**PART R25**

**SUPPLY OF BITUMINOUS MATERIALS**

**CONTENTS**

1. General

2. Residual Bitumen

3. Polymer Modified Binders (PMB's)

4. Primers and Primer Binders

5. Emulsions

6. Multigrade Bitumens

7. Crumb Rubber Binders (CRB’s)

8. Bituminous Flux and Cutter

9. Test Procedures

10. Sampling and Testing

11. Hold Points

12. Verification Requirements and Records

**1. GENERAL**

This Part specifies the requirements for the supply and delivery of bitumen, primers, primer binders, polymer modified binders, emulsions, multi-grades and crumb rubber.

Documents referenced in this Part are listed below:

|  |  |
| --- | --- |
| AS 1160 | Bituminous Emulsions for the Construction and Maintenance of Pavements |
| AS 1289 | Methods of Testing Soils for Engineering Purposes |
| AS 2008 | Residual Bitumen for Pavements |
| AS 2341 | Methods of Testing Bitumen and Related Road Making Products |
| AS 3530 | Solvents – Mineral Turpentine and White Spirit |
| AS 3568  AP-T41/06 | Oils for Reducing the Viscosity of Residual Bitumen for Pavements  Specification Framework for Polymer Modified Binder & Multigrade Bitumens |

**2. RESIDUAL BITUMEN**

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

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 2.1 ADDITIONAL REQUIREMENTS FOR CLASS 170 BITUMEN** | | | |
| **TEST** | **SPECIFIED PROPERTIES** | | **TEST PROCEDURE** |
| **min.** | **max.** |  |
| Durability, (days) | 9 | - | AS 2341.13 and AS 2341.5 |
| Density at 15°C, (kg/L) | 1.0 | - | AS 2341.7 |

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 2.2 ADDITIONAL REQUIREMENTS FOR CLASS 320 BITUMEN** | | | |
| **TEST** | **SPECIFIED PROPERTIES** | | **TEST PROCEDURE** |
| **min.** | **max.** |  |
| Durability, (days) | \*TBR | - | AS 2341.13 and AS 2341.5 |
| Density at 15°C, (kg/L) | 0.99 | - | AS 2341.7 |
| n-Heptane insolubles, (%) | TBR | - | ASTM D3279 |
| Penetration at 35°C, 100g, 5s (pu) | - | TBR | AS 2341.12 |

\*TBR - To Be Recorded

**3. POLYMER MODIFIED BINDERS (PMBs)**

Austroads Technical Report AP-T41/06 “Specification Framework for Polymer Modified Binders and Multigrade Bitumens” must apply, except that Table 5.1 “Properties of PMB’s for Sprayed Sealing Applications” and Table 5.2 “Properties of PMB’s for Asphalt Applications” be deleted, and replaced with Part R25 table 3.1 and 3.2.

PMB 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 PMB’s must conform to the requirements of clause 2 ‘Residual Bitumen’.

The product must be prepared in a manufacturing plant or blending plant of proven performance and must comply with the "Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders, First Edition", Australian Asphalt Pavement Association, June 2004.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TABLE 3.1 POLYMER Modified Binders for Sprayed Sealing** | | | | | | | | |
| Test Procedure | Minimum Testing Frequency (1) | Class | S10E | S15E | S20E | S25E | S35E | S45R |
| Binder Property |
| **PERFORMANCE RELATED PROPERTIES** | | | | | | | | |
| AGPT/T121 | Refer to Table 10.2 & 10.3 | Consistency at 60°C (Pa.s)(3) min | 250 | 700 | 700 | 6000 | 300 | 1000 |
| AGPT/T121 | Refer to Table 10.2 & 10.3 | Underlying viscosity at 60°C (Pa.s)(4) | TBR(6) | TBR | TBR | TBR | TBR | TBR |
| AGPT/T121 | Refer to Table 10.2 & 10.3 | Stiffness at 15°C (kPa) (6) max | 140 | 140 | 130 | 95 | 180 | 180 |
| AGPT/T142(12) | Refer to Table 10.2 & 10.3 | Rubber Content by Analysis, (%) | NA (7) | NA | NA | NA | NA | TBR |
| AGPT/T132 | Refer to Table 10.2 & 10.3 | Compression limit at 70°C, 2 kg (mm) min | NA | NA | NA | NA | NA | 0.2 |
| AGPT/T108 | Refer to Table 10.2 & 10.3 | Segregation Value (%) max | 8 | 8 | 8 | 8 | 8 | 8 |
|  |  |  |  |  |  |  |  |  |
| **INDEX PROPERTIES** | | | | | | | | |
| AGPT/T121 | Refer to Table 10.2 & 10.3 | Elastic recovery at 60°c, 100s (%) (3) min | NA | NA | NA | 85 | NA | 25 |
| **HANDLING PROPERTIES** | | | | | | | | |
| AGPT/T111 | Each batch | Viscosity at 165°C (Pa.s) (5) max | 0.55 | 0.55 | 0.55 | 0.8 | 0.55 | 4.5 (5) |
| 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 (9) | Torsional recovery at 25°C, 30s (%) | 22 - 50 | 32 - 62 | 45 - 74 | 54 - 85 | 16 - 32 | 25 – 55 |
| AGPT/T131 | Each batch (9) | Softening point (°C) | 48 - 64 | 55 - 75 | 62 - 88 | 82 - 100 | 48 - 56 | 55 - 65 |
| Other | Each batch | As proposed by supplier | TBR | TBR | TBR | TBR | TBR | TBR |

