

Roads

Master Specification

RD-BP-S1 Supply of Bituminous Materials

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Contents

Contents	3
RD-BP-S1 Supply of Bituminous Materials	4
1 General	4
2 Residual Bitumen	4
3 Polymer Modified Binders (PMBs)	4
4 Primers and Primer Binders	7
5 Emulsions	7
6 Multigrade Bitumens	7
7 Crumb Rubber Binders (CRBs)	7
8 Bituminous Flux and Cutter	8
9 Test Procedures	9
10 Sampling and Testing	9
11 Hold Points	11
12 Verification Requirements and Records	12

RD-BP-S1 Supply of Bituminous Materials

1 General

- 1.1 This Part specifies the requirements for the supply and delivery of bitumen, primers, primer binders, polymer modified binders, emulsions, multi-grades and crumb rubber.
- 1.2 Documents referenced in this Part are listed below:
- a) AS 1160 Bituminous Emulsions for the Construction and Maintenance of Pavements.
 - b) AS 1289 Methods of Testing Soils for Engineering Purposes.
 - c) AS 2008 Residual Bitumen for Pavements.
 - d) AS 2341 Methods of Testing Bitumen and Related Road Making Products.
 - e) AS 3530 Solvents – Mineral Turpentine and White Spirit.
 - f) AS 3568 Oils for Reducing the Viscosity of Residual Bitumen for Pavements.
 - g) AP-T41/06 Specification Framework for Polymer Modified Binder & Multigrade Bitumens.

2 Residual Bitumen

- 2.1 Residual bitumen shall comply with AS 2008 with the following additional requirements for Class 170 & Class 320 bitumen:

Table RD-BP-S1 2-1 Additional Requirements for Class 170 Bitumen

Test	Specified Properties		Test Procedure
	Minimum	Maximum	
Durability, (days)	9	-	AS 2341.13 and AS 2341.5
Density at 15°C, (kg/L)	1.0	-	AS 2341.7

Table RD-BP-S1 2-2 Additional Requirements for Class 320 Bitumen

Test	Specified Properties		Test Procedure
	Minimum	Maximum	
Durability, (days)	*BR	-	AS 2341.13 and AS 2341.5
Density at 15°C, (kg/L)	0.99	-	AS 2341.7
n-Heptane insoluble, (%)	TBR	-	ASTM D3279
Penetration at 35°C, 100g, 5s (pu)	-	TBR	AS 2341.12

*TBR – To Be Recorded

3 Polymer Modified Binders (PMBs)

Austrroads Technical Report AP-T41/06 "Specification Framework for Polymer Modified Binders and Multigrade Bitumens" shall apply, 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 Table RD-BP-S1 3-1 and

- 3.1 Table RD-BP-S1 3-2.
- 3.2 PMB shall 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 shall conform to the requirements of Clause 2 "Residual Bitumen".
- 3.3 The product shall be prepared in a manufacturing plant or blending plant of proven performance and shall comply with the "Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders, First Edition", Australian Asphalt Pavement Association, June 2004.

