

SUPERSEDED

**Technical Specification**

**Transport and Main Roads Specifications  
MRTS18 Polymer Modified Binder (including Crumb  
Rubber)**

**July 2020**

## Copyright

© The State of Queensland (Department of Transport and Main Roads) 2020.

## Licence



This work is licensed by the State of Queensland (Department of Transport and Main Roads) under a Creative Commons Attribution (CC BY) 4.0 International licence.

## CC BY licence summary statement

In essence, you are free to copy, communicate and adapt this work, as long as you attribute the work to the State of Queensland (Department of Transport and Main Roads). To view a copy of this licence, visit: <https://creativecommons.org/licenses/by/4.0/>

## Translating and interpreting assistance



The Queensland Government is committed to providing accessible services to Queenslanders from all cultural and linguistic backgrounds. If you have difficulty understanding this publication and need a translator, please call the Translating and Interpreting Service (TIS National) on 13 14 50 and ask them to telephone the Queensland Department of Transport and Main Roads on 13 74 68.

## Disclaimer

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained within. To the best of our knowledge, the content was correct at the time of publishing.

## Feedback

Please send your feedback regarding this document to: [tmr.techdocs@tmr.qld.gov.au](mailto:tmr.techdocs@tmr.qld.gov.au)

## How to use this document

This document is designed to be read and applied together with *ATS 3110 Supply of Polymer Modified Binders* (January 2020). You must have access to the Austroads documents to understand what applies in Queensland. All Austroads Technical Specifications (ATS) can be downloaded for free from the [Austroads website](#).

This document:

- sets out how ATS 3110 applies in Queensland
- has precedence over ATS 3110 when applied in Queensland
- generally follows the document structure of ATS 3110 with Queensland exceptions
- does not use paragraph numbering / items applied in ATS 3110.

The following table summarises the relationship between ATS 3110 and this document:

<b>Applicability</b>	<b>Meaning</b>
Accepted	The Austroads clause is accepted.
Accepted, with amendments	Part or all of the clause has been accepted with additions, deletions or differences.
New	There is no equivalent clause in the Austroads.
Not accepted	The Austroads clause is not accepted.

**Contents**

- 1 Introduction .....1**
- 2 Definition of terms .....1**
- 3 Referenced documents .....2**
- 4 Quality system requirements .....3**
  - 4.1 Hold Points, Witness Points and Milestones ..... 3
  - 4.2 Binder quality procedures ..... 3
- 5 Manufacture and handling of binders.....3**
  - 5.1 Manufacture ..... 3
  - 5.2 Binder handling ..... 4
  - 5.3 Binder contamination ..... 4
  - 5.4 Foaming ..... 5
- 6 Sampling and testing of binders .....5**
  - 6.1 General ..... 5
  - 6.2 Sampling and testing prior to release from the manufacturer ..... 5
  - 6.3 Sampling and testing at the point of delivery ..... 5
    - 6.3.1 Sampling.....5
    - 6.3.2 Testing requirements.....6
- 7 Records.....7**
- 8 Properties of binders.....7**
  - 8.1 General ..... 7
- 9 Testing frequencies.....9**
- Annexure A: Summary of Hold Points, Witness Points and Records ..... 10**

SUPERSEDED

## 1 Introduction

This Technical Specification accepts with amendments Clause 1 *Scope* and Item 1.1 of Austroads Technical Specification ATS 3110 *Supply of Polymer Modified Binders* (January 2020).

### Addition

This Technical Specification sets out the requirements for the supply (including transport and storage) of polymer modified binders (PMBs) and crumb rubber modified binders for use in both sprayed sealing and asphalt applications.

Polymer modified binder shall be supplied in accordance with the requirements specified in ATS 3110 *Supply of Polymer Modified Binders*, unless those requirements are specifically amended by this Technical Specification.

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

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

## 2 Definition of terms

This Technical Specification accepts with amendments Clause 2 *Definitions*, Items 2.1 to 2.2 of ATS 3110 *Supply of Polymer Modified Binders*.

### Addition

The terms used in this Technical Specification shall be defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Additional terms used in this Technical Specification shall be as defined in Table 2.

**Table 2 – Definition of terms**

Term	Definition
Manufacturer	An organisation which has the necessary plant and equipment to manufacture polymer modified binder to this Technical Specification.
Point of delivery	The point in the delivery process where the polymer modified binder is: <ol style="list-style-type: none"> <li>a) transferred to the sprayer for sprayed sealing work, or</li> <li>b) located in the storage tank at the asphalt plant immediately prior to asphalt production</li> </ol>

The nearest equivalent Austroads PMB class (ATS 3110) to the previous MRTS18 (November 2011) PMB class is listed in the table below.