Notes:

1. Not used.
2. Not used.
3. 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)
4. Underlying viscosity is derived from the Elastometer data (i.e. tested under the same conditions as Consistency testing, refer to Note 3 above).
5. The shear rate involved in determining viscosity by AGPT/T111 must 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.
6. ‘TBR’ throughout = to be reported.
7. ‘NA’ throughout indicates that the property is considered not applicable for that PMB class.
8. 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.
9. Not used.
10. Applicable only to products failing to meet the requirements for segregation value.
11. Properties for S15E are experimental, and are to be regarded as trial values for such period until manufacturing capabilities are proven.
12. Alternatively a soxhlet with toluene may be used.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TABLE 3.2 POLYMER Modified Binders for Asphalt** | | | | | | | | |
| **Test Procedure** | **Minimum Testing Frequency (1)** | **Class** | **A5EP** | **A10E** | **A15E** | **A20E** | **A30P** | | **A35P (5)** |
| **Binder Property** |
| **PERFORMANCE RELATED PROPERTIES** | | | | | | | | | |
| AGPT/T121 | 3-monthly | Consistency at 60°C (Pa.s) min | 10000 | 6000 | 5000 | 600 | 1500 | | 2000 |
| AGPT/T121 | 3 monthly | Consistency 6% at 60°C (Pa.s)(2) min | 2500 | TBA | 900 | 500 | TBA | | 1200 |
| AGPT/T121 | 3-monthly | Stiffness at 25°C (kPa)(2) max | 120 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 (%) min | 25 - 40 | 60 – 86 | 55 – 80 | 38 - 70 | 12 - 30 | | 6 - 21 |
| AGPT/T131 | Each batch | Softening point (°C) min | 94 – 110 | 88 – 110 | 82 - 105 | 65 - 95 | 70 - 80 | | 70 - 80 |
| Other | Each batch | As proposed by supplier | TBR | TBR | TBR | TBR | TBR | | TBR |

Notes:

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 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 AGPT/T111 must be calculated and recorded.
4. “TBR’ throughout = to be reported.
5. Where A35P is produced through the addition of polymer as part of the asphalt produced process evidence must be provided that the resultant binder can meet these values

**4. PRIMERS AND PRIMER BINDERS**

The properties of cutback primes and primer binders must be in accordance with AS 2157 Cutback Bitumen

Where the use of field blended primers has been approved, the properties must be consistent with the properties of laboratory prepared samples using components complying with Clause 2 "Residual Bitumen" and Clause 8 "Bituminous Flux and Cutter".

Where emulsion primers are to be used the following information must be submitted by the contractor at least 14 days prior to application:

* Indicative application rates
* Material safety data sheets
* Minimum curing periods
* Handling procedures including circulation requirements, maximum and minimum spraying temperatures, minimum pavement temperatures
* Quality control limits including bitumen, cutter and water contents, maximum and minimum viscosity.

0.5 parts of an approved bitumen adhesion additive must be added to all primer binders.

**5. EMULSIONS**

Emulsions must comply with AS 1160.

**6. MULTIGRADE BITUMENS**

Multigrade Bitumens must comply with Austroads Technical Report AGPT/T190 “Specification Framework for Polymer Modified Binders and Multigrade Bitumens”.