Table RD-BP-S1 3-1 Polymer Modified Binders for Sprayed Sealing

Test Procedure	Minimum Testing Frequency ⁽¹⁾	Class Binder Property		S10E	S15E	S20E	S25E	S35E	S45E
PERFORMANCE RELATED PROPERTIES									
AGPT/T121	Refer to Table 10.2 & 10.3	Consistency at 60°C (Pa.s) ⁽¹⁾	Min	250	700	700	6000	300	1000
AGPT/T121	Refer to Table 10.2 & 10.3	Underlying viscosity at 60°C (Pa.s) ⁽²⁾		TBR ⁽⁴⁾					
AGPT/T121	Refer to Table 10.2 & 10.3	Stiffness at 15°C (kPa) ⁽⁴⁾	Max	140	140	130	95	180	180
AGPT/T142 ⁽¹⁾⁽²⁾	Refer to Table 10.2 & 10.3	Rubber Content by Analysis, (%)		N/A ⁽⁵⁾	TBR ⁽⁴⁾				
AGPT/T132	Refer to Table 10.2 & 10.3	Compression limit at 70°C, 2 kg (mm)	Min	N/A ⁽⁵⁾	0.2				
AGPT/T108	Refer to Table 10.2 & 10.3	Segregation Value (%) max	Max	8	8	8	8	8	8
INDEX PROPERTIES									
AGPT/T121	Refer to Table 10.2 & 10.3	Elastic recovery at 60°C, 100s (%) ⁽¹⁾	Min	N/A ⁽⁵⁾	N/A ⁽⁵⁾	N/A ⁽⁵⁾	85	N/A ⁽⁵⁾	25
HANDLING PROPERTIES									
AGPT/T111	Each Batch	Viscosity at 165°C (Pa.s) ⁽³⁾	Max	0.55	0.55	0.55	0.8	0.55	4.5 ⁽³⁾
AGPT/T112	Annually	Flash point (°C)	Min	250	250	250	250	250	250
AGPT/T103	Annually	Loss on heating (%mass)	max	0.6	0.6	0.6	0.6	0.6	0.6
PRODUCTION CONTROL PROPERTIES									
AGPT/T122	Each Batch ⁽⁷⁾	Torsional recovery at 25°C, 30s (%)		22 – 50	32 – 60	45 – 74	54 – 85	16 – 32	25 – 55
AGPT/T131	Each Batch ⁽⁷⁾	Softening point (°C)		48 – 64	55 – 75	62 – 88	82 – 100	48 – 56	55 – 65
Other	Each Batch	As proposed by supplier		TBR ⁽⁴⁾					

(1) For Consistency and elastic recovery, Mould B shall be used for S10E and S35E (breakpoint of 5 mm and a test speed of 1.5 mm/s). Other grades shall 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 Note 1 above).

(3) The shear rate involved in determining viscosity by AGPT/T111 shall be calculated and recorded. L series Brookfield is recommended together with spindle SC4-31, except in the case of S45R where spindle SC4-29 is recommended.

(4) TBR = To Be Reported.

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

(6) 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.

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

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

(9) Alternatively a soxhlet with toluene may be used.

Table RD-BP-S1 3-2 Polymer Modified Binders for Asphalt

Test Procedure	Minimum Testing Frequency ⁽¹⁾	Class Binder Property		A5E	A10E	A15E	A20E	A30E	A35P ⁽⁵⁾
Performance Related Properties									
AGPT/T121	3-monthly	Consistency at 60°C (Pa.s)	Min	6000	6000	5000	600	1500	2000
AGPT/T121	3-monthly	Consistency 6% at 60°C (Pa.s) ⁽²⁾	Min	TBR ⁽⁴⁾	TBR ⁽⁴⁾	900	500	TBR ⁽⁴⁾	1200
AGPT/T121	3-monthly	Stiffness at 25°C (kPa) ⁽²⁾	Max	80 min	30	30	35	100	120
AGPT/T108	3-monthly	Segregation value (%)	Max	8	8	8	8	8	8
Handling Properties									
AGPT/T111	Each Batch	Viscosity at 165°C (Pa.s) ⁽³⁾	Max	0.8	1.1	0.9	0.6	0.7	0.6
AGPT/T112	Annually	Flash point (°C)	Min	250	250	250	250	250	250
AGPT/T103	Annually	Loss on heating (% mass)	Max	0.6	0.6	0.6	0.6	0.6	0.6
Production Control Properties									
AGPT/T122	Each Batch	Torsional recovery at 25°C, 30s (%)		25 – 40	60 – 86	55 – 80	38 – 70	12 – 30	6 – 21
AGPT/T131	Each Batch	Softening point (°C)	Min	90	88 – 110	82 – 105	65 – 95	70 – 80	70 – 80
Other	Each Batch	As proposed by supplier		TBR ⁽⁴⁾					

(1) Testing frequencies provided are suggested minima. Different testing frequencies may be agreed between the purchaser and the supplier.

(2) Consistency 6% at 60°C is derived from the Elastometer data (i.e. tested under the same conditions as Consistency testing). It shall 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 AGPT/T111 shall be calculated and recorded.

(4) TBR = To Be Reported.

