



## SPECIFICATION 509

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# POLYMER MODIFIED BITUMINOUS SURFACING

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REVISION REGISTER			
Clause Number	Description of Revision	Authorised By	Issue Date
509.01(1)	Deleted exclusion of rubber binder	BPC	
509.01(2a)	Added primed basecourse, seal and asphalt		
509.01(1d)	Added new treatment “enhanced aggregate retention seal”		
509.02	Deleted AP-T09, WA 0.1, AGPT/T130, various WA test methods		
509.02	Added AP-G41/15, AP-T262-14, AGPT/T101, AGPT/T530-535, Main Roads 71/05/1396		
509.03	Amended where relevant to be consistent with AS 1348.1 definitions. Added enhanced aggregate retention seal. New definition for high stress seal		
509.03(2)	Moved from (1) to (2)		
509.12(2)	Deleted clause on precoating		
509.16.5	Extra text on submission of ALD results		
509.17	Moved to 509.24.02		
509.20(1)	Next wording consistent with Specification 503		
509.21(2 & 3)	Added bridge deck, ERN15 and guideline on bridge deck sealing		
509.21(4)	deleted AS 1141.20.1 as incorrect		
Table 509.1	SAM, HSS and SAMI design information deleted as now in ERN15. Included rates for bridge decks.		
509.24.01	Amended to be consistent with Specification 503		
509.26.01(5)	Clause deleted on mercury thermometer		
Table 509.2	Precoating rates same as Specification 503		
509.26.02(1)	Hold point removed and clause reworded		
509.27.01(1)	Management plan required for stockpile sites		
509.27.01(3)	Hold point includes management plan		
509.27	Precoating moved to 509.37		
509.30.03	Moved to 509.37.01		
509.32.01	Moved to 509.41.03		
509.33.01	New clause consistent with Specification 503		
509.33.02(1)	Updated references		
509.33.02(2)	New text on calibration requirements		
Table 509.02	New table on nozzle set up		
Table 509.3	New table on nozzles to be used		
509.33.02 (4, 5, 6 & 7)	Amended wording		
509.33.02	Old clause on sealed shoulders deleted		
509.33.03	New requirements for rollers		
509.33.05	Extra text on aim of using drag broom		

509.36.01(1 & 3)	New text on primed basecourse requirements		
509.36.01(4)	Hold point reworded		
509.36.01(5)	Requirement for repairing holes		
509.36.02	Now includes concrete surfaces		
509.36.03	New clause		
509.37	New clause on precoating including heated aggregate		
509.39.4	Requires signs to be weighted down		
509.41.01(2)	New words relocated from 509.41.01(4)		
509.41.01(4)	New wording plus Table 509.5 on spray temperatures		
509.41.02 & .03	New clause on spraying viscosity		
509.42.01(1)	New requirement on weather		
509.42.04	New or amended text		
509.43.01(1a)	Text deleted and moved to 509.43.01(1c)		
509.43.01(1b)	Hold point deleted		
509.43.01(3)	New clause on double seals consistent with Specification 503		
509.43.02(1)	Adopted coverages in accordance with Specification 503. Table 509.9 now nominates roller size		
509.43.03(3)	Stones to be sept clear of guide posts		
509.49(1)	Moved to 509.91		
509.55(1)	New clause on testing		
509.91	New clause on records		
Table 509C1	New to align with Specification 503		
Table 509C2	Reorganised layout and seal types		
509C.3(1)	Line spotting same as Specification 503		
Guidance Note 1	References added		
Guidance Note 3.1.3	Included 7mm and 20mm aggregate		
Guidance Note 3.3	New on aggregate sizes		
Guidance note 4	New on responsibility for seal design		
Guidance note 5.2	Notes on selection of roller sizes		
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# SPECIFICATION 509

## POLYMER MODIFIED BITUMINOUS SURFACING

### GENERAL

#### 509.01 SCOPE

1. The work under this specification consists of the supply and application of the following types of sprayed polymer modified bituminous treatments :  
*Types of Treatment*
  - a. Strain Alleviating Membrane (SAM)
  - b. Strain Alleviating Membrane Interlayer (SAMI)
  - c. High Stress Seal (HSS)
  - d. Waterproof Bridge Deck Membranes (including prime)
2. The sprayed polymer modified bituminous treatment must provide a durable surface that:  
*Intent*
  - a. bonds to the underlying surface (whether a primed basecourse or concrete surface, a seal or asphalt;
  - b. provides a safe wearing surface for traffic; and
  - c. waterproofs the pavement or bridge deck.
3. Where applicable, a separate Schedule of Works is included at Annexure 509A, which provides details of specific surfacing treatments.  
*Schedule of Works*

#### 509.02 REFERENCES

1. Australian Standards and MAIN ROADS Western Australia Test Methods are referred to in abbreviated form (e.g. AS 1234, MRS 67-08-43 or WA 123). For convenience, the full titles are given below:

#### Australian Standards

- AS 1141.20.1 Methods for Sampling and Testing Aggregates - Average least dimension - Direct measurement (nominal size 10 mm and greater)
- AS 2809.5 Road tank vehicles for dangerous goods – Part 5: Tankers for bitumen-based products

#### Other Standards and Publications

AP-G41-15 Austroads Bitumen Sealing Safety Guide

AP-T262-14 Performance Requirements for Bitumen Sprayers

AGPT/T101 Method of sampling polymer modified binders, polymers and crumb rubber

AG:PT/T530 Calibration of Bitumen Sprayers – General Introduction and List of Methods

AG:PT/T531 – Volumetric Calibration of Bitumen Pumps

AG:PT/T532 – Transverse Distribution by Fixed Pit Facility

AG:PT/T533 – Transverse Distribution by Field Mat

AG:PT/T534 – Transverse Distribution by Portable Trough

AG:PT/T535 – Road Speed Calibration

Engineering Road Note No 15 – Design of Sprayed Seals

Main Roads 71/05/1396 Guidelines for the Application of Waterproof Membranes to Bridge Decks

WA Government **Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007**

### **MAIN ROADS Test Methods**

WA 200.1 Sampling Procedures for Aggregates

WA 210.1 Particle Size Distribution of Aggregate

WA 215.1 Average Least Dimension

WA 310.1 Pavement Skid Resistance: British Pendulum Method

WA 311.1 Texture Depth

WA 312.1 Ball Embedment

WA 340.1 Sprayed Binder Application Rate: Carpet Tile Method

### **MAIN ROADS Specifications**

Specification 201 QUALITY SYSTEMS

Specification 202 TRAFFIC

Specification 203 OCCUPATIONAL SAFETY AND HEALTH

Specification 301 CLEARING

Specification 302 EARTHWORKS

Specification 503 BITUMINOUS SURFACING

Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS

## **509.03 DEFINITIONS**

1. The term “polymer modified binder” is a binder consisting of polymeric materials dispersed in bitumen with enhanced binder performance for particular applications. **PMB**
2. The terms “polymer modified binder” and “polymer modified bitumen” and “binder” have the same meaning except where the context of any particular passage indicates otherwise. **Terms**

- |  |                         |
|--|-------------------------|
| 3. The term "batch" shall mean any quantity of material all of which has been produced at the same time by the same process and which is subject only to random variation and can therefore be accepted as being of homogeneous quality.   | <i>Batch</i>            |
| 4. The terms "seal", "sprayed seal" and "reseal" have the same meaning except where the context of any particular passage indicates otherwise.   | <i>Seal/Reseal</i>      |
| 5. A "high stress seal (HSS)" is a bituminous seal, or reseal, treatment that is subject to heavier than normal traffic loading due to braking, accelerating and turning vehicles. HSS can also include a seal applied at a low binder application rate requiring an S45R binder to achieve improved aggregate adhesion. | <i>High Stress Seal</i> |

#### **509.04 – 509.05      NOT USED**

### **PRODUCTS AND MATERIALS**

#### **509.06      POLYMER MODIFIED BINDER**

- |  |                   |
|--|-------------------|
| 1. The polymer modified binder shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.   |                   |
| 2. <b>Prior to the use of polymer modified binder, the Contractor shall demonstrate compliance with the properties of the polymer modified binder for each batch used on the Contract.</b> | <i>HOLD POINT</i> |

#### **509.07      BITUMEN EMULSION**

1. The bitumen emulsion shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

#### **509.08      PROTECTIVE PAPER**

1. Protective paper shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

#### **509.09      NOT USED**

#### **509.10      MEDIUM CURING CUTTING OIL**

1. The cutting oil shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

#### **509.11      SLOW CURING CUTTING OIL**

1. The cutting oil shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

## 509.12 PRECOATING AGENT

- Aggregate shall be precoated with a bitumen based precoating fluid meeting the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS. Where the weather is hot and the aggregate is clean and dry the Superintendent may approve the use of a distillate precoat fluid.