Austroads PMB Class (ATS 3110)	Previous PMB Class (MRTS18 – November 2011)
<b>Sprayed Sealing Applications</b>	
S10E	S0.25S
S15E	S0.7S
S20E	–
S25E	S4.5S
S35E	S0.3B
S45R	S1.8R
S15RF	S15RF
S18RF	S18RF
<b>Asphalt Applications</b>	
A10E	A10S
A15E	A5S
A20E	A0.6S
A25E	A0.6B
A35P	A2V

### 3 Referenced documents

This Technical Specification accepts with amendments Clause 3 *Referenced Documents*, Item 3.1 of ATS 3110 *Supply of Polymer Modified Binders*.

#### Addition

Table 3 lists documents referenced in this Technical Specification.

**Table 3 – Referenced documents**

Reference	Title
ATS3110	<i>Supply of Polymer Modified Binders, Austroads</i>
AP-C87	<i>Austroads Glossary of Terms, Austroads</i>
AP-T235-13	<i>Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens, Austroads</i>
HSE Guide 5	<i>Guide to the Manufacture, Storage and Handling of Polymer Modified Binders, Australian Asphalt Pavement Association (AAPA)</i>
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS11	<i>Sprayed Bituminous Treatment</i>
MRTS30	<i>Asphalt Pavements</i>
MRTS50	<i>Specific Quality System Requirements</i>

## 4 Quality system requirements

This Technical Specification accepts Clause 4 *Quality System Requirements*, Item 4.1 of ATS 3110 *Supply of Polymer Modified Binders*.

### 4.1 Hold Points, Witness Points and Milestones

New

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

The Witness Point applicable to this Technical Specification is shown in Table 4.1.

There are no Hold Points or Milestones defined.

**Table 4.1 – Hold Points, Witness Points and Milestones**

Clause	Hold Point	Witness Point	Milestone
10.3.1		1. Sampling at the point of delivery	

### 4.2 Binder quality procedures

New

The Contractor shall prepare documented procedures for all required processes as defined in Clause 6 of MRTS50 *Specific Quality System Requirements* and be consistent with the requirements of this Technical Specification, ATS 3110 *Supply of Polymer Modified Binders* and MRTS11 *Sprayed Bituminous Treatments* and the binder manufacturer's recommendations, as appropriate. These procedures shall be included in the respective asphalt quality plan or construction procedure specified in MRTS30 *Asphalt Pavements* or MRTS11 *Sprayed Bituminous Treatments*, as appropriate.

For field or plant blended crumb rubber modified binders, the procedures shall address the following specific issues:

- the management of crumb rubber blending, digestion, and storage times and temperatures
- the maximum time / temperature conditions that field produced / plant blended product can be stored and / or transported without loss of properties
- circulation of the product during transportation and storage
- method for achieving a homogeneous product that can be sprayed to achieve a uniform application of binder across the pavement during sealing operations, free of streaking, and
- requirements for spraying plant and spraying practices including adjustments to nozzles (if required).

## 5 Manufacture and handling of binders

### 5.1 Manufacture

This Technical Specification accepts with amendments Clause 5 *Manufacture of Binders*, Items 5.1 to 5.3 of ATS 3110 *Supply of Polymer Modified Binders*.

Addition

Polymer modified binders shall be manufactured using the polymer types listed in Table 5.1.

**Table 5.1 – Polymer type to be used in binder**

Polymer Type	Polymer Modified Binder Class
Styrene-butadiene-styrene (SBS)	S10E, S15E, S20E, S25E, A10E, A15E, A20E
Polybutadiene (PBD)	S35E, A25E
Ethylene vinyl acetate (EVA)	A35P
Crumb rubber (CR)	S45R, S15RF, S18RF

**5.2 Binder handling**

New

The handling, storage, transport, heating and transfer of polymer modified binder shall comply with the requirements and practices outlined in the latest versions of the following documents:

- a) Austroads – *Bituminous Materials Safety Guide*, AP-G41
- b) Austroads – *Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens*, AP-T235-13
- c) AAPA – *Guide to the Heating and Storage of Binders for Sprayed Sealing and Asphalt Manufacture*, Advisory Note 7, and
- d) AAPA – *Guide to the Manufacture, Storage and Handling of Polymer Modified Binders*, HSE Guide 5.

Polymer modified binder shall not be heated to temperatures greater than the maximum values listed in the latest version of AAPA Advisory Note 7 – *Guide to the Heating and Storage of Binders for Sprayed Sealing and Asphalt Manufacture* and the binder manufacturer's recommendations. The rate of increase in temperature shall not exceed 15°C per hour.

**5.3 Binder contamination**

New

Polymer modified binder shall be heated, stored and transported in purpose-built containers and transferred between containers in such a way that contamination does not occur. The resultant product complies with this Technical Specification and the performance of the product is not adversely affected.