(5) Where A35P is produced through the addition of polymer as part of the asphalt produced process evidence shall be provided that the resultant binder can meet these values

4 Primers and Primer Binders

- 4.1 The properties of cutback primers and primer binders shall be in accordance with AS 2157 Cutback Bitumen.
- 4.2 Where the use of field blended primers has been approved, the properties shall be consistent with the properties of laboratory prepared samples using components complying with Clause 2 "Residual Bitumen" and Clause 8 "Bituminous Flux and Cutter".
- 4.3 Where emulsion primers are to be used, the following information shall be submitted by the Contractor at least 14 days prior to application:
 - a) indicative application rates;
 - b) material safety data sheets;
 - c) minimum curing periods;
 - d) handling procedures including circulation requirements, maximum and minimum spraying temperatures, minimum pavement temperatures; and
 - e) quality control limits including bitumen, cutter and water contents, maximum and minimum viscosity.
- 4.4 0.5 parts of an approved bitumen adhesion additive shall be added to all primer binders.

5 Emulsions

- 5.1 Emulsions shall comply with AS 1160.

6 Multigrade Bitumens

- 6.1 Multigrade Bitumens shall comply with Austroads Technical Report AGPT/T190 "Specification Framework for Polymer Modified Binders and Multigrade Bitumens".

7 Crumb Rubber Binders (CRBs)

General

- 7.1 Crumb rubber binders shall be 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. The Contractor's quality plan shall include procedures related to mixing and storage processes together with minimum digestion times.
- 7.2 Field produced Crumb Rubber Binders shall comply with the properties set out in Table 5.4 of AP-T41/06 "Specification Framework for Polymer Modified Binders and Multigrade Bitumens".
- 7.3 The Contractor shall prepare and test samples of the crumb rubber binder using the proposed plant, constituent materials and digestion times.
- 7.4 The samples may be sourced from work undertaken in the 3 months prior to the Contract commencing, or from the first batch of full scale production for this Contract. Samples shall be free of diluents or other contamination.
- 7.5 Results shall be supplied within 5 days of the Contract commencing. Submission of test results shall constitute a **Hold Point**.
- 7.6 Manufacturing, blending and storage details for each batch of binder shall be supplied by the Contractor including:
 - a) traceability details of input materials;
 - b) quantities of input materials added reported by weight / volume and parts;

- c) digestion times and temperatures; and
 - d) storage times and temperatures.
- 7.7 The Principal shall be notified where the source of input material changes from that submitted at the commencement of the Contract. Test results as required by Table RD-BP-S1 10-2 shall be supplied by the Contractor to confirm the resultant Crumb Rubber Binder meets specification.

Materials

- 7.8 Base bitumen used in the manufacture of crumb rubber binder shall consist of C170 complying with AS 2008.
- 7.9 Granular crumb rubber shall comply with the following requirements:
- a) fall within the grading specified in Table RD-BP-S1 7-1;
 - b) have a maximum bulk density of 350 kg/m³;
 - c) particles less than 3 mm in length;
 - d) not exceed a moisture content of one percent;
 - e) be free of cord, wire fluff and other deleterious material; and
 - f) be free of lumps and capable of being poured freely.

Table RD-BP-S1 7-1 Crumb Rubber Requirements

Sieve Size AS (mm)	% Passing
2.36	100
1.18	100
0.6	70 – 100
0.15	0 – 5

8 Bituminous Flux and Cutter

General

- 8.1 Any Flux and cutter for use in the preparation of bituminous binder shall be prepared by the refining of crude oil.

Flux (Distillate or Industrial Diesel Fuel)

- 8.2 Flux shall comply with AS 3568.

Cutter

- 8.3 Low flash point (Jet A-1 Fuel or Kerosene) shall comply with AS 3568 with the exception that the minimum flash point shall be 40°C.
- 8.4 High flash point shall comply with the requirements listed in Table RD-BP-S1 8-1.