## 509.13 ADHESION AGENT

- The adhesion agent shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

**Approved  
Adhesion  
Agents**

## 509.14 – 509.15 NOT USED

## 509.16 AGGREGATES

- Crushed aggregate, including its source rock, shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.
- Where Principal supplied aggregate cover material is made available to the Contractor, the Contractor shall use all such aggregate cover material before using Contractor supplied aggregate cover material. Details of Principal supplied aggregate are given in Annexure 509B.
- The source of aggregate supplied by the Contractor shall be nominated with the Tender.
- The Contractor shall make all necessary arrangements with the nominated supplier concerning load size, rate for supply, timing of the delivery, payment and documentation.

**Principal  
Supplied  
Aggregate**

- Prior to the on-site delivery of crushed aggregate, the Contractor shall provide test results to the Superintendent showing that the aggregate conforms to specified requirements. Results for the Average Least Dimension (ALD) of each stockpile shall be provided before the aggregate is applied. The Superintendent is to be advised of a change in stockpile source and the ALD of that aggregate before it is applied.

**HOLD POINT**

- The Contractor shall organise all cover material supplied under this Contract into clearly identifiable stockpiles either at source or on site in order that they may be tested as required by the Quality Plan.

**Stockpiles**

- The maximum size of a lot shall be no more than one day's production, or, no more than approximately 2000m<sup>3</sup>, whichever is the lesser.

**Lot Size**

- Any contamination of aggregate after acceptance by the Superintendent shall be corrected at no cost to the Principal.

**Contamination**

## 509.17 - 509.19 NOT USED

## DESIGN OF SPRAYED SEALS

### **509.20 GENERAL**

1. Unless otherwise specified in Table 509C1 the sprayed seal shall be designed by the Principal. Where Table 509C1 specifies design by the Contractor, then the Contractor shall be responsible for and shall carry out the design for binder application rate and aggregate spread rate for each type of treatment specified except for a bridge deck waterproof membrane.

**Design Responsibility**

### **509.21 DESIGN METHODS**

1. The design of sprayed seals shall include selection of binder class and design of binder and aggregate application rates unless otherwise specified.
2. Selection of binder class, except for a bridge deck waterproof membrane, shall be in accordance with Engineering Road Note No. 15. Selection of binder class for a bridge deck waterproof membrane shall be in accordance with Main Roads Guidelines for the Application of Waterproof Membranes to Bridge Decks, document 71/05/1396.
3. Design of binder application rates and aggregate spread rates, except for a bridge deck waterproof membrane, shall be in accordance with Engineering Road Note No. 15. Rates for a bridge deck waterproof membrane are shown in Table 509.1.
4. Testing for Average Least Dimension (ALD) shall be carried out in accordance with AS 1141.20.1 or WA 215.1. Sampling for testing of ALD shall be in accordance with WA 200.1.
5. Testing for surface texture shall be in accordance with WA 311.1. Testing for ball embedment the test shall be in accordance with WA 312.1.

**Design Method**

**Binder Class**

**Application Rates**

**Test Methods**

**TABLE 509.1 APPLICATION RATES FOR BRIDGE DECK WATERPROOF MEMBRANE**

Binder Class	Binder Application Rate at 15°C	Aggregate Size and Application Rate
S45R	1.6 L/m <sup>2</sup>	5mm at 250 m <sup>2</sup> /m <sup>3</sup>
S25E	1.6 L/m <sup>2</sup>	7mm at 200 m <sup>2</sup> /m <sup>3</sup>

### **509.22 DESIGN BY PRINCIPAL**

1. Where Binder Application Rate(s) and other aspects of the sprayed seal have been provided by the Principal, the Superintendent will as necessary, issue to the Contractor any variations to such design.

2. Such amended details may include, but not necessarily be limited to:

- a. Average Least Dimension (ALD) of the aggregate
- b. Aggregate precoating rate

**Design Variables**

- c. Binder Application Rate (BAR)
- d. Binder type and composition
- e. Aggregate spread rate
- f. Rolling and sweeping requirements

## **509.23 DESIGN BY CONTRACTOR**

### 509.23.01 GENERAL

1. Where the Contractor is responsible for the design of the sprayed seal, the design shall be in accordance with the procedures described in 509.21.

***Design Practices***

### 509.23.02 PRELIMINARY DESIGN

1. The Contractor shall carry out a preliminary design based on the following as applicable:
  - a. The type of treatment and nominal aggregate size specified by the Principal.
  - b. Measurement of the Average Least Dimension of the aggregate proposed for use, or if not available, an estimate based on past test results from the same aggregate source, or an estimate based on typical results for aggregate of the size proposed for use.
  - c. Measurement of the surface texture and/or ball embedment of the surface upon which the treatment is to be applied.
  - d. Traffic volume and composition data provided by the Principal on request.
  - e. A visual assessment of the condition of the surface on which the seal is to be applied and the defects present.
  - f. Historic data provided by the Principal on request on similar treatments in similar circumstances where available.
  - g. Climatic data relevant to the Site.

### 509.23.03 FINAL DESIGN

1. The Contractor shall carry out a final design based on the measurement of the Average Least Dimension of the aggregate supplied under this Contract and for other factors listed in 509.23.02.
2. **Prior to the application of any sprayed seal, the Contractor shall provide the Superintendent with evidence of the application of appropriate design methods as outlined in 509.21.**
3. During application of a seal the Contractor may vary the design to allow for changes to any of the design factors, site conditions or observed performance. Details of the design variations shall be documented and submitted to the Superintendent within 7 days of implementation of the variations.

***HOLD POINT***

## TRANSPORT AND HANDLING OF BINDER

### 509.24 TRANSPORT AND SAMPLING

#### 509.24.01 GENERAL

1. The handling, transport and heating of polymer modified binder shall comply with the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.
2. The Contractor shall make all necessary arrangements with its supplier concerning load sizes, rates of supply, loading temperatures, payment of opening fees where applicable and all documentation.
3. In order to avoid the danger of mixing incompatible bituminous products in any cartage vehicles provided by the Contractor for the purpose of transporting polymer modified binder, the Contractor shall ensure that the binder supplier's loading procedures are understood and the Binder Loading Docket is fully completed by the Contractor's driver PRIOR TO LOADING, including the signing of any certification concerning the nature of the previous load carried by the cartage vehicle.

**Dangerous  
Mixes**

#### 509.24.02 SAMPLING OF BINDER AT DELIVERY

1. Prior to application or blending with any cutters or adhesion agent, the Contractor shall sample a minimum of one (1) load in every five (5), or part thereof. Two samples shall be taken from each load to be sampled, immediately following one another in accordance with Austroads AG:PT/T101 such that each is similar and represents the polymer modified binder in the load.
2. Each of the sample containers in which the samples are taken from a load shall be labelled to identify the supplier, the supplier's batch number, the date of sampling, the road and the SLKs of the section on which the polymer modified binder is applied so that traceability between samples and corresponding road sections is maintained.
3. The Contractor shall provide the Superintendent with, one of each set of samples at no cost to the Principal.
4. In addition to samples provided to the Superintendent by the Contractor, the Superintendent may take audit samples at any stage during production, storage, delivery or application process.
5. The frequency and timing of sampling will be at the Superintendent's discretion. The Contractor shall provide the Superintendent with ready access for sampling at all times within the hours of work of the Contractor or its Sub-contractors.

6. The cost of material taken, cleaning of the sampling facility and any delays to road tankers or site operations as a result of the sampling shall be considered to have been included in the Schedule of Rates item for binder application. Sampling may be carried out by the Contractor on behalf of the Superintendent but a representative of the Superintendent shall be present at the time of the sampling.

## 509.25 NOT USED

### PREPARATORY OPERATIONS

## 509.26 BINDER STORAGE AND DISPOSAL FACILITIES

### 509.26.01 BINDER STORAGE SITES

1. The Contractor shall select suitable sites for bulk storage of binder and notify the Superintendent in writing at least five (5) days prior to establishing the sites. *HOLD POINT*
2. The Contractor shall ensure that site layout and safe handling procedures conform to requirements detailed in Austroads "Bitumen Sealing Safety Guide" AP-G41-05.
3. The Contractor shall provide and maintain adequate equipment to receive, store, heat, circulate, handle and protect bulk binder from the time of receipt to prevent misuse, damage, deterioration or loss. *Equipment*
4. Binder heating and storage tanks shall be fitted with dipsticks for volume measurement and suitable thermometers for temperature reading of the bitumen.
5. Suitable equipment shall be supplied by the Contractor to facilitate removal of liquid used to flush pumps and lines to approved disposal sites.
6. Storage tanks for slow curing cutting oil and medium curing cutting oil shall be fitted with dipsticks or flow meters for volume measurement and suitable thermometers for monitoring temperature control.
7. The accuracy of volume and temperature measurement facilities shall be sufficient to ensure that the binder constituents (adhesion agent excepted) and proportions (expressed as percentages) are those ordered  $\pm 0.5\%$ . *Required Accuracy*

### 509.26.02 DISPOSAL SITES

1. The Contractor shall dispose of bituminous products or other disposable items such as protective paper at an authorised waste disposal site.
2. Any area so used without the approval of the Superintendent shall be made good immediately at no cost to the Principal.

