

Master Specification

Part RD-BP-S1

Supply of Bituminous Material

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RD-BP-S1 Supply of Bituminous Material

1 General

- a) This Master Specification Part sets out the requirements for the supply and delivery of bitumen, primers, primer binders, polymer modified binders (PMB), emulsions, multi-grades and crumb rubber binders (CMB) including:
- i) the documentation requirements, as set out in section 2;
 - ii) the requirements for residual bitumen, as set out in section 3;
 - iii) the requirements for PMB, as set out in section 4;
 - iv) the requirements for primers and primer binders, as set out in section 5;
 - v) the requirements for emulsions, as set out in section 6;
 - vi) the requirements for multigrade bitumens, as set out in section 7;
 - vii) the requirements for CRB, as set out in section 8;
 - viii) the requirements for bituminous flux and clutter, as set out in section 9;
 - ix) the test procedures, as set out in section 10;
 - x) the requirements for sampling and testing, as set out in section 11;
 - xi) the requirements for records, as set out in section 12;
 - xii) the Hold Points and Witness Points requirements, as set out in section 13; and
 - xiii) the verification requirements and records, as set out in section 14.
- b) The supply of bituminous material must comply with the Reference Documents, including:
- i) AAPA Guide to the Manufacture, Storage and Handling of Polymer Modified Binders;
 - ii) Austroads Test Method ATM-103 Mass Change or Loss on Heating of Polymer Modified Binders After Rolling Thin Film Oven [RTFO] Treatment;
 - iii) Austroads Test Method AGPT-T108 Segregation of Polymer Modified Binders;
 - iv) Austroads Test Method ATM-111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel);
 - v) Austroads Test Method AGPT-T121 Shear Properties of Polymer Modified Binders (ARRB ELASTOMETER);
 - vi) Austroads Test Method ATM-112 Flash Point of Polymer Modified Binders;
 - vii) Austroads Test Method ATM-122 Torsional Recovery of Polymer Modified Binders;
 - viii) Austroads Test Method AGPT-T124 Toughness of Polymer Modified Binders (ARRB Extensiometer);
 - ix) Austroads Test Method AGPT-T131 Softening Point of Polymer Modified Binders;
 - x) Austroads Test Method ATM-132 Compressive Limit of Polymer Modified Binders;
 - xi) Austroads Test Method AGPT-T142 Rubber Content of Crumb Rubber Modified Bitumen: Soxhlet Method;
 - xii) Austroads Test Method AGPT-T144 Morphology of Crumb Rubber - Bulk Density Test;
 - xiii) Austroads Test Method AGPT-T190 Specification Framework for Polymer Modified Binders;

- xiv) Austroads Technical Specification ATS-3110 Supply of Polymer Modified Binders;
- xv) AS 1160 Bituminous emulsions for the construction and maintenance of pavements;
- xvi) AS 1289 Methods of testing soils for engineering purposes;
- xvii) AS 1289.2.1.1 Methods of testing soils for engineering purposes, Method 2.1.1: Soil moisture content tests - Determination of the moisture content of a soil - Oven drying method (standard method);
- xviii) AS 1289.2.1.4 Methods of testing soils for engineering purposes, Method 2.1.4: Soil moisture content tests - Determination of the moisture content of a soil - Microwave-oven drying method (subsidiary method);
- xix) AS 2008 Bitumen for pavements;
- xx) AS 2157 Cutback bitumen;
- xxi) AS 3568 Oils for reducing the viscosity of bituminous binders for pavements;
- xxii) AS 2106 Methods for the determination of the flash point of flammable liquids (closed cup);
- xxiii) AS 2341 Methods of testing bitumen and related roadmaking products;
- xxiv) AS 2341.6 Methods of testing bitumen and related roadmaking products, Method 6: Determination of density using a hydrometer;
- xxv) AS 2341.18 Methods of testing bitumen and related roadmaking products, Method 18: Determination of softening point (ring and ball method);
- xxvi) AS 2341.9 Methods of testing bitumen and related roadmaking products, Method 9: Determination of water content (Dean and Stark);
- xxvii) ASTM D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity);
- xxviii) ASTM D1319 Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption;
- xxix) ASTM D86 Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure;
- xxx) Department Test Procedure TP652 Determination of Viscosity by Haake Viscobalance (available from: https://dit.sa.gov.au/standards/test_procedures);
- xxxi) Department Test Procedure TP667 Method for Calculation of the Parts Cutter in Bituminous Binder (available from: https://dit.sa.gov.au/standards/test_procedures);
- xxxii) Department Test Procedure TP705 Determination of Aggregate Stripping by the One Day Plate Stripping Test (available from: https://dit.sa.gov.au/standards/test_procedures);
- xxxiii) Department Test Procedure TP780 Determination of the Total Amine Value of an Adhesion Agent and the Percentage of Adhesion Agent in Precoat (available from: https://dit.sa.gov.au/standards/test_procedures); and
- xxxiv) TfNSW Test Method T730 Sieve analysis of scrap rubber (available from: <https://standards.transport.nsw.gov.au/>).