As necessary, storage and delivery vessels, sprayers and hoses shall be flushed or cleaned with appropriate solvents before transfer of binder has commenced. Residues from flushing and cleaning shall be removed before transfer.

If contamination of the binder is suspected, additional sampling and testing may be ordered by the Administrator to confirm compliance of the binder with the requirements of this Technical Specification.



## **5.4 Foaming**

### New

Polymer modified binder shall not foam at any time when heated up to a temperature of 180°C. The formation of a thin layer of bubbles on the surface of the binder is not regarded as foaming.

## **6 Sampling and testing of binders**

### **6.1 General**

This Technical Specification accepts with amendments Clause 6 *Sampling and Testing of Binder*, Items 6.1 to 6.6 of ATS 3110 *Supply of Polymer Modified Binders*.

### Addition

Further details of test method numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Specifications*.

Polymer modified binders shall be sampled and tested as follows:

- a) prior to release from the manufacturer, and
- b) at the point of delivery.

### **6.2 Sampling and testing prior to release from the manufacturer**

#### New

The minimum frequency for sampling and testing prior to release from the manufacturer shall be in accordance with Clause 9 of ATS 3110 *Supply of Polymer Modified Binders*.

### **6.3 Sampling and testing at the point of delivery**

#### **6.3.1 Sampling**

##### New

The Contractor shall take two samples of binder at the point of delivery. Each sample shall contain a minimum of one litre (1 L) of polymer modified binder. The binder sample containers shall be labelled at the time the binder is sampled.

Binder sample labels would typically contain the following information:

- designation or classification of the binder
- name of binder manufacturer
- batch or identification number
- date and time of sampling
- sampling location
- type and identifying number of the container or vehicle where the sample was taken
- name of sampler
- identification mark or sample number
- project name or number
- sampling temperature

Unless otherwise directed by the Administrator, one sample shall be retained by the Contractor while the other sample shall be forwarded to the Administrator. These samples shall be either tested for conformance or stored for a minimum of 12 months, or for the duration of the project's defect liability / correction period, whichever is greater.

For asphalt work, the samples shall be taken from the binder storage tank immediately prior to the commencement of asphalt production for each work shift.

For sprayed sealing work, the samples shall be taken immediately prior to transfer or during each transfer of binder from the tanker/storage tank to the sprayer. **Witness Point 1** Where a single tanker/storage tank load of binder is being transferred multiple times to the sprayer during the same work shift, only one pair of samples need be obtained.

### 6.3.2 Testing requirements

#### New

In the event of a test result nonconformance, additional tests shall be performed on the same sample so that the one sample is tested for the following additional properties:

- a) consistency 6% at 60°C
- b) stress ratio
- c) segregation, and
- d) viscosity.

For the purpose of undertaking these tests, reheating of binder samples shall be minimised as much as possible.

## 7 Records

This Technical Specification accepts with amendments Clause 7 *Records*, Item 7.1 of ATS 3110 *Supply of Polymer Modified Binders*.

### Addition

The following additional requirements shall also apply (as relevant):

- a) all test results obtained from each manufactured batch shall be included in the relevant construction lot record
- b) dates, times, production batch numbers, polymer modified binder classes and volumes of transfers into and out of each container used in the supply chain
- c) date, time and amount of any additives (e.g. cutter oil and/or adhesion agent) incorporated into the binder
- d) duration of storage, temperature over time, and degree of agitation during any period of storage, and
- e) delivery dockets shall be made available for inspection by the Administrator and shall be included in the quality records for each relevant construction lot.

## 8 Properties of binders

### 8.1 General

This Technical Specification accepts with amendments Clause 8 *Properties of Binders*, Item 8.1 and Tables 8.1 to 8.4 of ATS 3110 *Supply of Polymer Modified Binders* prior to release from the manufacturer.

### Addition

In addition to these requirements, binders must also comply at the point of delivery with the requirements detailed in Table 8.1 of this Technical Specification.