## 509.27 AGGREGATE DUMP SITES

### 509.27.01 GENERAL

1. The aggregate stockpile sites shall be constructed and maintained in a tidy condition and the Contractor's operations shall not contaminate aggregate in the stockpiles. Surplus aggregate shall be removed from temporary stockpiles and the aggregate stockpile sites shall be fully cleaned and rehabilitated. The Contractor shall prepare a management plan for the stockpile sites detailing how contamination from precoating work is to be managed and cleaned after completion of work.
2. Where aggregate is supplied in stockpiles by the Principal, the locations of the stockpile sites are as detailed in Annexure 509B. Where aggregate is supplied by the Contractor, temporary stockpile sites shall be prepared and maintained in good condition by the Contractor.
3. **Prior to the stockpiling of aggregate, the Contractor shall nominate to the Superintendent the proposed location of the stockpile sites and provide a management plan for the sites.**

**HOLD POINT**

### 509.27.02 SITE PREPARATION

1. The Contractor shall prepare aggregate stockpile sites such that they incorporate a firm, smooth, level, well-drained surface. Stockpile areas shall be of sufficient size to allow a 4m clear margin around each stockpile.
2. Clearing of sites shall be in accordance with Specification 301 CLEARING, and compaction shall be in accordance with EMBANKMENT FOUNDATION COMPACTION: PRINCIPAL'S METHOD SPECIFICATION as detailed in Specification 302 EARTHWORKS.

**Site Requirements**

**Clearing and Compaction**

## APPLICATION OF SEAL

### 509.28 GENERAL

1. The application of a seal shall include preparation of the surface, and the supply and application of various treatments over the widths, lengths and areas either as shown in the Drawings and/or as specified in Annexure 509A and 509C.

### 509.29 - 32 NOT USED

### 509.33 PLANT AND EQUIPMENT

#### 509.33.01 ROAD TANKER

1. Road tankers shall comply with AS 2809.5 and the Australian Dangerous Goods Code. Road tankers shall have lagging and shall have calibrated thermometers located at the top, middle and bottom thirds of the product tank. The tanker shall be provided with heating tubes and pipework to allow circulation of the binder during heating. Road tankers shall have a permanent sampling cock that is safe and easy to use to obtain samples of the polymer modified binder.

### 509.33.02 MECHANICAL SPRAYER

1. Binder shall be applied using a bitumen sprayer with a minimum capacity of 5 000 litres complying with AS 2809.5 and the Australian Dangerous Goods Code. The sprayer shall comply with the requirements of Austroads document AP-T262-14. In addition to the above requirements, the sprayer dipstick shall be calibrated in 50 litre increments, and unless the sprayer is of the air pressure type, the spray bar shall be fully circulating.
2. The sprayer shall have been calibrated at a facility accredited by NATA for the calibration of bitumen sprayers to the Austroads test methods AG:PT/T 530, T531, T532 or T533 or T534, and T535. The tests shall have been performed within the past twelve (12) months and the sprayer shall have passed the Pump Output and Transverse Distribution tests for the maximum allowable width of the bar. A sprayer shall have been tested to method AG:PT/T 531 for each type of nozzle to be used by the sprayer. The sprayer shall be tested at the nozzle output and width of the bar up to the maximum as shown in Table 509.2. A NATA endorsed calibration certificate shall be issued for the sprayer which clearly indicates the Austroads methods used in the calibration and the pass/fail status of the sprayer to each of the Austroads calibration test methods.

**Sprayer  
Calibration**

**TABLE 509.2 NOZZLE SETUP**

Austroads Nozzle Type	Previous Nozzle Naming	Output of Nozzle (L/min.)	Maximum Width of Spraybar (m)
AN 18	A4	18	NA
AN 27	B6	27	5.0
AN 36	B8	36	4.0

3. Prior to the use of the sprayer on the Works, the Contractor shall make available to the Superintendent the calibration certificate for the sprayer. The Superintendent may require the sprayer to be made available at the Main Roads' Calibration Facility at Welshpool, Perth, for inspection and testing prior to or during execution of the work.

**HOLD POINT**

4. The Superintendent may request prior to the commencement of Works, or at any time during the Works, that the sprayer be tested for uniformity of spray bar output, particularly transverse application, in accordance with WA 340.1. The test will be conducted for the maximum spray bar width to be used under this Contract. The requirements for the spraybar output and distribution are shown below:

- a. The mean binder application rate of the width tested shall not exceed  $\pm 10\%$  of the binder application rate at 15°C specified for the Works;
- b. Every tile used in the test which was fully coated shall have a binder application rate within 15% of the mean binder application rate for the width tested;

- c. Not more than two consecutive tiles that have been fully coated shall have a binder application rate exceeding  $\pm 10\%$  of the mean binder application rate for the width tested.
  
- 5. If the sprayer does not conform to the requirements shown above it shall not be used on the Works. Subsequent tests to confirm conformity will be at the Contractor's cost. Any delays to site operations because of conducting these tests are not claimable as separate costs.
  
- 6. The Contractor shall use Copley EAN18 (W) End Nozzles for use in spraying edges with all binders. Copley intermediate nozzles shall be fitted to the remainder of the spray bar as shown in Table 509.3. Nozzles shall not be used for more than two years of service and shall be used within 4 years of the date stamp on a nozzle.

***Sprayer Conformity******Spray Nozzles*****TABLE 509.3 NOZZLE TYPES**

Binder Class	S10E	S35E	S20E	S45R
Single Coat Seal (including those with a scatter coat)	AN 18 or AN 27	AN 18 or AN 27	AN 27	AN 36
Bridge Deck Waterproof Membrane			AN 27	AN 36 or AN 27
Single Coat Seal with BAR < 1.5 L/m <sup>2</sup> (S45R only)				AN 36 or AN 27
Double Double Seal	AN 18 or AN 27	AN 18 or AN 27		AN 27

- 7. The sprayer shall be capable of passing over protective paper doing a running start without damaging or moving the paper. Where curtains are fitted to the spraybar they shall be fitted with sufficient height off the ground such that build-up of binder does not interfere with the paper.

**509.33.03 ROLLERS**

- 1. The size of multityred rollers to be used is specified in Table 509.9 and where not specified then the requirements of this clause are the minimum requirements. Where an 18T roller is specified then a minimum of two 18T rollers shall be used. Where an 11T roller is specified it shall be used along with a combination roller with a vibrating rubber coated drum OR a vibrating multi tyred roller. The wheels shall have smooth pneumatic tyres inflated to pressures of at least 700kPa.

***Rubber Tyred Rollers*****509.33.04 ROAD BROOM**

- 1. The units shall be a mechanically or power driven roller broom, capable of removing excess cover material and/or other loose material from the pavement surface without damage to the existing primerseal or seal surface.

2. The broom, or its prime mover, shall be equipped with an amber flashing lamp visible from all directions in accordance with Specification 203 OCCUPATIONAL SAFETY AND HEALTH.

**Flashing Lamp**

#### 509.33.05 DRAG BROOM

1. The units shall consist of fixed brushes fitted to a frame and shall be capable of distributing loose cover material laterally and longitudinally to fill empty void spaces. The drag broom shall not dislodge particles embedded in the binder or damage the surface in any way. Brooms shall be angled, height adjustable and suspended under rubber tyred rollers.

#### 509.33.06 PRECOATER

1. The precoater shall be capable of applying a uniform film of precoating agent to cover all of the surface area of the aggregate particles at a controlled and variable rate. The precoater shall have sufficient output capacity to maintain an adequate supply to the spraying operations.
2. The precoater shall also be capable of screening dirt/foreign matter (both oversize and undersize materials) from the aggregate during its operation.
3. **Prior to the use of the precoater on the Works, the Contractor shall notify the Superintendent of such intention.**

**Screening**

**HOLD POINT**

#### 509.33.07 SURFACE DAMAGE

1. In the event of any fuel or oil leaks or spillages onto the newly sealed surface, the Contractor shall reinstate the surface to its pre-damage condition at no cost to the Principal.