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

- a) emulsion primer materials and application information as required by section 5c);
- b) bitumen adhesion additive product details as required by 5d);
- c) procedures related to mixing and storage of CRB's as required by section 8.1b); and
- d) details of the plant, constituent materials and digestion times proposed for the preparation and testing of CRB samples, as required by section 8.1d).

2.2 Quality Management Records

In addition to the requirements of PC-QA1 "Quality Management Requirements" or PC-QA2 "Quality Management Requirements for Major Projects" (as applicable), the Quality Management Records must include:

- a) manufacturing, blending and storage details of CRB's as required by section 8.1g);
- b) test results required by section 10b);
- c) test results required by section 11.1a);
- d) delivery documentation required by section 11.1c) (where applicable);
- e) test results required by section 11.2a);
- f) PMB sampling and records required by section 11.2b);
- g) sampling and testing records required by section 11.3a);
- h) delivery documentation required by section 11.3b) (where applicable);
- i) records required by section 12; and
- j) verification records required by section 14.

3 Residual bitumen

The Contractor must ensure that residual bitumen complies with:

- a) AS 2008 Bitumen for pavements;
- b) Table RD-BP-S1 3-1; and Table RD-BP-S1 3-2.

Table RD-BP-S1 3-1 Additional requirements for Class 170 bitumen

Test	Specified properties - minimum	Specified properties - maximum	Test procedure
Durability, (days)	7	-	AS 2341.13 and AS 2341.5
Density at 15°C, (kg/L)	1.0	-	AS 2341.7

Table RD-BP-S1 3-2 Additional requirements for Class 320 bitumen

Test	Specified properties - minimum	Specified properties - maximum	Test procedure
Durability, (days)	TBR ⁽¹⁾	-	AS 2341.13 and AS 2341.5
Density at 15°C, (kg/L)	0.99	-	AS 2341.7
n-Heptane insoluble, (%)	TBR ⁽¹⁾	-	ASTM D3279
Penetration at 35°C, 100g, 5s (pu)	-	TBR ⁽¹⁾	AS 2341.12

Table Notes:

(1) "To be recorded".

4 Polymer modified binders (PMB)

The Contractor must ensure that PMB comply with Austroads Test Method AGPT-T190 Specification Framework for Polymer Modified Binders, except that Table 5.1 “Properties of PMBs for Sprayed Sealing Applications” and Table 5.2 “Properties of PMBs for Asphalt Applications” be deleted and replaced with the following requirements:

- a) PMBs must comply with Table RD-BP-S1 7-1 and Table RD-BP-S1 7-2;
- b) PMBs must be suitable for the purpose of retaining the screenings in the seal by initial wetting and subsequent bonding. The base binder used in the manufacture of PMBs must conform to the requirements of section 3; and
- c) PMBs must be prepared in a manufacturing plant or blending plant of proven performance and must comply with the AAPA Guide to the Manufacture, Storage and Handling of Polymer Modified Binders.