**7. CRUMB RUBBER BINDERS (CRB’S)**

**7.1 General**

Crumb rubber binders must 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 must include procedures related to mixing and storage processes together with minimum digestion times.

Field produced Crumb Rubber Binders must comply with the properties set out in Table 5.4 of AP‑T41/06 “Specification Framework for Polymer Modified Binders and Multigrade Bitumens”. The Contractor must prepare and test samples of the crumb rubber binder using the proposed plant, constituent materials and digestion times. 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 must be free of diluents or other contamination. Results must be supplied within 5 days of the contract commencing. Submission of test results shall constitute a **HOLD POINT**.

Manufacturing, blending and storage details for each batch of binder must be supplied by the contractor including:

* Traceability details of input materials
* Quantities of input materials added reported by weight/volume and parts.
* Digestion times and temperatures
* Storage times and temperatures

The Superintendent must be notified where the source of input material changes from that submitted at the commencement of the contract. Test results as required by Clause.10.3 must be supplied by the Contractor at to confirm the resultant Crumb Rubber Binder meets specification.

**7.2 Materials**

Base bitumen used in the manufacture of crumb rubber binder must consist of C170 complying with AS 2008.

Granular crumb rubber must comply with the following requirements:

1. Must fall within the grading specified in Table 7.2
2. Have a maximum bulk density of 350 kg/m3
3. Particles less than 3 mm in length
4. Not exceed a moisture content of one percent
5. Be free of cord, wire fluff and other deleterious material
6. Be free of lumps and capable of being poured freely.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TABLE 7.2** | | | | |
| **Sieve Size AS (mm)** | **2.36** | **1.18** | **0.6** | **0.15** |
| % Passing | 100 | 100 | 70 - 100 | 0 - 5 |

**8. BITUMINOUS FLUX AND CUTTER**

**8.1 General**

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

**8.2 Flux (Distillate or Industrial Diesel Fuel)**

Flux must comply with AS 3568.

**8.3 Cutter**

(a) Low flash point (Jet A‑1 Fuel or Kerosene) must comply with AS 3568 with the exception that the minimum flash point must be 40°C.

(b) High flash point must comply with the requirements listed in Table 8.3.

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 8.3 TABLE OF REQUIREMENTS ‑ HIGH FLASH POINT CUTTER** | | | |
| PROPERTY | REQUIREMENTS | | TEST PROCEDURE |
| MIN. | MAX. |
| Density 15°C (kg/L) | 0.78 | 0.84 | AS 2341.6 |
| Flash point (°C) | 61.5 | ‑ | AS 2106 |
| Viscosity 40°C (mm2/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  250°C | ‑  80 | 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 |

**9. TEST PROCEDURES**

The Contractor must use the following test procedures (refer <http://www.dpti.sa.gov.au/contractor_documents>) to verify conformance with the Specification:

|  |  |  |
| --- | --- | --- |
| **TEST** | | **TEST PROCEDURE** |
| Moisture Content: | Oven Drying Method  Microwave Method | AS 1289.2.1.1  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**

**10.1 General**

The Contractor must conduct sampling and testing of products for control and verification purposes at the frequency shown in Table 10.2 during manufacture, and Table 10.3 at the point of delivery (for spray seals only).

For the point of delivery samples the Contractor must provide 3 hours notification of sampling. All samples must be clearly marked and traceable to the relevant Lot in accordance with Part G20 "Quality System Requirements". The sample size must not be less than ¾ litre in a 1 litre sample tin.

For contracts which include asphalt all binder samples must 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 must provide documentation to confirm that the samples have been received at the DPTI Laboratory, and submit this as part of the Lot package.

**10.2 Point of Manufacture (Spray Seals only)**

The Contractor must 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 must also be recorded when the test samples are taken and the tests are conducted.