**Care of Works**

#### 509.34 - 509.35 NOT USED

#### 509.36 SURFACE PREPARATION

##### 509.36.01 EXISTING BITUMINOUS SURFACE

1. Where the pavement to be sealed is a seal, microsurfacing, asphalt or a primed basecourse the surface shall be swept clean of all loose sand, stones, dust and other foreign matter before the new surfacing is applied. Adherent patches of foreign matter shall be removed by using hand brooming and steel scrapers or similar methods. For a primed basecourse the surface shall be dark in colour uniformity with primer on the entire surface area. Where the colour of the basecourse is showing on more than 25% of the surface area the modified binder shall not be applied.
2. Loose material shall be swept a sufficient distance off the pavement to permit execution of the bituminous surfacing.
3. On a primed basecourse the Contractor shall set out and mark the edge of the binder at a position to achieve the specified tolerances and to suit the method of work employed. The interval of spotting of any line is given in Annexure 509C. The Contractor shall provide such additional markers as are necessary to achieve the specified tolerances.

**Line Spotting**

4. Prior to the application of bituminous binder the Contractor shall certify to the Superintendent that any required sweeping and/or necessary repairs to the existing surface have been carried out, and that the surface is suitable to receive the sprayed seal.
5. Where encountered, the Contractor shall remove and dispose off site existing raised pavement markers, both permanent and temporary, prior to spraying. The pavement markers shall only be removed at the commencement of works for the day, and shall be removed only from the section to be resealed on that day. Any depression left by the removal of a raised pavement marker shall be repaired with coldmix to a level flush with the existing seal.

**HOLD POINT**

**Raised  
Pavement  
Markers**

#### 509.36.02 BRIDGE DECKS OR OTHER CONCRETE SURFACES

1. Bridge deck or concrete surfaces shall be swept clean of all loose sand, stones, dust and other foreign matter before sealing. Adherent patches of foreign matter shall be removed by hand brooming, or by using steel scrapers, or similar methods.
2. The surface shall be primed with a cationic slow setting emulsion (Grade CSS/170-60 or CRS/170-60), diluted with water in the ratio of one (1) part emulsion to one (1) part water. The emulsion shall be compatible with the water used for dilution. The rate of application of the dilute bitumen emulsion primer shall be 0.6L/m<sup>2</sup>. No polymer modified binder shall be applied on the prime until the emulsion has broken and all water has evaporated.
3. All traffic shall be kept off the bridge deck or concrete structure until application of the binder is complete and conforms to the Specification.

**Emulsion  
Grade**

#### 509.36.03 COLD PLANED SURFACE

1. Where the pavement surface to be sealed has been produced by cold planning, the surface shall be swept clean of all loose sand, stones, dust and other foreign matter before surfacing. Adherent patches of foreign matter shall be removed by using hand brooming and steel scrapers or similar methods
2. Loose material shall be swept a sufficient distance off the pavement to permit execution of the bitumen surfacing.
3. At the completion of the cold planning surface being swept and prior to the application of the bituminous binder, the Contractor shall certify to the Superintendent that the cold planed surface complies with the surface finish requirements as described in Specification 508 COLD PLANING and that the surface is suitable to receive the bituminous binder. The Contractor shall request the release of this Hold Point in writing after the sweeping of the cold planed surface is completed and at least one (1) hour prior to the application of the bituminous binder.

**HOLD POINT**

## 509.37 AGGREGATE PREPARATION

### 509.37.01 PRECOATING

1. All aggregate precoated with a bitumen based precoating agent shall be precoated a minimum of four (4) days but not more than twenty eight (28) days prior to its intended use. Aggregate must not be left uncovered for more than 14 days. Where approved, aggregate precoated with a distillate precoat agent shall be precoated at least 24 hours but not more than seven (7) days prior to its intended use. *Timing*
2. The rate of application of precoat agent for clean, surface dry aggregate shall be as stated in Table 509.4. The rate shall be varied to provide a complete, light, uniform, effective cover to all aggregate particles at the time of spreading in accordance with the type and condition of the aggregate. At the time of spreading the precoated aggregate shall not be covered with excess precoat such that it sticks together or picks up on vehicle tyres or causes a delay in adhesion to the polymer modified binder. *Rate of Application*
3. Care shall be taken to minimise aggregate losses and to ensure dust does not blow back onto precoated aggregate.

**TABLE 509.4 APPLICATION RATE FOR PRECOATING**

Nominal Size Aggregate (mm)	Application Rate (litres/m <sup>3</sup> loose) Bitumen based agent	Application Rate (litres/m <sup>3</sup> loose) Distillate only
7	12	6
10	10	5
14	8	5
16	6	4
20	5	4

### 509.37.02 HEATED AGGREGATE

1. The aggregate shall be clean 7 or 10mm sealing aggregate that has not been precoated. Where used in a seal other than a SAMI seal or bridge deck membrane the aggregate shall be from the same quarry as any aggregate applied in an adjacent seal with precoated aggregate. Heated aggregate shall not be used for a geotextile reinforced seal. *Aggregate*
2. The aggregate shall be heated, dried and coated with Class 170 or 320 bitumen in a batch type asphalt plant. The aggregate shall be heated to a dry condition and then mixed with 0.3-0.4% by mass of bitumen for an extended wet mixing time to ensure an even coating of the bitumen over all stones. The temperature of the coated aggregate shall be 170°C to 180°C at discharge from the plant. *Heating and Mixing*

3. The heated aggregate shall be transported to site covered with a heavy tarpaulin or covered tray.
4. Heated aggregate shall be applied to a sprayed binder immediately and rolled immediately.

### **509.38 NOT USED**

### **509.39 PROVISION FOR TRAFFIC**

1. The Contractor shall minimise delays and inconvenience to road users during the course of the work. Traffic shall not be allowed on the new work until sufficient rolling has taken place to prevent damage to the freshly applied bituminous mat.
2. The Contractor shall supply signs, lights, plus any other necessary equipment, and erect and maintain same in good condition in accordance with Specification 202 TRAFFIC.
3. Signs inscribed "ROADWORKS IN PROGRESS FOR NEXT ... KM" shall be erected at each end of unswept work where the length of the work, intermittent or continuous, exceeds 1 kilometre.
4. Signs shall remain in position until after the seal has been swept with no loose stones remaining on the surface. No item of plant will be permitted to operate outside the appropriate warning signs. All signs shall be free standing and weighted to hold the signs down.

***Signing***

5. The Contractor shall provide at least two persons on a full time basis as traffic controllers. Warning signs shall always be erected in conjunction with the use of traffic controllers. Each traffic controller shall be equipped with a portable two-way radio, plus a spare and wear a high visibility vest.

***Traffic  
Controllers***

6. **Prior to implementing traffic control measures for the Works, particularly temporary speed restrictions, the Contractor shall notify the Superintendent of such proposed measures.**

***HOLD POINT***

### **509.40 NOT USED**

### **509.41 PREPARATION OF POLYMER MODIFIED BINDER**

#### **509.41.01 GENERAL**

1. Polymer modified binder and other constituents shall be mixed by circulation in the mechanical sprayer for not less than fifteen minutes immediately prior to application or such longer periods as may be necessary to ensure a uniform and homogeneous mixture.
2. Adhesion agent as specified in clause 509.8 shall be dissolved in the hot binder and thoroughly mixed prior to the binder being sprayed on the road. The binder shall be sprayed within twelve (12) hours of adding the adhesion agent to the binder. Where the binder has not been sprayed within twelve (12) hours, further adhesion agent shall be added to the remaining binder. Adhesion agent shall be added at a rate of 0.5% by volume of the binder.

***Mixing***

***Adhesion  
Agent***

3. Adhesion agent shall be added at least to the minimum level specified or ordered. All other binder constituent proportions (expressed as percentages) shall be those specified or ordered  $\pm 0.5\%$ .
4. The binder spraying temperature shall be as specified in Table 509.5 unless otherwise specified by the binder manufacturer. The manufacturer's instructions shall take precedence over Table 509.5. Where cutting oil is added refer to the manufacturer's instructions for spraying temperature.

***Mix Tolerance******Spraying Temperature*****TABLE 509.5 SPRAYING TEMPERATURE**

Binder Type	Temperature °C
S10E S35E S20E	180 to 190
S45R	190 to 200

**509.41.02 SPRAYING VISCOSITY – SAMI AND BRIDGE DECKS**

1. Medium curing cutting oil shall not be added to S20E or S45R binders where they are being used in a SAMI seal or waterproof bridge deck membrane. The sprayer shall apply these seal types in accordance with Clause 509.42.04(2).