Table RD-BP-S1 8-1 Table of Requirements - High Flash Point Cutter

Property	Requirements		Test Procedure
	Minimum	Maximum	
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:			
200°C	-	80	
250°C	80	-	

Property	Requirements		Test Procedure
	Minimum	Maximum	
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

9 Test Procedures

9.1 The Contractor shall use the following test procedures (refer https://www.dpti.sa.gov.au/contractor_documents) to verify conformance with the Specification:

Table RD-BP-S1 9-1 Test Procedures

Test	Test Procedure
Moisture Content: Oven Drying Method	AS 1289.2.1.1
Microwave Method	AS 1289.2.1.4
Determination of Viscosity By Haake Viscobalance	TP 652
Determination of Softening Point	AS 2341.18
Calculation of Parts Cutter in Bituminous Binder	TP 667
Preparation of a Bituminous Binder Cutting Chart	TP 668
Determination of Segregation of Bituminous Binder	TP 678
Pre-treatment & Loss on Heating of Bitumen, Multigrade & Polymer Modified Binder (RTFO)	AGPR/T103
Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)	AGPT/T111
Elastic Recovery, Consistency and Stiffness of Polymer Modified Binders (ARRB Elastomer)	AGPT/T121
Torsional Recovery of Polymer Modified Binders	AGPT/T122
Toughness of Polymer Modified Binders (ARRB Extensiometer)	AGPT/T124
Softening Point of Polymer Modified Binders	AGPT/T131
Determination of Aggregate Stripping Value - One Day Plate Stripping Test	TP 705
Determination of Total Amine Value of Adhesion Agent and Percentage of Adhesion Agent in Precoat	TP 780
Recovery and determination of Rubber Content of Scrap Rubber Mixes	AGPT/T142
Bulk Density of Scrap Rubber	AGPT/T144
Sieve Analysis of Scrap Rubber	RTA T730

10 Sampling and Testing

General

- 10.1 The Contractor shall conduct sampling and testing of products for control and verification purposes at the frequency shown in Table RD-BP-S1 10-1 during manufacture, and Table RD-BP-S1 10-2 at the point of delivery (for spray seals only).
- 10.2 For the point of delivery samples the Contractor shall provide 3 hours notification of sampling. All samples shall be clearly marked and traceable to the relevant Lot in accordance with PC-QA1 "Quality System Requirements". The sample size shall not be less than ¼ litre in a 1 litre sample tin.
- 10.3 For contracts which include asphalt, all binder samples shall be delivered to the DPTI Materials Laboratory at 19 Bridge Road, Walkley Heights at a minimum of fortnightly intervals. The samples will be stored at the Principal's expense. The Contractor shall provide documentation to confirm that the samples have been received at the DPTI Laboratory, and submit this as part of the Lot package.

Point of Manufacture (Spray Seals only)

10.4 The Contractor shall undertake the following tests and supply results to demonstrate continual monitoring of product performance at point of manufacture. These test results may predate the award of this Contract. The time, date and sample temperature shall also be recorded when the test samples are taken and the tests are conducted.

Table RD-BP-S1 10-1 Process Control Testing Requirements

Product	Properties	Test Frequency at Point of Manufacture	Acceptance Limit
C170 Bitumen	As listed in AS 2008 & Table RD-BP-S1 2-1	3 months or after addition of bitumen into bulk storage	Clause 2
	Flashpoint, Durability	Annually	Clause 2
C320 Bitumen	As listed in AS 2008 & Table RD-BP-S1 2-2	3 months or after addition of bitumen into bulk storage	Clause 2
	Flashpoint, Durability	Annually	Clause 2
Cutback Binder	Viscosity at 60°C	Each production batch	Report Value
Primers and Primer Binder	As listed in AS 2157	Each production batch	Clause 4
	Viscosity at 60°C	Each production batch	
Multigrades	Penetration at 25°C	Each production batch	
	Viscosity at 135°C	Each production batch	
	Viscosity at 60°C after RTFOT	Each production batch	Clause 6
	Penetration at 25°C after RTFOT 100g, 5s	Each production batch	
	Matter Insoluble in Toluene	Each production batch	
	Flashpoint & Loss on Heating	Annually	
Polymer Modified Binders* (refer Table RD-BP-S1 3-1 and Table RD-BP-S1 3-2)	Performance Related & Index Properties	Monthly	Clause 3
	Flash Point & Loss on Heating	Annually	Clause 3
	Viscosity at 165°C	Each production batch	Clause 3
	Torsional Recovery at 25°C	Each production batch	Clause 3
	Softening Point	Each production batch	Clause 3
Cutter	Viscosity at 40°C	Each production batch	Clause 9
Granular Crumb Rubber	Bulk Density	One per 100 tonne lot	Report value
	Grading	One per 100 tonne lot	Clause 7
Crumb Rubber Binder	Properties as per Table 7.1	Refer Table 7.1	Refer Table 7.1
Bitumen Emulsion	Sieve residue	Each production batch	Clause 5
	Residue from evaporation	Each production batch	Clause 5