5 Primers and primer binders

- a) The Contractor must ensure that the properties of cutback primers and primer binders are in accordance with AS 2157 Cutback bitumen.
- b) Where the use of field blended primers has been nominated, the properties must be consistent with the properties of laboratory prepared samples using components complying with section 3 and section 9.
- c) Where emulsion primers are to be used, the following information must be submitted by the Contractor as part of the Construction Documentation:
 - i) indicative application rates;
 - ii) material safety data sheets;
 - iii) minimum curing periods;
 - iv) handling procedures, including circulation requirements, maximum and minimum spraying temperatures and minimum pavement temperatures; and
 - v) quality control limits including bitumen, cutter and water contents, maximum and minimum viscosity.
- d) The Contractor must ensure that 0.5 parts of a bitumen adhesion additive, that has been approved as part of the Construction Documentation, is added to all primer binders.

6 Emulsions

The Contractor must ensure that all emulsions comply with AS 1160 Bituminous emulsions for the construction and maintenance of pavements.

7 Multigrade bitumens

The Contractor must ensure that multigrade bitumens comply with AS 2008 Bitumen for pavements.

Table RD-BP-S1 7-1 PMBs for sprayed sealing

Test procedure	Minimum frequency testing	Class blinder property		S10E	S15E ⁽⁷⁾	S20E	S25E	S35E	S15R
Performance related properties									
AGPT/T121	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Consistency at 60°C (Pa.s) ⁽¹⁾	Min	250	700	700	6000	300	1000
AGPT/T121	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Underlying viscosity at 60°C (Pa.s) ⁽²⁾		TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾
AGPT/T121	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Stiffness at 15°C (kPa)	Max	140	140	130	95	180	180
AGPT/T142	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Rubber content by analysis, (%)		N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	TBR ⁽⁸⁾
ATM132	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Compression limit at 70°C, 2 kg (mm)	Min	N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	0.2
AGPT/T108	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Segregation value (%)	Max	8	8	8	8	8	8
Index properties									
AGPT/T121	Refer to Table RD-BP-S1 11-1and Table RD-BP-S1 11-2	Elastic recovery at 60°C, 100s (%) ⁽¹⁾	Min	N/A ⁽⁴⁾	N/A ⁽⁴⁾	N/A ⁽⁴⁾	85	N/A ⁽⁴⁾	25
Handling properties									
AS/NZS 2341.4 or ATM-111	Each batch	Viscosity at 165°C (Pa.s) ⁽³⁾	Max	0.55	0.55	0.55	0.8	0.55	4.5
ATM-112	Annually	Flash point (°C)	Min	250	250	250	250	250	250
ATM-103	Annually	Loss on heating (%mass)	Max	0.6	0.6	0.6	0.6	0.6	0.6
Production control properties									
ATM-122	Each batch ⁽⁶⁾	Torsional recovery at 25°C, 30s (%)		22 - 50	32 - 60	45 - 74	54 - 85	16 - 32	25 - 55
AGPT/T131	Each batch ⁽⁶⁾	Softening point (°C)		48 - 64	55 - 75	62 - 88	82 - 100	48 - 56	55 - 65
Other	Each batch	As proposed by supplier		TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾	TBR ⁽⁸⁾

Table notes:

(1) For consistency and elastic recovery, Mould B must be used for S10E and S35E (breakpoint of 5 mm and a test speed of 1.5 mm/s). Other grades must be tested using Mould A (breakpoint of 10 mm and a test speed of 1 mm/s).

(2) Underlying viscosity is derived from the elastometer data (i.e. tested under the same conditions as consistency testing, refer to table note 1 above).

(3) The shear rate involved in determining viscosity by AS/NZS 2341.4 Methods of testing bitumen and related roadmaking products and Austroads Test Method ATM-111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel) must be calculated and recorded. Austroads Test Method ATM-111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel) has been retained to allow laboratories sufficient time to adopt AS-NZS 2341.4 Methods of testing bitumen and related roadmaking products. L series Brookfield is recommended together with spindle SC4-31, except in the case of S15R where spindle SC4-29 is recommended.

(4) N/A indicates that the property is considered not applicable for that PMB class.

(5) To assist users in determining the quantity of added cutter oil required for spraying, the manufacturer must report on the concentration and type of process oil used in the formulation.

(6) Applicable only to products failing to meet the requirements for segregation value.

(7) Properties for S15E are experimental and are to be regarded as trial values for such period until manufacturing capabilities are proven.

(8) "To be recorded".