***Mix Tolerance*****509.41.03 SPRAYING VISCOSITY – SAM AND HIGH STRESS SEALS**

1. To achieve the initial wetting of aggregate modification of the binder viscosity is required. Depending upon the anticipated pavement temperature medium curing cutting oil shall be added to the binder.
- For a single/single seal add medium curing cutting oil in accordance with Table 509.6 and accompanying notes;
  - For a double/double seal where both coats are applied on the same day using S10E and S35E binders do not add cutter to the binder used in the first coat. For the second coat add medium curing cutting oil in accordance with Table 509.6 and accompanying notes;
  - For a double double seal where both coats are applied on the same day using S45R binder add only 2% medium curing cutting oil to the binder used for the first coat. For the second coat add medium curing cutting oil in accordance with Table 509.6 and accompanying notes.

***Mix Tolerance***

**TABLE 509.6 PERCENTAGE OF CUTTING OIL TO BE ADDED**

Pavement Temperature (°C)	Traffic (vehicle/lane/day based on AADT)	Class of Polymer Modified Binder	
		S10E and S35E	S45R (Note e)
20 to 25	Less than 1000	6	9
	1000 or more	4	7 to 8
26 to 32	Less than 1000	4	6 to 8
	1000 or more	2	6
33 to 38	Less than 1000	2	6
	1000 or more	2	4 to 6
39 to 45	Less than 1000	0 to 2	Min 4
	1000 or more	0 to 2	
Above 45	All	0	Min 4

**NOTES to Table 509.6**

- a. Cutter amount is percentage by volume of total binder.
- b. Assessment of pavement temperature shall take into account the presence of shaded areas. Areas with a significant portion of shading shall be treated separately to adjacent areas that are not shaded. Ambient weather conditions in the days and week following must be considered in deciding on adding cutting oil.
- c. Where manufacturer's instructions vary from Table 509.6, the manufacturer's instructions shall be followed.
- d. Where the proportion of heavy vehicles is greater than 20% of the total traffic reduce the cutter content by 2%.
- e. Where AN36 nozzles are being used for a single coat seal with a BAR of  $\geq 1.5 \text{ L/m}^2$  no cutter is required above a pavement temperature of 45 °C and the cutter content below 45 °C is reduced by 2 °C.

## 509.42 APPLICATION OF BINDER

### 509.42.01 GENERAL

1. The surface to be sealed shall be dry and no binder shall be applied during wet or rainy conditions, or when adverse weather conditions may prevail at any time during such work. When binder is applied and rain is forecast during the 24 hour period after application of the seal the Contractor shall be responsible for any damage to or defects in the seal and action and cost to maintain or repair the seal. No binder shall be applied whilst the pavement surface temperature is less than 20°C.
2. The Contractor shall provide the Superintendent with safe and convenient access to the sprayer at all times for checking the volume before and after spraying by means of the dipstick.

*Weather  
Minimum  
Pavement  
Temperature*

### 509.42.02 APPLICATION RATE

1. The binder application rate (BAR) for tender purposes shall be as detailed in Annexure 509C. Where adjustments to the binder application rates in excess of 7.5 percent of the rates detailed in Annexure 509C are directed by the Superintendent, then changes to the Contractor's rates for sealing shall be made as follows:

$$\text{URN} = \text{URC} + (\text{ARO} - \text{ARC})L$$

Where :

URN = New Rate for polymer modified binder treatment (\$ per m<sup>2</sup>)

URC = Contracted rate for polymer modified binder treatment as applicable (\$ per m<sup>2</sup>)

ARO = Ordered binder application rate (Litres per m<sup>2</sup>)

ARC = Contracted binder application rate in Annexure (Litres per m<sup>2</sup>)

L = Rate per litre for variation in the Schedule of Rates (\$ per litre)

Adjustments made under this clause shall be made prior to any adjustments that are due to conditional acceptance.

2. The actual BAR at 15°C shall be calculated from the quantity of binder sprayed and the actual area covered as measured on the ground.
3. On sections where the actual binder application rate differs from the ordered application rate and the work is deemed to be non-conforming, refer to Clause 509.53 ("Non Conformance in Binder Application").

### 509.42.03 VOLUME CONVERSION

1. Table 509.7 gives factors to be used when converting binder volumes or spray rates at temperatures other than 15°C to volumes or spray rates at 15°C or vice versa. Adjustment shall be made using the following formulae:

- a. Volume or spray rate at 15°C equals the Volume or spray rate at T °C multiplied by the Factor for T °C
- b. Volume or spray rate at T °C equals the Volume or spray rate at 15°C divided by the Factor for T °C

**TABLE 509.7 CONVERSION FACTORS**

Observed Temp T °C	Factor For T °C	Observed Temp T °C	Factor for T °C	Observed Temp T °C	Factor For T °C
15	1.000	80	0.9597	145	0.9207
20	0.9969	85	0.9567	150	0.9177
25	0.9937	90	0.9536	155	0.9148
30	0.9906	95	0.9506	160	0.9118
35	0.9875	100	0.9476	165	0.9089
40	0.9844	105	0.9446	170	0.9060
45	0.9813	110	0.9416	175	0.9031
50	0.9782	115	0.9385	180	0.9002
55	0.9751	120	0.9356	185	0.8973
60	0.9720	125	0.9326	190	0.8944
65	0.9689	130	0.9296	195	0.8915
70	0.9658	135	0.9266	200	0.8886
75	0.9628	140	0.9236		

Note: Factors for intermediate temperatures in Table 509.7 may be obtained by direct interpolation.

#### 509.42.04 SPRAYING

1. S45R binder shall be sprayed at a width no more than 4.0m regardless of nozzle type being used. Other binder types being sprayed with AN 27 nozzles shall be sprayed at a width no more than 5.0m. For binders sprayed with AN 18 nozzles the maximum width is as specified in the calibration certificate for the sprayer.
2. **Binder shall not be applied until the Contractor has sufficient spreader trucks to comply with 509.43.01(1c) at the location of the area to be sprayed. In addition all rollers shall be at the location of the area to be sprayed at the time of spraying.** **HOLD POINT**
3. The binder shall be bar circulated for a minimum of three (3) minutes immediately prior to spraying.

- |  |                            |
|--|----------------------------|
| 4. The spraying of the binder for each run of the sprayer shall start and finish on protective paper. All tapers and fillets shall be sprayed after masking with protective paper. The paper so used and any spilt binder shall be removed and disposed of in a suitable manner. | <b>Protective Paper</b>    |
| 5. The sprayer shall cross the protective paper at its correct spraying speed at the start of each run. The sprayer shall maintain its correct spraying speed over the full length of each run and shall cross the finish paper at this speed.                                   | <b>Sprayer Speed</b>       |
| 6. All outside edges of the seal, parallel to the road centreline shall be sprayed using Copley EAN18 (W) end nozzles.   | <b>End Spray Nozzles</b>   |
| 7. Where the direct use of the mechanical sprayer is impracticable, the binder may be applied by using a hand lance fed from the mechanical sprayer. Caution should be taken with this operation due to the higher viscosity of the polymer modified binder.                     |                            |
| 8. The binder shall be sprayed onto areas as detailed in the Drawings, or as otherwise specified between two lines as defined by the line markers and the surfacing widths given in Annexure 509A. The sprayed binder edge shall conform to the following requirements:          | <b>Spraying Tolerances</b> |
| a. the sprayed edge shall not deviate from the specified edge by more than 50mm;   |                            |
| b. the rate of deviation of the sprayed edge from the specified edge lines shall not exceed one in four hundred (1: 400);  |                            |
| c. tapers to accommodate variations in specified width shall be at one in one (1:1), except at floodway exits, where the tapers shall be at one in twenty (1:20).  |                            |
| 9. The Contractor shall take all necessary precautions to prevent binder from adhering to any existing structure. Any damage or defacement shall be made good by the Contractor at no cost to the Principal immediately surfacing work on a section has been completed.          | <b>Damage</b>              |

#### 509.42.05 EXISTING GUIDEPOSTS

- |  |                                |
|--|--------------------------------|
| 1. Where necessary, existing guideposts shall be removed and stored safely by the Contractor to allow bituminous surfacing operations to proceed.  | <b>Guidepost Removal</b>       |
| 2. The Contractor shall reinstate removed guideposts to their original locations at the completion of bituminous surfacing operations. Any guideposts damaged during their removal or reinstatement shall be replaced by the Contractor at no cost to the Principal. | <b>Guidepost Reinstatement</b> |

### 509.43 APPLICATION OF COVER MATERIAL

#### 509.43.01 APPLICATION

1. General

- a. The aggregate shall be dry (containing no water) at the time of application and shall be uniformly spread over the sprayed area by use of a suitable mechanical spreader. The mechanical spreader shall be fitted with removable cut-off attachments to allow the aggregate spread width to match the required width on the pavement.
- b. The aggregate shall be placed to form a uniform stone mosaic of single particle thickness, in almost continuous interlocked contact, generally orientated with their least dimension vertical. Specified aggregate application rates given in Table 509C2 are nominal and should be adjusted to suite the aggregate used to give the correct stone mosaic. Where the aggregate is supplied by the Principal, approval shall be obtained from the Superintendent for any change in the ordered rate.
- c. The sprayed binder shall be totally covered with the exception of approved lapping strips with aggregate within 5 minutes of the application of the binder. The length of spray runs shall be limited to comply with this requirement.

