentage of stones crushed shall not exceed 10% and the percentage of stones cracked shall not exceed 10%. When tested in accordance with AS 1141.42 the PAFV of the laterite aggregate shall be a minimum of 40%. ***Laterite Aggregate***

6. Aggregate shall be loaded, transported and stockpiled in such a manner so as not to cause contamination, loss of material or deterioration of properties. Any aggregate that is considered contaminated or otherwise non-conforming or unsuitable for use at any stage prior to use shall not be used. Aggregates are to be stockpiled only in agreed suitable areas that are free draining and do not allow contamination with other stockpiles or surrounding or floor materials. ***Handling and Transport***

511.10.05 NATURAL SAND FOR INTERMEDIATE COURSE ASPHALT

1. Natural sand shall be clean, hard, durable, non-plastic, free from clumps or other aggregations, not contain any organic matter or other deleterious material.

2. The sand shall have a water absorption value of no more than 1.5% when determined in accordance with AS 1141.5. ***Water absorption***

3. The sand shall have a linear shrinkage value of no more than 1.5% when determined in accordance with AS 1289.3.4.1 or WA 123.1. ***Linear shrinkage***

511.10.06 CRUSHER DUST OR SAND FOR PRIMERSEALING

1. Crusher dust or sand use as cover material for primersealing shall meet the requirements of Table 511.11 and shall be free of clay or silt.

TABLE 511.11 PROPERTIES OF CRUSHER DUST OR SAND

Property	Requirement	Test Method
Moisture Content	Dry (free of visible surface moisture)	WA 212.1 or 212.2
Water Absorption of Fine Aggregate	2% maximum	AS 1141.5
Particle Size Distribution (Grading)	See below	WA 210.1

2. Crusher dust or sand shall have properties not less than the following requirements: ***Grading***

   (a) Material shall be coarse, with a $D_{80} > 0.60\text{mm}$ and $C_u(Coefficient\ of\ Uniformity) > 4$,
   Where D_{80} is the particle size in millimetres at which 80%, by mass of the sample, is smaller in size and $C_u = \frac{D_{60}}{D_{10}}$,where D_{60} and D_{10} are respectively equal to the particle size in millimetres at which 60% and 10%, by mass of the sample, is smaller in size.

   (b) The maximum particle size shall be 4.75 mm. Oversize material shall be removed by screening.

   (c) Shall not have more than 4% by mass passing the 0.075 mm sieve.

511.10.07 FILLER FOR ASPHALT

1. Where additional filler is required for asphalt, this shall be baghouse dust from the same origin of the mineral filler and aggregates used to produce the asphalt.

2. The combined filler shall comply with the requirements of Table 511.12 and 511.13.

TABLE 511.12 COMBINED FILLER REQUIREMENTS

Property	Test Method	Requirement
Voids in Dry Compacted Filler (%)	AS/NZS 1141.17	≥ 28 and ≤ 45
Apparent Density of Filler (t/m^3)	AS/NZS 1141.7	Report

TABLE 511.13 COMBINED FILLER PSD

Australian Standard Sieve Size (mm)	Percentage Passing by mass (%) AS 1141.11.1
0.600	100
0.300	95 - 100
0.075	75 - 100

511.11 CUTTING OILS

511.11.01 GENERAL

1. Oils used for reducing the viscosity of bituminous binders shall comply with the properties shown below at any stage after manufacture and until the cutting oil is used. Products such as high flash point cutter shall not be used.

511.11.02 MEDIUM CURING CUTTING OIL

1. Medium curing cutting oil shall be a petroleum product conforming to the requirements shown in Table 511.14. Supply of certified Aviation Turbine Fuel-Jet A1 with a statement that it had been denatured and supplied without other change as Medium Curing Cutting Oil is acceptable.