Table RD-BP-S1 7-2 PMBs for asphalt

Test procedure	Minimum frequency testing ⁽¹⁾	Class blinder property		A5E	A10E	A15E	A20E	A30E
AGPT/T121	3-monthly	Consistency at 60 °C (Pa.s)	Min	6000	6000	5000	600	1500
AGPT/T121	3-monthly	Consistency 6% at 60 °C (Pa.s) ⁽²⁾	Min	TBR ⁽⁴⁾	TBR ⁽⁴⁾	900	500	TBR ⁽⁴⁾
AGPT/T121	3-monthly	Stiffness at 25 °C (kPa) ⁽²⁾	Max	80 min	30	30	35	100
AGPT/T108	3-monthly	Segregation value (%)	Max	+/-8	8	8	8	8
AS/NZS 2341.4 or ATM111	Each batch	Viscosity at 165 °C (Pa.s) ⁽³⁾	Max	0.8	1.1	0.9	0.6	0.7
ATM112	Annually	Flash point (°C)	Min	250	250	250	250	250
ATM103	Annually	Loss on heating (%mass)	Max	0.6	0.6	0.6	0.6	0.6
ATM-112	Each batch	Torsional recovery at 25 °C, 30 s (%)		25 - 40	60 - 86	55 - 80	38 - 70	12 - 30
AGPT/T131	Each batch	Softening point (°C)	Min	90	88 - 110	82 - 105	65 - 95	70 - 80
Other	Each batch	As proposed by supplier		TBR ⁽⁴⁾	TBR ⁽⁴⁾	TBR ⁽⁴⁾	TBR ⁽⁴⁾	TBR ⁽⁴⁾

Table notes:

(1) Testing frequencies provided are the minima.

(2) Consistency 6% at 60°C is derived from the elastometer data (i.e. tested under the same conditions as consistency testing). It must be tested using Mould A (breakpoint of 10 mm and a test speed of 1 mm/s).

(3) The shear rate involved in determining viscosity by AS/NZS 2341.4 Methods of testing bitumen and related roadmaking products and Austroads Test Method ATM-111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel) must be calculated and recorded. Austroads Test Method ATM-111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel) has been retained to allow laboratories sufficient time to adopt AS-NZS 2341.4 Methods of testing bitumen and related roadmaking products.

(4) "To be recorded".

8 Crumb rubber binders (CRB)

8.1 General

- a) The Contractor must ensure that CRB is blended on Site in such a way to provide a homogenous product of consistent quality that can be sprayed to provide a uniform application of binder across the pavement.
- b) The Construction Documentation must include procedures related to CRB mixing and storage processes, together with minimum digestion times.
- c) The Contractor must ensure that field produced CRBs comply with the properties set out in ATS-3110 Supply of Polymer Modified Binders.
- d) The Contractor must prepare and test samples of the CRBs using the plant, constituent materials and digestion times proposed in the Construction Documentation.
- e) The samples required by section 8.1d) may be sourced from work undertaken in the 3 months prior to the commencement of the Works, or from the first batch of full scale production. Samples must be free of diluents or other contamination.
- f) The results from the testing required in section 8.1d) must be supplied within 5 days of the samples being taken. Submission of test results will constitute a **Hold Point**. Manufacture of the CRB must not occur until this Hold Point has been released.
- g) Manufacturing, blending and storage details for each batch of CRB must be submitted as part of the Quality Management Records including:
 - i) traceability details of input materials;
 - ii) quantities of input materials added reported by weight or volume and parts;
 - iii) digestion times and temperatures; and
 - iv) storage times and temperatures.
- h) Where the source of input material changes from that submitted as part of the Construction Documentation, test results as required by Table RD-BP-S1 11-2 must be supplied by the Contractor to confirm the resultant CRB meets the requirements of this Master Specification Part. Submission of test results will constitute a **Hold Point**. Manufacture of the CRB must not continue until this Hold Point has been released.

8.2 Materials

- a) The Contractor must ensure that base bitumen used in the manufacture of CRB consists of C170 complying with AS 2008 Bitumen for pavements.
- b) The Contractor must ensure that granular crumb rubber complies with the following requirements (at a minimum):
 - i) fall within the grading specified in Table RD-BP-S1 8-1;
 - ii) have a maximum bulk density of 350 kg/m³;
 - iii) have particles less than 3 mm in length;
 - iv) not exceed a moisture content of 1%;
 - v) be free of cord, wire fluff and other deleterious material; and
 - vi) be free of lumps and capable of being poured freely.