**Timing of Application**

## 2. Additional Aggregate

- a. Additional aggregate shall be applied to any bare or insufficiently covered areas as necessary to provide a uniform and complete cover. Where the area to be covered with additional aggregate is not of uniform width the additional aggregate shall be spread by hand.
- b. Additional aggregate shall be applied before the completion of four passes of rubber tyred rolling.
- c. If there are surplus loose particles on any portion of the sealed area, such portion shall be swept lightly to remove the loose particles but not disturb the aggregate embedded in the binder.

**Timing**

## 3. Double/Double Seals

- a. the first coat of a double/double seal shall be applied using a larger sized aggregate than the aggregate used in the second coat;
- b. the application rate of aggregate for the first coat shall result in more gaps between the aggregate particles than would occur if the same sized aggregate was applied in a single coat seal.

## 4. Principal Supplied Aggregate

- a. Where the actual aggregate spread rate is less than 0.925 times the ordered or approved aggregate spread rate, the cost of any additional aggregate used supplied by the Principal (calculated as below) shall be deducted from payments due to the Contractor.

**Spread Rate**

$$\text{Cost of additional aggregate} = A \times R \left( \frac{1}{S_a} - \frac{1}{0.925 S_o} \right)$$

**Aggregate Cost**

where:  $A$  = actual area ( $m^2$ ) covered at rate  $S_a$

$R$  = rate (in  $$/m^3$ ) stated in Annexure 509B

$S_o$  = ordered aggregate spread rate in  $m^2/m^3$

$S_a$  = actual aggregate spread rate in  $m^2/m^3$

- b. The cost of aggregate spread outside the specified area (with due allowance for tolerances) shall be deducted from money due to the Contractor at the rate stated in Annexure 509B.

#### 509.43.02 ROLLING AND DRAG BROOMING

1. Immediately after application of the cover material, the surface shall be rolled to the number of complete coverages as stated in Table 509.9 over the whole area. Where the roller size is not specified then 11 tonne rollers shall be used. A complete coverage is one pass of a roller over the entire area, ie. the total length and width of a spray run being rolled. For the first four complete coverages, rollers shall be operated at speeds less than 7km per hour. Drag brooming shall be carried out after every second pass of rolling.

***Rolling Sequence***

**TABLE 509.9 ROLLER SIZE AND COVERAGES**

Minimum Mass of Multityred Rollers	Minimum Number of Complete Coverages
18 tonne	10
11 tonne	10

2. The Superintendent may order additional rolling and drag brooming and such additional work shall be paid at Daywork rates.
3. For double double seals, the rolling shall comply with the requirements of this clause for each coat of the seal. Any aggregate not incorporated in the first coat of the seal shall be removed in such a manner as to prevent removal of aggregate embedded in the first coat. Any damage to the first coat shall be repaired by the Contractor at no cost to the Principal prior to spraying the binder for the second coat.

***Double Double Seals***

#### 509.43.03 SURFACE SWEEPING

1. Any loose cover material not incorporated in the seal after the completion of rolling shall be swept off the sealed surface to beyond the outer edge of each shoulder without damage to the seal, shoulder or guideposts, and shall then be dispersed such that no windrows of swept material remain.
2. Where the roadway to be sealed is kerbed, the excess cover material may be swept hard against the kerb during interim sweeping operations but shall be picked up and removed during the final sweeping.

***Excess Cover Material***

3. The initial sweeping shall be carried out prior to the completion of the day's work. A second sweeping shall be carried out at the commencement of the following day's work. The Contractor shall carry out subsequent sweepings as necessary for the following seven (7) days to ensure that no loose stones remain on the road surface. All loose aggregate shall be swept clear of the sealed surface, off the shoulder and past the line of the guide posts. **Repeated Sweeping**
4. The Contractor shall install "LOOSE STONE" signs and other temporary traffic management signs in accordance with Specification 202 TRAFFIC. The signs shall remain in place on each section of the Works for the following seven (7) days after completion of sealing. **Signing**

#### **509.44 - 509.51        NOT USED**

#### **509.52        NONCONFORMING TEST RESULTS**

1. If defects occur in the surfacing in any way, either in part or in full, attributable to binder for which test results are non-conforming, then within 60 days of completion of the works on which that binder was used, the Superintendent may direct the Contractor to take remedial action to repair or replace any defective sections of work. Any remedial action so directed will be at no cost to the Principal.
2. The Superintendent may consider not making payment to the Contractor for the Schedule of Rates item for binder supply and delivery related to that delivery for 60 days after the work has been completed, plus any subsequent time thereafter if remedial work is outstanding.
3. The Superintendent may initiate testing of other samples retained but not previously tested.

#### **509.53        NON-CONFORMANCE IN BINDER APPLICATION**

1. The actual binder application rate at 15°C on a spray run shall be deemed to be conforming to the ordered binder application rate if it falls within the tolerances given in Table 509.10 for Polymer Modified Bituminous Surfacings.
2. Where the actual binder application rate at 15°C on a spray run differs from the ordered rate, the Quality Level shall be deemed to be either a non-conformance or one of a range of conditional conformance levels, depending on the difference between the actual binder application rate and the ordered binder application rate. The tolerances applicable to conditional conformance are given in Table 509.10, and a Pay Factor shall be applied for work at the corresponding conformance levels. The Pay Factor applied will reflect the lower level of serviceability of conditionally conforming sprayed bituminous work. **Application**
3. Where sprayed work is deemed non-conforming, the Contractor shall apply corrective action subject to the procedures contained in the Quality System Specification.
4. No payment shall be made for binder sprayed outside the 50mm margin specified in Clause 509.42.04.

**TABLE 509.10 PAY FACTORS FOR POLYMER MODIFIED BITUMINOUS SURFACINGS**

<b>Actual Binder Application Rate (BAR) L/m<sup>2</sup> @ 15° (Converted)</b>	<b>Quality Level</b>	<b>Pay Factor (PF)</b>
(OAR - 0.16) or less	Non-Conformance	N/A
(OAR - 0.15) to (OAR - 0.11)	Conditional Conformance Level 2	0.90
(OAR - 0.10) to (OAR + 0.10)	Conformance	1.00
(OAR + 0.11) to (OAR + 0.15)	Conditional Conformance Level 1	0.90
(OAR + 0.16) to (OAR + 0.20)	Conditional Conformance Level 3	0.70
(OAR +0.21) or more	Non-Conformance	N/A

(OAR = Ordered Binder Application Rate at 15°C)

**509.54 CRUSHED AGGREGATE**

1. Conformance of the aggregate at its source shall be construed only as authorising the Contractor to deliver the material. Contamination of the aggregate during cartage, or failure to cart and stockpile the aggregate as specified shall render the material non-conforming. The Contractor shall not be paid for non-conforming material or its cartage.

**509.55 TESTING FREQUENCY**

1. The minimum testing frequency to determine the conformance of product and work processes with specified characteristics shall be in accordance with Specification 201 QUALITY SYSTEMS.

**509.56 – 509.80 NOT USED**

**AS BUILT AND HANDOVER REQUIREMENTS**

**509.81 – 509.90 NOT USED**

**CONTRACT SPECIFIC REQUIREMENTS**

**509.91 WORKS RECORDS**

1. The Contractor shall accurately record the information required on Record Forms similar to those shown in Annexure 509C, in respect of each application of binder. The forms shall be supplied by the Contractor and one copy of the completed form for each item of work shall be submitted to the Superintendent at the completion of each day's surfacing work.

**509.92 – 509.99 NOT USED**

## ANNEXURE 509A

### SCHEDULE OF WORKS

Works Item (Section Nos)	From <sup>1</sup> (SLK)	To <sup>1</sup> (SLK)	Length (km)	Width (m)	Side <sup>2</sup> (L,C,R)	Area (m <sup>2</sup> )	Type of Treatment	Comments
<b>Road Name 1</b>								
1								
2								
Etc. etc.								
<b>Road Name 2</b>								
1								
2								
Etc. etc.								
<b>Road Name 3</b>								
1								
2								
Etc. etc.								