* Pre-blended PMBs only

10.5 For Polymer Modified Binders, the following shall be undertaken:

- a) one point of manufacture sample taken at the same time as the manufacturer's sample, which is to be provided to the Principal;
- b) one sample per transport bulker at the point of "load out" from the manufacturing yard to the bulker on request; and
- c) provision of sampling records, including time, date and sample temperature when the test samples are taken (in accordance with the "Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders", AAPA June 2004, Clause 3.1).

Point of Delivery (Spray Seals only)

10.6 The Contractor shall undertake the following tests and supply results to demonstrate continual monitoring of product performance at point of delivery. Unless indicated otherwise one sample for the Contractor and one sample for the Principal shall be taken at the frequency shown in Table RD-BP-S1 10-2.

Table RD-BP-S1 10-2 Deliver, Sampling and Testing Requirements

Product	Properties	Sample Frequency on Site	Testing Frequency	Acceptance Limit
*C170 & C320 Bitumen	As listed in Table RD-BP-S1 2-1	One Contractor sample per bulker	On request	Clause 2
Cutback Binder	Viscosity at 60°C	On request	On request	Report value
Primers and Primer Binder	As listed in Table AS2157 4.1	Sample per bulker	On request	Clause 4
*Polymer Modified Binders Plant Blended Crumb Rubber (refer Table RD-BP-S1 3-1)	Viscosity at 165°; Torsional Recovery at 25°C; and Softening Point	Sample from each bulker at the point of delivery. The samples shall 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 Crumb Rubber Binder	Viscosity at 165° Consistency at 60°C	Sample from each batch	First batch of the Contract then on request	Report value
	Torsional Recovery at 25°C; and Softening Point	Sample from each batch	First batch of the Contract then on request	Clause 7
	Rubber Content	Sample from each batch	On request	Clause 7
*Multigrade	Viscosity at 60°C Penetration at 25°C Viscosity at 135°C Matter Insoluble in Toluene	Sample per bulker	On request	Clause R25.6
Cutter	Viscosity at 40°C	One per contract	One per contract	Clause 8
Bitumen Emulsion	As listed in AS 1160	Sample per bulker	On request	Clause 5
Adhesion Agent	Amine Value	One per contract	One per contract	Minimum 120

*Note: Samples shall be taken prior to addition of adhesion agent / cutter.

10.7 All Principal samples shall be delivered to the DPTI Materials Laboratory at 19 Bridge Road, Walkley Heights at a minimum of fortnightly intervals. The samples will be stored at the Principal's expense. The Contractor shall provide documentation to confirm that the samples have been received at the DPTI Laboratory, and submit this as part of the lot package.

10.8 Where immediate testing of samples is not required in accordance with Table RD-BP-S1 10-2, the Contractor shall store the samples for not less than 12 months from the date of sampling.

11 Hold Points

11.1 The following is a summary of Hold Points referenced in this Part:

Document Ref.	Hold Point	Response Time
7.5	Submission of test results for crumb rubber binder.	5 working days

12 Verification Requirements and Records

General

- 12.1 The Contractor shall supply written verification that the testing undertaken demonstrates compliance with the requirements of this Part and supply the verification with the lot package.

Binder Information to be submitted upon Delivery

- 12.2 At a minimum, the Contractor shall provide the following information with each delivery on site of PMB and Multigrade binder:
- a) Contractor's batch number / identifier;
 - b) PMB Grade or Multigrade class;
 - c) location of manufacturing plant;
 - d) date and time of manufacture;
 - e) date, time and temperature of dispatch into the bulker;
 - f) delivery Details (delivery point, date, time and temperature); and
 - g) product heating information (heating start time, finish time, total heating time and temperature).
-