Table RD-BP-S1 8-1 Crumb rubber requirements

Sieve size AS (mm)	% passing
2.36	100
1.18	100
0.6	70 - 100
0.15	0 - 5

9 Bituminous flux and cutter

9.1 General

The Contractor must ensure that any flux and cutter for use in the preparation of bituminous binder is prepared by the refining of crude oil.

9.2 Flux (distillate or industrial diesel fuel)

The Contractor must ensure that flux (distillate or industrial diesel fuel) complies with AS 3568 Oils for reducing the viscosity of bituminous binders for pavements.

9.3 Cutter

- The Contractor must ensure that the low flash point cutter (jet A-1 fuel or kerosene) complies with AS 3568 Oils for reducing the viscosity of bituminous binders for pavements, with the exception that the minimum flash point must be 40°C.
- The Contractor must ensure that the high flash point cutter complies with the requirements listed in Table RD-BP-S1 9-1.

Table RD-BP-S1 9-1 High flash point cutter requirements

Property	Requirements - minimum	Requirements - maximum	Test procedure
Density 15°C (kg/L)	0.78	0.84	AS 2341.6
Flash point (°C)	61.5	-	AS 2106
Viscosity 40°C (mm ² /s)	1.2	2.2	ASTM D445
Aromatics (%)	15	-	ASTM D1319
Distillation I.B.P. (°C)	150		ASTM D86
% of original volume recovered at:			
(1) 200°C	-	80	
(2) 250°C	80	-	
F.B.P. (°C)	-	280	
Water content by volume (%)	-	0.1	AS 2341.9
Cleanliness and fluidity	To comply		AS 3568, Clause 4.2
Miscibility with Class 170 bitumen	Complete with no precipitation		AS 3568, Clause 4.3

10 Test procedures

- The Contractor must carry out testing in accordance with the requirements of this Master Specification Part, including the Reference Documents and the test procedures listed in Table RD-BP-S1 10-1.
- Results of the testing must be provided as part of the Quality Management Records.

Table RD-BP-S1 10-1 Test procedures

Test	Test procedure
Moisture content:	Oven drying method AS 1289.2.1.1 Methods of testing soils for engineering purposes, Method 2.1.1: Soil moisture content tests - Determination of the moisture content of a soil - Oven drying method (standard method)
	Microwave method AS 1289.2.1.4 Methods of testing soils for engineering purposes, Method 2.1.4: Soil moisture content tests - Determination of the moisture content of a soil - Microwave-oven drying method (subsidiary method)
Determination of viscosity by Haake Viscobalance	Department Test Procedure TP652 Determination of Viscosity by Haake Viscobalance
Determination of softening point	AS 2341.18 Methods of testing bitumen and related roadmaking products determination of softening point (ring and ball method)
Calculation of parts cutter in bituminous binder	Department Test Procedure TP667 Method for Calculation of the Parts Cutter in Bituminous Binder
Determination of segregation of bituminous binder	Austrroads Test Method AGPT-T108 Segregation of Polymer Modified Binders
Pre-treatment and loss on heating of bitumen, multigrade and PMB	Austrroads Test Method ATM-103 Mass Change or Loss on Heating of Polymer Modified Binders after Rolling Thin Film Oven (RTFO) treatment
Handling viscosity of polymer modified binders (Brookfield Thermosel)	Austrroads Test Method ATM-111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)
Elastic recovery, consistency and stiffness of polymer modified binders (ARRB Elastomer)	Austrroads Test Method AGPT-T108 Segregation of Polymer Modified Binders
FlashPoint of PMB	Austrroads Test Method ATM-112 Flash Point of Polymer Modified Binders
Torsional recovery of PMB	Austrroads Test Method ATM-122 Torsional Recovery of Polymer Modified Binders
Toughness of PMB (ARRB Extensiometer)	Austrroads Test Method AGPT-T124 Toughness of Polymer Modified Binders (ARRB Extensiometer)
Softening point of PMB	Austrroads Test Method AGPT-T131 Softening Point of Polymer Modified Binders
Determination of aggregate stripping value - one day plate stripping test	Department Test Procedure TP705 Determination of Aggregate Stripping by the One Day Plate Stripping Test
Determination of total amine value of adhesion agent and percentage of adhesion agent in precoat	Department Test Procedure TP780 Determination of the Total Amine Value of an Adhesion Agent and the Percentage of Adhesion Agent in Precoat
Recovery and determination of rubber content of scrap rubber mixes	Austrroads Test Method AGPT-T142 Rubber Content of Crumb Rubber Modified Bitumen: Soxhlet Method
Bulk density of scrap rubber	Austrroads Test Method AGPT-T144 Morphology of Crumb Rubber - Bulk Density Test
Sieve analysis of scrap rubber	TfNSW Test Method T730 Sieve analysis of scrap rubber