**Table 8.1 – Binder properties**

Binder Class	Softening Point(°C)		Torsional Recovery at 25°C (%)	
	Prior to Release from the Manufacturer <sup>1</sup>	At the Point of Delivery	Prior to Release from the Manufacturer <sup>1</sup>	At the Point of Delivery
A35P	62 – 74	62 – 74	6 – 21	6 – 21
A25E	52 – 62	52 – 62	17 – 30	16 – 30
A20E	65 – 95	59 – 95	38 – 70	25 – 70
A15E	82 – 105	76 – 105	55 – 80	45 – 80
A10E	88 – 110	81 – 110	60 – 86	49 – 86
S10E	48 – 64	48 – 64	22 – 50	14 – 50
S15E	55 – 75	52 – 75	32 – 62	20 – 62
S20E	65 – 95	59 – 95	38 – 70	25 – 70
S25E	82 – 105	76 – 105	55 – 80	45 – 80

Binder Class	Softening Point(°C)		Torsional Recovery at 25°C (%)	
	Prior to Release from the Manufacturer <sup>1</sup>	At the Point of Delivery	Prior to Release from the Manufacturer <sup>1</sup>	At the Point of Delivery
S35E	48 – 56	48 – 56	16 – 32	15 – 32
S45R	55 – 65	53 – 65	25 – 55	23 – 55
S15RF	–	≥ 55	–	≥ 25
S18RF	–	≥ 62	–	≥ 30

Notes:

<sup>1</sup>.Requirements for softening point and torsional recovery prior to release from the manufacturer are given in Tables 8.1, 8.2 and 8.3 of ATS 3110, and are repeated in this table for information purposes.

#### **Variation of binder properties prior to release from the manufacturer and at the point of delivery**

A reduction in torsional recovery and softening point can occur with some binder grades over time due to ageing, particularly for moderately to heavily modified SBS binder grades. Such changes do not have a significant detrimental effect on the performance of the binder and have been accounted for in the lower point of delivery requirements. However, reductions in torsional recovery and softening point caused by other means (such as nonconforming binder properties at the point of release from the manufacturer, contamination or mishandling) can have a detrimental effect on the performance of the binder.

All properties, other than softening point, torsional recovery and consistency 6% at 60°C should not change between the point of manufacture and the point of delivery.

#### **Acceptance of nonconforming binder**

For binder that does not conform with the requirements at the point of delivery but has been assessed by the Administrator as being suitable to remain in the Works, the reduction in value of the binder used in sprayed bituminous treatments would typically be determined in accordance with Clause 3.2.2 of MRS11 *Sprayed Bituminous Treatments*. Additionally, the project's defect liability / correction period for sprayed seals and asphalt containing nonconforming binder would typically be extended to a period of at least 24 months after the date of installation, as the performance implications associated with the nonconformance cannot be fully evaluated until it has been subject to a period of sustained hot weather.

### **Audit testing undertaken by the Administrator**

When audit testing is undertaken by the Administrator, samples are typically tested for the following properties:

- softening point
- torsional recovery
- consistency 6% at 60°C, and
- segregation.

## **9 Testing frequencies**

This Technical Specification accepts with amendments Clause 9 *Frequency of Testing*, Item 9.1 and Tables 9.1 and 9.2 of ATS 3110 *Supply of Polymer Modified Binders*.

### Addition

The minimum testing frequencies at the point of delivery are provided in Table 9 of this Technical Specification.

Where the Contractor is able to provide suitable, traceable and auditable records to the Administrator that demonstrate the binder has been handled, stored, transported, heated and transferred in accordance with this Technical Specification and the latest version of AAPA Advisory Note 7 – *Guide to the Heating and Storage of Binders for Sprayed Sealing and Asphalt Manufacture*, the frequency of compliance testing for each class of polymer modified binder from each manufacturer shall be at the 'normal frequency'. If the Contractor is unable to demonstrate compliance with the above requirements, an 'increased frequency' shall be adopted.

A 'normal frequency' shall immediately change to an 'increased frequency' if a nonconforming sample has been detected. The frequency may return to the 'normal frequency' after no nonconformances have occurred in four consecutive compliance testing samples.

Where the binder has not been stored in accordance with the latest version of AAPA Advisory Note 7 – *Guide to the Heating and Storage of Binders for Sprayed Sealing and Asphalt Manufacture*, the 'increased frequency' shall apply.

In addition to the requirements of MRTS50 *Specific Quality System Requirements*, and unless otherwise specified or agreed with the Administrator, the extents of conforming and nonconforming works shall be determined based on the midpoint between adjacent binder tests.

**Table 9 – Minimum testing frequencies**

<b>Frequency</b>	<b>Normal Frequency</b>	<b>Increased Frequency</b>
Testing of samples required:	The first compliance testing sample and then every 10th compliance testing sample thereafter for a particular binder class (that is compliance testing sample 1, 11, 21, etc)	Each compliance testing sample

## **Annexure A: Summary of Hold Points, Witness Points and Records**

### *Not accepted*

This Technical Specification does not accept Annexure A *Summary of Hold Points, Witness Points and Records, of Testing of ATS 3110 Supply of Polymer Modified Binders*.

Refer to Clause 4.1 of this Technical Specification for Hold Points, Witness Points and Milestones.

Refer to Clause 7 of this Technical Specification for Records.

SUPERSEDED

SUPERSEDED