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 10.2 PROCESS CONTROL TESTING REQUIREMENTS** | | | |
| **PRODUCT** | **PROPERTIES** | **TEST FREQUENCY AT POINT OF MANUFACTURE** | **ACCEPTANCE LIMIT** |
| C170 Bitumen | As listed in AS 2008 & Table 2.1 | 3 months or after addition of bitumen into bulk storage | Clause R25.2 |
| Flashpoint, Durability | Annually | Clause R25.2 |
| C320 Bitumen | As listed in AS 2008 & Table 2.2 | 3 months or after addition of bitumen into bulk storage | Clause R25.2 |
|  | Flashpoint, Durability | Annually | Clause R25.2 |
| Cutback Binder | Viscosity at 60oC | Each production batch | Report value |
| Primers and Primer Binder | As listed in AS 2157 | Each production batch | Clause R25.4 |
| Multigrades | Viscosity at 60°C | Each Production batch | Clause R25.6 |
| Penetration at 25°C | Each Production batch |
| Viscosity at 135°C | Each Production batch |
| Viscosity at 60°C after RTFOT | Each Production batch |
| 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 Tables 3.1 & 3.2) | Performance Related & Index Properties | Monthly | Clause R25.3 |
| Flash Point & Loss on Heating | Annually | Clause R25.3 |
| Viscosity at 165°C | Each production batch | Clause R25.3 |
| Torsional Recovery at 25°C, | Each production batch | Clause R25.3 |
| Softening Point | Each production batch | Clause R25.3 |
| Cutter | Viscosity at 40oC | Each production batch | Clause R25.9 |
| Granular Crumb Rubber | Bulk Density | One per 100 tonne lot | Report value |
| Grading | One per 100 tonne lot | Clause R25.7 |
| Crumb Rubber Binder | Properties as per Table 10.3 | Refer Table 10.3 | Refer Table 10.3 |
| Bitumen Emulsion | Sieve residue | Each production batch | Clause R25.5 |
| Residue from evaporation | Each production batch | Clause R25.5 |

\* Preblended PMB’s only

For Polymer Modified Binders the following additional sampling must be undertaken

* One point of manufacture sample taken at the same time as the manufacturer’s sample is to be provided to the principal.
* Contractor must also take one sample per transport bulker at the point of "load out" from the manufacturing yard to the bulker on request.

In accordance with the "Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders", AAPA June 2004, Clause 3.1, details including but not limited to the time, date and sample temperature must also be recorded when the test samples are taken.

**10.3 Point of Delivery (Spray Seals only)**

The Contractor must 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 must be taken at the frequency shown in Table 10.3.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TABLE 10.3 DELIVERY, SAMPLING AND TESTING REQUIREMENTS** | | | | |
| **PRODUCT** | **PROPERTIES** | **SAMPLE FREQUENCY ON SITE** | **TESTING FREQUENCY** | **ACCEPTANCE LIMIT** |
| \*C170 & C320 Bitumen | As listed in Table 2.1 | One Contractor sample per bulker | On request | Clause R25.2 |
| Cutback Binder | Viscosity at 60oC | On request | On request | Report value |
| Primers and Primer Binder | As listed in Table 4.1 | Sample per bulker | On request | Clause R25.4 |
| \*Polymer Modified Binders  Plant Blended Crumb Rubber (refer Table 3.1) | Viscosity at 165°; 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 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 R25.7 |
| Rubber Content | Sample from each batch | On request | Clause R25.7 |
| \*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 40oC | One per contract | One per contract | Clause R25.8 |
| Bitumen Emulsion | As listed in AS 1160 | Sample per bulker | On request | Clause R25.5 |
| Adhesion Agent | Amine Value | One per contract | One per contract | Minimum 120 |

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

All Principal samples must 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 must provide documentation to confirm that the samples have been received at the DPTI Laboratory, and submit this as part of the Lot package.

Where immediate testing of samples is not required in accordance with Table 10.3, the Contractor must store the samples for not less than 12 months from the date of sampling.

**11. HOLD POINTS**

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

|  |  |  |
| --- | --- | --- |
| **CLAUSE REF.** | **HOLD POINT** | **RESPONSE TIME** |
| 7.1 | Submission of test results for crumb rubber binder. | 5 working days |

**12. VERIFICATION REQUIREMENTS AND RECORDS**

**12.1 General**

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

**12.2 Binder Information to be Submitted Upon Delivery**

At a minimum, the Contractor must provide to the Superintendent on site the following information with each delivery of PMB and Multigrade binder:

1. Contractor's batch number/identifier
2. PMB Grade or Multigrade class
3. Location of manufacturing plant
4. Date and time of manufacture
5. Date, time and temperature of dispatch into the bulker
6. Delivery Details (delivery point, date, time and temperature)
7. Product heating information (heating start time, finish time, total heating time and temperature).

\_\_\_\_\_\_\_\_\_\_\_\_