11 Sampling and testing

11.1 General

- a) The Contractor must conduct sampling and testing of products for control and verification purposes at the frequency shown in Table RD-BP-S1 11-1 during manufacture, and at the frequency shown in Table RD-BP-S1 11-2 at the point of delivery (for spray seals only) and the test results must be submitted as part of the Quality Management Records.
- b) For the point of delivery samples required by section 11.1a) the Contractor must provide 3 hours' notification of sampling which constitutes a **Witness Point**. All samples must be clearly marked and traceable to the relevant Work Lot in accordance with PC-QA1 "Quality Management Requirements" or PC-QA2 "Quality Management Requirements for Major Projects" (as applicable). The sample size must not be less than $\frac{3}{4}$ litre in a 1 litre sample tin.
- c) For asphalt works, all binder samples must be delivered to the Principal's nominated materials laboratory at a minimum of monthly intervals. The samples will be stored at the Principal's expense. The Contractor must provide documentation to confirm that the samples have been received at the Principal's nominated materials laboratory, and submit this as part of the Quality Management Records forming part of the Work Lot package.

11.2 Point of manufacture (spray seals only)

- a) The Contractor must undertake the tests required by this section 11.2 and supply results to demonstrate continual monitoring of product performance at point of manufacture. The time, date and sample temperature must be recorded when the test samples are taken and the tests are conducted. The test results must be submitted as part of the Quality Management Records.
- b) For PMBs, the following samples must be undertaken and results submitted as part of the Quality Management Records:
 - i) one point of manufacture sample taken at the same time as the manufacturer's sample, which is to be provided to the Principal upon request;
 - ii) one sample per transport bulker at the point of "load out" from the manufacturing yard to the bulker on request from the Principal; and
 - iii) provision of sampling records, including time, date and sample temperature when the test samples are taken (in accordance with the AAPA Guide to the Manufacture, Storage and Handling of Polymer Modified Binders).

Table RD-BP-S1 11-1 Process control testing requirements

Product	Properties	Test frequency at point of manufacture	Acceptance limit
C170 bitumen	Normal as listed in AS 2008 and Table RD-BP-S1 3-1	3 months or after addition of bitumen into bulk storage	As set out in section 3
	Flashpoint, durability	Annually	As set out in section 3
C320 bitumen	As listed in AS 2008 and Table RD-BP-S1 3-2	3 months or after addition of bitumen into bulk storage	As set out in section 3
	Flashpoint, durability	Annually	As set out in section 3
Cutback binder	Viscosity at 60°C	Each production batch	Report value
Primers and primer binder	As listed in AS 2157	Each production batch	As set out in section 5
Multigrades	Viscosity at 60°C	Each production batch	As set out in section 7
	Penetration at 25°C	Each production batch	
	Viscosity at 135°C	Each production batch	
	Viscosity at 60°C after RTFO treatment	Each production batch	