Note 1: SLK denotes Straight Line Kilometre distance values for "From" and "To". Alternatively, section limits may be described using chainages.

Note 2: "L, C, R" denotes "Left", "Centre", or "Right". Leave "Side" column blank if width value in previous column is entire seal width.

## **ANNEXURE 509B**

### **COVER MATERIALS - PRINCIPAL SUPPLY**

#### **1. AGGREGATE DUMPSITE LOCATIONS**

1.1 Details of aggregate supplied by the Principal are shown in Table 509B1.

**TABLE 509B1 DUMPSITE DETAILS**

Location (SLK)	Offset (M)	Quantity Available (M <sup>3</sup> )	Size (Mm)	Type

#### **2. RATE OF DEDUCTION**

2.1 The rates for deduction for over-spreading the Principal's aggregate are as shown in Table 509B2.

**TABLE 509B2 RATES FOR DEDUCTION**

Nominal Size of Aggregate (mm)	Rate for Deduction (\$/m <sup>3</sup> )
10	
14	
16	
20	

**ANNEXURE 509C****509C.1 RESPONSIBILITY FOR SEAL DESIGN****TABLE 509C1 DESIGN RESPONSIBILITY**

<b>Seal Type</b>	<b>Location</b>	<b>Design Responsibility</b>
Strain Alleviating Membrane	All Works	Principal
Strain Alleviating Membrane Interlayer	All Works	Principal
High Stress Seal	All Works	Principal

**509C.2 BINDER AND AGGREGATE APPLICATION RATES**

The aggregate size, spread rate, class of binder and binder application rates for Tender purposes shall be as detailed in Table 509C2. Final binder application rate and aggregate spread rate to be designed in accordance with 509.20.

**TABLE 509C2 BINDER, AGGREGATE AND APPLICATION RATES**

<b>Treatment Type</b>	<b>Aggregate Size (mm)</b>	<b>Aggregate Spread Rate m<sup>2</sup>/m<sup>3</sup></b>	<b>Binder Class</b>	<b>Binder Application Rate (BAR) at 15°C (L/m<sup>2</sup>)</b>
Single coat seal				
Single Coat Seal				
with Scatter Coat				
<b>Double Double Seal</b>				
First coat				
Second coat				

### **509C.3 LINE SPOTTING**

1. Seal and reseal sections are spotted at the following intervals:

**TABLE 509C3 LINE SPOTTING INTERVAL**

Road Feature	Spotting Interval (m)
Straight Sections	8
Curved Sections	5

### **509C.4 RECORD FORMS**

- a) BITUMINOUS SURFACING - CONTRACTORS SPRAYING LOADING RECORD
- b) BITUMINOUS SURFACING - CONTRACTORS DAILY RECORD

## **509C.1 Bituminous Surfacing - Contractors Daily Surfacing Record**

DATE: _____	BASE MATERIAL TYPE: _____	PAVEMENT SURFACE TYPE: _____	COVER AGGREGATE CONDITION: _____	BITUMEN **TYPE: <input checked="" type="checkbox"/> 50 <input type="checkbox"/> 170 <input type="checkbox"/> Emulsion SOURCE: _____	TOTAL QTY OF BITUMEN USED LITRES AT 15.0°C
CONTRACT NO: _____			SIZE: _____ DUMP: _____		
TIE IN POINTS: _____				**CONDITION: <input type="checkbox"/> Dusty <input type="checkbox"/> Pre-coated <input type="checkbox"/> Damp ADHESION AGENT: _____	
FROM _____	TO _____				

\* Description Of    Component No. 1 \_\_\_\_\_    Remarks: \_\_\_\_\_  
                            Component No. 2 \_\_\_\_\_  
                            Component No. 3 \_\_\_\_\_

**CONTRACTORS REPRESENTATIVE:**

**\*\* = Tick Appropriate Box**

**SUPERINTENDENT:**

**SIGNATURE**

## **509C.2 Bituminous Surfacing - Contractors Sprayer Loading Record**

DATE: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

#### **GRADE OF BITUMEN :**

ROAD :

**SPRAY LOAD No :**

**TYPE OF BLEND :**

## **SPRAY RUN NUMBERS :**

CONTRACT No :

## A. LOADING INTO EMPTY SPRAYER

## ACTUAL COMPONENTS ADDED

<b>A</b>	<b>B</b>
Component 1    ____ L @ ____ °C	Component 1    ____ L @ ____ °C
Component 2    ____ L @ ____ °C	Component 1    ____ L @ ____ °C
Component 3    ____ L @ ____ °C	Component 1    ____ L @ ____ °C
Adhesion Agent    ____ L	Adhesion Agent    ____ L
Actual Blend    ____ / ____ / ____	Actual Blend    ____ / ____ / ____

## **SIGNATURES :**

Contractor's Rep

## Superintendent

### **B. LOADING INTO SPRAYER CONTAINING PRIMER**

\_\_\_\_\_ L \_\_\_\_\_ °C \_\_\_\_\_ L @ 15°C

6 Actual Primer Composition \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

7 Components Remaining in Sprayer

Component 1	_____ L	Component 3	_____ L
Component 3	_____ L		

8 Components To Be Added (15°C)

Component 1	_____ L	<b>OR</b> _____ L @ _____ °C
Component 2	_____ L	<b>OR</b> _____ L @ _____ °C
Component 3	_____ L	<b>OR</b> _____ L @ _____ °C
Adhesion Agents	_____ L	

Description of Components	<p>1 _____</p> <p>2 _____</p> <p>3 _____</p>
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## GUIDANCE NOTES

### FOR REFERENCE ONLY – DELETE GUIDANCE NOTES FROM FINAL DOCUMENT

1. All edits to downloaded Specifications shall be made using *Track Changes*, to clearly show added/deleted text.
  2. If **all** information relating to a clause is deleted, the clause number should be retained and the words "**NOT USED**" should be inserted.
  3. The proposed documents with tracked changes shall be submitted to the Project Manager for review, prior to printing the final batch of documents. When this final printing is carried out, the tracked changes option is to be turned off.
  4. Before printing accept all changes in the document, turn off *Track Changes* and refresh the Table of Contents.
  5. The Custodian of this specification is Bituminous Products Consultant.
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### 1. GENERAL EDITING

When one or more of the types specified in clause 509.01.1 is not required for a Contract, all the relevant parts of this specification must be deleted.

Treatment NOT required.	Sections to be deleted or marked as "NOT USED"
Strain Alleviating Membrane (SAM)	509.41.03 and amend 509.01
Strain Alleviating Membrane Interlayer (SAMI)	509.41.02 and amend 509.01
High Stress Seal	509.41.03 and amend 509.01
Waterproof Bridge Deck Membrane	509.07 509.36.02 509.41.02 Amend 509.01

### 2. BITUMINOUS SURFACING INTENT

Clause 509.01.2 has been inserted to define the intended outcomes of applying a bituminous surfacing treatment. This specification includes a number of different types of treatment, as indicated within Clause 509.01.1. The critical intention will vary slightly from treatment to treatment. The requirement for a bituminous treatment to be "durable" is constant irrespective of the type.

The three bullet points in this clause are the essential outcomes of the application of a bituminous surfacing treatment. If these outcomes are not met, then the treatment is not achieving the desired intention and further scrutiny should be applied to determine the cause for this failure. This might include such factors as design, preparation, application, and/or operational practices.

### **3. AGGREGATE**

#### **3.1 PRINCIPAL SUPPLIED AGGREGATE (Clause 509.91)**

- 3.1.1 If screening of Principal-supplied aggregate is required, include Clause 509.91 in CONTRACT SPECIFIC REQUIREMENTS.
- 3.1.2 Insert any other requirements concerning Principal-supplied aggregate as necessary in CONTRACT SPECIFIC REQUIREMENTS, e.g. care of dumpsites (Clause 509.92).
- 3.1.3 Provide aggregate spread rates. Based on test results where known calculated using the formula:

$$\text{Spread rate (m}^2/\text{m}^3\text{)} = 900/\text{Average Least Dimension (ALD)}$$

adjusted to increase the amount of aggregate per m<sup>2</sup> for SAM and SAMI treatments by 10%, i.e. Spread rate = 900/1.1ALD.