TABLE 511.14 PROPERTIES OF MEDIUM CURING CUTTING OIL

Property	Requirement	Test Method
Distillation		ASTM D86
Initial Boiling Point	132 - 160°C	
Final Boiling Point	265°C maximum	
Temperature at 50% Recovery	220°C maximum	
Flash Point (Pensky Martin Closed)	35°C minimum	AS 2106
Viscosity at 40°C	1.0 - 1.4 mm^2/s	ASTM D445
Density at 15°C	780 - 820 kg/m^3	AS 2341.7
Miscibility with Equal Parts of Class 170 Bitumen	Complete No Precipitation	
Water Content	0.05% maximum	AS 2341.9
Percentage Aromatics	15% minimum (Vol)	ASTM D1319

511.11.03 SLOW CURING CUTTING OIL

1. Slow curing cutting oil shall be the recognised petroleum product distillate fuel oil conforming to the requirements shown in Table 511.15. Supply of certified Automotive Distillate, with a statement that it had been supplied without change as SC Cutting Oil, is acceptable.

TABLE 511.15 PROPERTIES OF SLOW CURING CUTTING OIL

Property	Requirement	Test Method
Distillation		ASTM D86
Initial Boiling Point	170 - 195°C	
Final Boiling Point	360 - 400°C	
Temperature at 50% Recovery	250 - 290°C	
Flash Point (Pensky Martin Closed)	65°C minimum	AS 2106
Viscosity at 40°C	2.0 - 4.0 mm^2/s	ASTM D445
Miscibility with Equal Parts of Class 170 Bitumen	Complete No Precipitation	
Water Content	0.05% maximum	AS 2341.9

511.12 PRECOAT FLUID

511.12.01 GENERAL

1. Unless otherwise specified, distillate precoating fluid shall be used for works using hot bitumen and PMBs.

2. Crushed aggregate used for bitumen emulsion surfacing work shall not be precoated with distillate or bitumen based precoating fluids. For emulsion sealing or primersealing the aggregate shall be prewetted with water to assist adhesion of the binder.

511.12.02 DISTILLATE PRECOATING FLUID

1. Unless otherwise specified, distillate precoating fluid shall be slow curing cutting oil with 0.5% by volume of an approved adhesion agent.

511.12.03 BITUMEN BASED PRECOATING FLUID

1. Where specified bitumen based Precoating Fluid shall be a blend of Slow Curing Cutting Oil, Class 170 Bitumen and an approved adhesion agent for sprayed sealing works. The blend may contain between 15 and 30% by volume of bitumen and shall contain 0.5% by volume of adhesion agent. The volume of slow curing cutter must be adjusted dependent upon the proportion of bitumen within the blend. The fluid shall not contain any other materials, whether they are bituminous materials, fuels, solvents, water or oils.

511.13 ADHESION AGENT

511.13.01 ADHESION AGENT FOR SPRAY SEALING WORKS

1. Adhesion agent shall be added to all hot bitumen and PMBs used for spray sealing in the proportion given in the contract Specification. Adhesion agent shall be from the list of approved products in Table 511.16.

TABLE 511.16 ADHESION AGENTS

Bitumite Concentrate
Redicote BE
Diamin TO-L
Rhodoval DA 410
Aggrebond PC
Evotherm PC 1770

511.13.02 ADHESION AGENT FOR ASPHALT WORKS

1. Adhesion agent for asphalt mixes shall be hydrated lime conforming to AS 1672.1.

2. For mixes produced in rural regions where the inclusion of hydrated lime may be impractical, an approved liquid adhesion agent, listed in Table 511.16, shall be added to the asphalt binder to promote adhesion. Where liquid adhesion agents are used, the concentration of adhesion agent in the binder tank at any time during production shall be between 0.5 to 1.0% by mass of the binder. The adhesion agent shall have been added to the binder no more than 48 hours before production of the asphalt.

511.14 FIBRES

1. Fibres for use in stone mastic asphalt shall be:

   (a) Viatop cellulose fibre

   (b) Topcell cellulose fibre

   (c) Ravasol Bitcel cellulose fibre

511.15 NOT USED

511.16 CRUMB RUBBER

Crumb Rubber

1. Crumb rubber for use in crumb rubber modified binders shall consist of rubber processed from end of life tyres or other suitable rubber products. Uncured or devulcanized rubber shall not be used as a source material.

2. Crumb rubber shall be sourced from a Tyre Stewardship Australia accredited tyre recycler or a Main Roads approved supplier.