Product	Properties	Test frequency at point of manufacture	Acceptance limit
	Penetration at 25°C after RTFO treatment 100 g, 5 s	Each production batch	
	Matter insoluble in toluene	Each production batch	
	Flashpoint and loss on heating	Annually	
PMB ⁽¹⁾ (refer Table RD-BP-S1 7-1 and Table RD-BP-S1 7-2)	Performance related and index properties	Monthly	As set out in section 4
	Flash point and loss on heating	Annually	As set out in section 4
	Viscosity at 165°C	Each production batch	As set out in section 4
	Torsional recovery at 25°C	Each production batch	As set out in section 4
	Softening point	Each production batch	As set out in section 4
Cutter	Viscosity at 40°C	Each production batch	As set out in section 10
Granular crumb rubber	Bulk density	One per 100 t lot	Report value
	Grading	One per 100 t lot	As set out in section 8
CRB	Properties as per Table RD-BP-S1 7-1	Each production batch	Refer Table RD-BP-S1 8-1
Bitumen emulsion	Sieve residue	Each production batch	As set out in section 6
	Residue from evaporation	Each production batch	As set out in section 6

Table notes:

(1) Pre-blended PMBs only.

11.3 Point of delivery (spray seals only)

- a) The Contractor must undertake the tests required by this section 11.3 and supply results to demonstrate continual monitoring of product performance at point of delivery. The Contractor must undertake one sample at the frequency shown in Table RD-BP-S1 11-2 and submit the results as part of the Quality Management Records. The Contractor must undertake a second sample for auditing purposes if requested by the Principal to do so.
- b) Where requested, all secondary samples requested by the Principal for auditing purposes must be delivered to the Principal's nominated materials laboratory at a minimum of fortnightly intervals. The samples will be stored at the Principal's expense. The Contractor must provide documentation to confirm that the samples have been received at the Principal's nominated materials laboratory, and submit this as part of the Quality Management Records forming part of the Work Lot package.
- c) Where immediate testing of samples is not required in accordance with Table RD-BP-S1 11-2, the Contractor must store the samples for not less than 12 months from the date of sampling.

Table RD-BP-S1 11-2 Delivery, sampling and testing requirements

Product	Properties	Sample frequency on site	Testing frequency	Acceptance limit
C170 and C320 Bitumen ⁽¹⁾	As listed in Table RD-BP-S1 3-1 and Table RD-BP-S1 3-2	One sample per bulker	On request	As set out in section 3
Cutback binder	Viscosity at 60°C	On request	On request	Report value
Primers and primer binder	As listed in AS2157 Table 4.1	Sample per bulker	On request	As set out in section 5
PMB and plant blended crumb rubber ⁽¹⁾ (refer Table RD-BP-S1 7-1)	Viscosity at 165°C; torsional recovery at 25°C; and softening point	Sample from each bulker at the point of delivery. The samples must be taken at the time of discharge into the sprayer (for the first run) or at the time of discharge into the kettle or Site storage	On request	Report value
Field blended CRB ⁽¹⁾	Viscosity at 165°C consistency at 60°C	Sample from each batch	First batch of the works then on request	Report value
	Torsional recovery at 25°C; and softening point	Sample from each batch	First batch of the works then on request	As set out in section 8
	Rubber content	Sample from each batch	On request	As set out in section 8
Multigrade ⁽¹⁾	Viscosity at 60°C penetration at 25°C Viscosity at 135°C matter insoluble in toluene	Sample per bulker	On request	As set out in section 7
Cutter	Viscosity at 40°C	One per project	One per project	As set out in section 9.3
Bitumen emulsion	As listed in AS 1160	Sample per bulker	On request	As set out in section 6
Adhesion agent	Amine value	One per project	One per project	Minimum 120

Table notes:

(1) Samples must be taken prior to addition of adhesion agent or cutter.

12 Records

At a minimum, the Contractor must provide the following information with each delivery on Site of PMB and multigrade binder and submit as part of the Quality Management Records:

- Contractor's batch number / identifier;
- PMB grade or multigrade class;
- location of manufacturing plant;
- date and time of manufacture;
- date, time and temperature of dispatch into the bulker;
- delivery details (delivery point, date, time and temperature); and
- product heating information (heating start time, finish time, total heating time and temperature).

13 Hold Points and Witness Points

- a) Table RD-BP-S1 13-1 details the review period or notification period, and type (documentation or construction quality) for each Hold Point referred to in this Master Specification Part.
- b) Table RD-BP-S1 13-2 details the review period or notification period, and type (documentation or construction quality) for each Witness Point referred to in this Master Specification Part.