The provided rate should be adjusted in the field to give the correct stone mosaic.  
Typical values are:

7mm	200 to 250 m <sup>2</sup> /m <sup>3</sup>
10mm	140 to 170 m <sup>2</sup> /m <sup>3</sup>
14mm	90 to 120 m <sup>2</sup> /m <sup>3</sup>
16mm	65 to 90 m <sup>2</sup> /m <sup>3</sup>
20mm	50 to 70 m <sup>2</sup> /m <sup>3</sup>

- 3.1.4 Provide rate of deduction to allow for the cost of wastage in \$/m<sup>3</sup> for over-spreading aggregate. A typical value might be of the order of \$50/m<sup>3</sup>, and would represent the production cost of the aggregate.

#### **3.2 CONTRACTOR SUPPLIED AGGREGATE**

In Schedule L of the Conditions of Tender, include an item to cover the Contractor's response to clause 509.16(3) resource of aggregate.

#### **3.3 AGGREGATE SIZE**

3.3.1 For bridge deck waterproofing membranes use 5mm aggregate with a S45R binder or 7mm aggregate with a S25E binder.

3.3.2 For a Stress Alleviating Membrane (SAM) seal the nominal aggregate size will typically vary between 10mm to 14mm.

3.3.3 For a Stress Alleviating Membrane Interlayer (SAMI) seal the nominal size of aggregate shall be 10mm.

3.3.4 For an enhanced aggregate retention seal the nominal size is that which would have been used for a seal using Class 170 bitumen.

3.3.5 For a double double seal the stone size in the second coat is of the order of about half the size of the stone in the first coat where the larger sized stone is applied first. Typical applications are 14/7mm which can be 14/10mm if 7mm aggregate supply is difficult, however the control of spreading the 14mm stone has to be managed. A 14/10mm double double seal is not recommended unless experienced Main Roads supervision is on site.

Larger combinations of 16/7mm, 16/10mm or 20/10mm would be used as an extreme treatment to regain surface texture. The 16mm sized aggregate is difficult to procure and a Contractor needs a good lead time to procure the stone. An option is for a region to get its Materials Manager to liaise with quarries on availability. The use of 20mm sized aggregate should not happen without discussion with the Materials Engineering Branch first as this is a very large sized stone that will result in a hungry surface texture which will be uncomfortable for some road users. Neither 16mm, or 20mm aggregate is to be used for single coat seals as the stones will become large missiles if dislodged by high speed traffic.

#### **4. RESPONSIBILITY FOR SEAL DESIGN**

Amend Table 509C1 to show whether the Principal or Contractor is responsible for the design of sprayed seals.

#### **5. ROLLING**

##### **5.1 STEEL WHEELED ROLLERS**

There is no reference to the use of steel wheel rollers in the standard specification. The use of steel rollers on seal/reseal works is not recommended particularly on softer aggregates such as granite due to the possibility of over-rolling and crushing the aggregate.

##### **5.2 ROLLER SIZE**

Table 509.9 requires that the size of rollers be specified by deleting one of two rows showing roller size. For sprayed seals that will remain as so for their service life it is important to achieve the best embedment and alignment of the sealing aggregate at the time of application. For seals or reseals with a service life to be beyond 1-2 years heavier rollers with a minimum mass of 18 tonnes must be used. For seals that may not be trafficked, such as SAMI seals under asphalt or bridge deck waterproofing membranes to be covered with asphalt smaller sized rollers of at least 11 tonne mass are acceptable. The use of the 11 tonne rollers can be acceptable also for initial seals (primerseals etc.) with a trafficked lifetime of no more than 1-2 years.

#### **6. NOTES RE ANNEXURES**

##### **6.1 ANNEXURE 509A SCHEDULE OF WORKS**

Use only if required (e.g. Minor Works sealing/resealing contract), and insert details on a road-by-road basis including the type of treatment as shown in Table 509C1 or 509C2. This schedule is not normally required in Major Works, but could be adapted to suit if necessary. When Annexure 509A is NOT used, the text of Clause 509.01.3 and the title of Annexure 509A should be replaced with "NOT USED", while the table in Annexure 509A should also be deleted.

## 6.2 ANNEXURE 509B COVER MATERIALS - PRINCIPAL SUPPLY

Insert relevant details of Principal-supplied aggregate. Insert CONTRACT SPECIFIC REQUIREMENTS into text of Specification as noted in Item 3 of the Specification Guidance Notes.

## 6.3 ANNEXURE 509C APPLICATION DETAILS

Insert relevant details into Table 509C.2.

# 7. MINOR WORKS CONTRACTS

## 7.1 WORKING HOURS (CLAUSE 509.93)

Where sealing works are organised as a separate Minor Works contract, a Clause for Working Hours should be added in CONTRACT SPECIFIC REQUIREMENTS if not already covered elsewhere (e.g. in the Conditions of Contract). The hours stated here are typical – vary to suit the conditions, particularly in heavily trafficked areas.

## 7.2 CLEARING (CLAUSE 509.94)

Add this Clause if required.

## CONTRACT SPECIFIC REQUIREMENTS

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

### 509.91 SCREENING REQUIREMENTS

1. Aggregate supplied by the Principal for use in the Works shall be screened prior to being used as cover aggregate.
2. All rejected material and by-products of the screening operations shall remain the property of the Principal and shall be stockpiled within each dumpsite as directed by the Superintendent.
3. All screened aggregate shall meet the Particle Size Distribution specified in Clause 509.16 when tested in accordance with WA 210.1.

### 509.92 COVER MATERIAL DUMP SITES

1. The Contractor shall be required to remove star picket fencing from the perimeter of dumpsites of Principal supplied aggregate in order to gain access. Fences shall be carefully dismantled and fencing materials stacked at the dumpsites without damage. The fences will be re-erected by the Principal at the completion of the Works. The Contractor shall be liable for any damage to fencing or dumpsite signs caused by the Contractor's operations.
2. Cover material dumpsites shall be left in a tidy condition. Residual stockpiled aggregate shall be re-heaped into a single uniformly shaped stockpile for each sized aggregate.

### 509.93 WORKING HOURS AND DAYS

1. The Contractor may work up to 120 hours per fortnight with a maximum of 10 hours on any day between the hours of 6 am and 6 pm. In addition, the Contractor shall complete each day's spraying by 5.00 pm at the latest, unless otherwise authorised by the Superintendent. The Contractor shall notify the Superintendent of the delivery times and dates for each dump site for the aggregate, and work start times and working days for the sealing work prior to commencement of work on site. The Superintendent may approve variation to the start and finish times and/or working days.
2. The Contractor may work outside the nominated working hours for the following activities:
  - a. Repairs to plant.
  - b. Travelling to and from worksite by personnel.
  - c. Travelling of plant and personnel from one worksite to another.
  - d. Receipt and reheating of bitumen at worksite.

- e. Screening of Principal's aggregate (if specified).

#### **509.94 CLEARING**

1. **Prior to the clearing of any area for any purpose, the Contractor shall *HOLD POINT* notify the Superintendent.**

## AMENDMENT CHECKLIST

Specification No. **509** Title: **Polymer Modified Bituminous Surfacing** Revision No: \_\_\_\_\_

Project Manager: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Checked by: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Contract No: \_\_\_\_\_ Contract Description: \_\_\_\_\_

ITEM	DESCRIPTION	SIGN OFF
<i>Note: All changes/amendments must be shown in Tracked Changes mode until approved.</i>		
2.	Project Manager has reviewed Specification and identified Additions and Amendments.	
	<b>CONTRACT SPECIFIC REQUIREMENTS</b> addressed? Contract specific materials, products, clauses added? (Refer Specification Guidance Notes for guidance).	
	Any unlisted materials/products proposed and approved by the Project Manager? If "Yes" provide details at 16.	
	Standard clauses amended? <b>MUST SEEK</b> approval from Manager Commercial.	
	Clause deletes shows as " <b>NOT USED</b> ".	
	Appropriate <b>INSPECTION AND TESTING</b> parameters included in Spec 201 (Text Methods, Minimum Testing Frequencies verified).	
	<b>ANNEXURES</b> completed (refer Specification Guidance Notes).	
	<b>HANOVER</b> and <b>AS BUILT</b> requirements addressed.	
	Main Roads QS has approved changes to <b>SMM</b> .	
	Project Manager certifies completed Specification reflects intent of the design.	
	Completed Specification – independent verification arranged by Project Manager.	
	Project Manager's review completed.	
	<b>SPECIFICATION GUIDANCE NOTES</b> deleted.	
	<b>TABLE OF CONTENTS</b> updated.	
	<b>FOOTER</b> updated with Document No., Contract No. and Contract Name.	
	Supporting information prepared and submitted to Project Manager.	
Further action necessary:		

Signed: \_\_\_\_\_ (*Project Manager*) Date: \_\_\_\_\_