3. Crumb rubber shall be supplied in a dry condition, shall be protected against moisture ingress, and shall be stored undercover to ensure the product remains dry.

4. Crumb rubber shall be sampled and prepared for testing in accordance with AG:PT/T101, AG:PT/T143 and WA 201.1.

5. Crumb rubber shall meet the requirements shown in Table 511.17. Crumb rubber shall not contain any foreign material such as sand, fibres or aggregate. Crumb rubber shall not contain more than 20% of elongated particles. An elongated particle is one where the length of the major axis of the particle is more than double the length of the minor axis.

TABLE 511.17 PROPERTIES OF CRUMB RUBBER

Property	Requirement	Test Method
Bulk Density	< 350 kg/m³	AG:PT/T144 or WA 235.1
Iron or Steel Content	≤ 0.1% by mass	AG:PT/T143 or WA 237.1
Particle Shape	Mean of measured particles Maximum 3mm	AG:PT/T143
Moisture Content	Maximum 1%	AG:PT/T143
Particle Size Distribution Sieve Size (mm)	**Percentage Passing (by Mass)**	AG:PT/T143 or WA 236.1
2.36	100	
1.18	100	
0.60	60 - 100	
0.30	0 - 22	
0.075	0 - 2	

511.17 PIGMENT

1. Red iron oxide pigment shall be incorporated into laterite asphalt mixes. The Asphalt Manufacturer shall use an appropriate type, quantity and process for the incorporation of red iron oxide pigment to meet the requirements of Specification 504. ***Oxide***

511.18 MINERAL FILLER

1. Mineral filler shall be defined as all material passing a 75 micron Australian Standard Sieve and shall consist of dry mineral dust. Where hydrated lime is used as filler in asphalt, it shall conform to AS 1672.

511.19 PROTECTIVE PAPER

1. A heavy-duty protective paper, such as a bitumen-laminated paper, shall be used for all start, finish, and taper operations on spray sealing works. The paper shall be held securely in place during spraying operations and shall be of sufficient width and strength to prevent overspray and spillage during removal. A minimum width of 900 mm is required. ***Protective Paper***

511.20 GEOTEXTILE FABRIC

1. The geotextile fabric shall be non-woven needle punched fabric manufactured from polyester. The fabric shall be free of any flaws that may impact upon performance of the fabric. Geotextile fabric used for spray sealing applications shall comply with the requirements of Table 511.18. ***Geotextile***

TABLE 511.18 PROPERTIES OF HEAVY GRADE GEOTEXTILE FABRIC

Test Property (Note 1)	Test Method	Requirement
Wide strip tensile strength (kN/m)	AS 3706.2	≥ 9.0
Mass per unit area (g/m^2)	AS 3706.1	170 - 200
Maximum Elongation (%)	AS 3706.2	40 - 60
UV Stabilisation – Retained Strength (Note 2)	AS 3706.11	At least 50%
Melting Point (°C)	ASTM D276	≥ 200
Bitumen Retention at 160°C (L/m^2) (Note 1)	ASTM D6140	0.9 - 1.4
Thickness (mm)	AS 3706.1	1.6 - 2.0

Note 1: Geotextile fabric shall be dry conditioned prior to testing.

Note 2: Test shall be completed using Class 170 bitumen as per AS 2008. The sample of bitumen shall be reheated only once.

Note 3: Results are to be reported for both fabric directions. Test specimens are to be exposed for a period of 500 ± 50 hours with a total exposure of 630 KJ/m^2.

2. A roll of geotextile fabric shall: ***Geotextile Roll***

   (a) Be rolled on to a rigid PVC tube.

   (b) Be evenly wound on to the tube to create square ends with the roll varying no more than 40 mm in rolled width.

   (c) Be within 50 mm of the ordered width for the full length of the roll.

   (d) Not be shorter than the ordered length and be no more than 1 m longer

3. When stored, geotextile fabric shall be: ***Storage***

   (a) Wrapped with a waterproof opaque material including the ends of rolls.

   (b) Stored in a shed away from direct sunlight and rain.

   (c) Kept off the ground and away from any source of moisture.