Table RD-BP-S1 13-1 Hold Points

Section reference	Hold Point	Documentation or construction quality	Review period or notification period
8.1f)	Submission of test results for CRB	Documentation	5 Business Days review
8.1h)	Submission of test results for CRB when the source of input material changes	Documentation	5 Business Days review

Table RD-BP-S1 13-2 Witness Points

Section reference	Witness Point	Documentation or construction quality	Review period or notification period
11.1b)	The point of delivery of samples	Construction quality	3 hours notification

14 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-BP-S1 14-1 have been complied with.

Table RD-BP-S1 14-1 Verification requirements

Subject	Property	Sample frequency	Frequency	Acceptable limits
Point of manufacture				
C170 bitumen	Normal as listed in AS 2008 and Table RD-BP-S1 3-1	N/A	3 months or after addition of bitumen into bulk storage	As set out in section 3
	Flashpoint, durability	N/A	Annually	As set out in section 3
C320 bitumen	As listed in AS 2008 and Table RD-BP-S1 3-2	N/A	3 months or after addition of bitumen into bulk storage	As set out in section 3
	Flashpoint, durability	N/A	Annually	As set out in section 3
Cutback binder	Viscosity at 60°C	N/A	Each production batch	Report value
Primers and primer binder	As listed in AS 2157	N/A	Each production batch	As set out in section 5
Multigrades	Viscosity at 60°C	N/A	Each production batch	As set out in section 7
	Penetration at 25°C	N/A	Each production batch	
	Viscosity at 135°C	N/A	Each production batch	
	Viscosity at 60°C after RTFO treatment	N/A	Each production batch	
	Penetration at 25°C after RTFO treatment 100 g, 5 s	N/A	Each production batch	
	Matter insoluble in toluene	N/A	Each production batch	
	Flashpoint and loss on heating	N/A	Annually	
PMB ⁽¹⁾ (refer Table RD-BP-S1	Performance related and index properties	N/A	Monthly	As set out in section 3

Subject	Property	Sample frequency	Frequency	Acceptable limits
7-1 and Table RD-BP-S1 7-2)	Flash point and loss on heating	N/A	Annually	As set out in section 3
	Viscosity at 165°C	N/A	Each production batch	As set out in section 3
	Torsional recovery at 25 °C	N/A	Each production batch	As set out in section 3
	Softening point	N/A	Each production batch	As set out in section 3
Cutter	Viscosity at 40°C	N/A	Each production batch	As set out in section 10
Granular crumb rubber	Bulk density	N/A	One per 100 tonne lot	Report value
	Grading	N/A	One per 100 tonne lot	As set out in section 8
CRB	Properties as per Table RD-BP-S1 8-1	N/A	Refer Table RD-BP-S1 8-1	Refer Table RD-BP-S1 8-1
Bitumen emulsion	Sieve residue	N/A	Each production batch	As set out in section 6
	Residue from evaporation	N/A	Each production batch	As set out in section 6
Point of delivery				
C170 and C320 bitumen	As listed in Table RD-BP-S1 3-1 and Table RD-BP-S1 3-2	One Contractor sample per bulker	On request	As set out in section 3
Cutback binder	Viscosity at 60°C	On request	On request	Report value
Primers and primer binder	As listed in AS2157 Table 4.1	Sample per bulker	On request	As set out in section 5
PMB plant blended crumb rubber (refer Table RD-BP-S1 7-1)	Viscosity at 165°C; Torsional recovery at 25°C; and Softening point	Sample from each bulker at the point of delivery. The samples must be taken at the time of discharge into the sprayer (for the first run) or at the time of discharge into the kettle / site storage	On request	Report value
Field blended CRB	Viscosity at 165°C consistency at 60°C	Sample from each batch	First batch of the works then on request	Report value
	Torsional recovery at 25°C; and softening point		First batch of the works then on request	As set out in section 8
	Rubber content		First batch of the works then on request	As set out in section 8
Multigrade	Viscosity at 60°C Penetration at 25°C	Sample per bulker	On request	As set out in section 7
	Viscosity at 135°C matter insoluble in Toluene			
Cutter	Viscosity at 40°C	One per contract	One per project	As set out in section 9
Bitumen emulsion	As listed in AS 1160	Sample per bulker	On request	As set out in section 6
Adhesion agent	Amine value	One per contract	One per project	Minimum 120