4. Rolls of geotextile fabric shall show the manufacturer's name, batch number and date of manufacture. ***Labelling***

5. Geotextile fabric shall be used within 2 years of the date of manufacture. ***Age***

6. The Contractor shall test the geotextile fabric for conformance to the properties in Table 511.19 at the testing frequency shown in Specification 201 QUALITY MANAGEMENT. Testing shall be undertaken in a laboratory accredited by NATA or a laboratory accredited by a body that is signatory to the ILAC Mutual Recognition Agreement. ***Compliance Testing***

511.21 WORKABILITY ADDITIVE

1. Workability additives approved for use in asphalt works shall be: ***Workability Additive***

   (a) Sasol Sasobit

   (b) Evotherm

511.22 PAVING TAPE

1. Where paving tape is shown in drawings or Specifications, the tape shall be 200mm to 300mm wide of either: ***Paving Tape***

   (a) Denso Paving tape; or

   (b) Flexiseal Tape HD; or

   (c) Bitac DS Multi-Laminate tape.

511.23 – 511.80 NOT USED

AS BUILT AND HANDOVER REQUIREMENTS

511.81 – 511.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

511.90 – 511.99 NOT USED

GUIDANCE NOTES

FOR REFERENCE ONLY – DELETE GUIDANCE NOTES FROM FINAL DOCUMENT

1. All edits to this specification are to be made using track changes, to clearly show added/ deleted text.

2. If **all** information relating to a clause is deleted, the clause number should be retained and the words **"NOT USED"** should be inserted.

3. The proposed document with tracked changes must be submitted to the Project Manager for review, prior to finalising the document.

4. Once the Project Manager's review is complete, accept all changes in the document, turn off track changes and refresh the Table of Contents.

5. The Custodian of this specification is the Manager Materials Engineering.

CONTRACT SPECIFIC REQUIREMENTS

The following clauses are to be placed under the CONTRACT SPECIFIC REQUIREMENTS, as required. After inserting the clause, change the clause number and heading to style “H2 SP” so it appears in the Table of Contents.

511.XX SUBHEADING (H2 SP)

1. Insert text (Main Table SP) ***Keyword SP***

2. Insert text (Main Table SP)

511.XX SUBHEADING (H2 SP)

1. Insert text (Main Table SP)

2. Insert text (Main Table SP)

AMENDMENT CHECKLIST

Specification No. **511** Title: **MATERIALS FOR BITUMINOUS TREATMENTS** Revision No: _____

Project Manager: _____ Signature: _____ Date: _____

Checked by: _____ Signature: _____ Date: _____

Contract No: _____ Contract Name: _____

ITEM	DESCRIPTION	SIGN OFF
Note: All changes/amendments must be shown in tracked changes until approved.		
1.	Project Manager has reviewed the specification and identified additions and amendments.	
2.	Standard clauses amended? **MUST SEEK** approval from the Specification Custodian.	
3.	Any unlisted materials/products proposed and approved by the Project Manager? If "Yes" provide details at 16.	
4.	Deleted clauses shown as **"NOT USED"**.	
5.	Ensure appropriate **INSPECTION AND TESTING** parameters are included in Specification 201 (test methods, minimum testing frequencies verified).	
6.	**AS-BUILT AND HANDOVER** requirements addressed.	
7.	**CONTRACT SPECIFIC REQUIREMENTS** addressed? Contract specific materials, products, clauses added? (refer Specification Guidance Notes).	
8.	**ANNEXURES** completed (refer Specification Guidance Notes).	
9.	Estimates Manager has approved changes to **SMM**.	
10.	Project Manager certifies completed specification reflects intent of the design.	
11.	Independent verification of completed specification arranged by Project Manager.	
12.	Project Manager's review completed.	
13.	**SPECIFICATION GUIDANCE NOTES** deleted.	
14.	**TABLE OF CONTENTS** updated.	
15.	**FOOTER** updated with Document No., Contract No. and Contract Name.	
16.	Supporting information prepared and submitted to Project Manager.	
Additional information or further action:		

Signed: _____ *(Project Manager)* Date: _____