SPECIFICATION 503

BITUMINOUS SURFACING

REVISION REGISTER			
Clause Number	**Description of Revision**	**Authorised By**	**Issue Date**
503.01	Deleted rubber seals, added bitumen and emulsion instead of conventional and bridge deck changed to structures. Scope excludes polymer modified seals.	BPC	
503.02	Deleted rubber methods, deleted ERN7, added ERN15, deleted AP-T09, deleted various WA test methods		
503.03	New definition on term binder		
503.08	New clause on 5% rubber		
503.09	Clause on protective paper moved to here		
503.12	Deleted link to Annexure 503C		
503.15	Deleted clause on anti-foaming agent		
503.21(1b & 1c)	Deleted AP-T09 added ERN15		
503.21(1d & 1f)	Deleted clause on PMB seals, SAM and SAMI		
503.21.2	Deleted clause on rubber seals for bridges		
503.24	New clause on transport and sampling consistent with 509		
503.26.05	Deleted clause on mercury thermometer		
503.27	Precoating moved to 503.37		
503.29.04(3)	Amended to 5% rubber for GRS		
503.29.04(4)	Deleted clause on rubber SAM and SAMI seals		
503.30.02(1)	Changed from bridge decks to concrete structures		
503.33.01(1)	New clause on tankers consistent with 509		
503.33.02(1)	Clauses reworded		
503.33.02(8)	Clause on sprayer for rubber deleted		
503.33.03	Use of field blending machine removed and rubber to come from a bulk mixing facility. Clause 2 deleted.		
503.33.04	Two sizes of rollers as per table. Includes combination and vibrating multi rollers.		
503.36.02(3)	Hold point reworded		
503.36.03	Asphalt surface preparation moved to 503.36.02		
503.36.05	Bridge deck changed to concrete surface		
503.37	New clause on precoating including heated aggregate		
503.41.01	Changed to hot binders including 5% rubber		
503.41.03	Clause on rubber binders deleted		
503.42.01(1)	Amended wording on rain for 24 hours after seal application consistent with 509		
503.42.04(1)	New hold point		
503.42.04(2)	Running start moved to 503.42.04(3)		

503.44.01(1b)	Hold point deleted		
503.44.01(1c)	New clause timing of application		
503.44.03(3)	Stones to be swept clear of guide posts		
503.45.01(1)	Amended wording on rain for 24 hours after seal application consistent with 509		
503.45.02(1)	New Hold Point on logistics		
503.45.02(3)	Temperatures for three types of emulsions		
503.45.03(1)	New clause timing of application		
503.45.03(2e)	Drag brooming removed for emulsion		
503.45.03(2f)	Clause moved to 503.45.03(1)		
Table 503C2 & C3	Rubber deleted		
503.C4	Rubber details deleted		
Table 503C6	Now shows size of roller to be used		
503.C7 & C8	Details moved to body of specification		
Guidance Notes 1	Table updated		
Guidance Note 6.2	Guidance on use of 70% emulsion on base		
Guidance Note 7	Amended to use of 5% rubber binder		
Guidance Note 8.1	New notes on other rollers		
Whole document	Reformatting	SCO	22/05/2017
Revision Register 23/09/2011	Corrected error in reformatting of date field for 09/09/15 update	BPC	02/10/2015

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SPECIFICATION 503

BITUMINOUS SURFACING

GENERAL

503.01 SCOPE

1. The work under this specification consists of the supply and application of the following types of sprayed bituminous treatments.

    a. Primes.

    b. Primerseals (both aggregate and sand/crusher dust).

    c. Bitumen and emulsion Seals and Reseals.

    d. Geotextile Reinforced Seals including use of 5% rubber.

2. The sprayed bituminous treatment must provide a durable surface that: ***Intent***

    a. bonds to the underlying surface (whether base course, concrete or another bituminous surfacing treatment);

    b. provides a safe wearing surface for traffic; and

    c. waterproofs the pavement or structure.

3. Where applicable for sealing and resealing works, a separate Schedule of Works is included at Annexure 503A, which provides details of specific surfacing treatments. ***Schedule of Works***

503.02 REFERENCES

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

Australian Standards

AS 1141 Methods for Sampling and Testing Aggregates

AS2809.5 Road Tank Vehicles for Dangerous Goods – Tankers for bitumen–based products

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 311.1 Texture Depth

WA 312.1 Ball Embedment

WA 340.1 Sprayed Binder Application Rate: Carpet Tile Method

WA 700.1 Sampling Procedures for Bitumen and Oils

Other Standards and Publications

Main Roads

Guide to Primersealing with Cutback Bitumen (1985)

Engineering Road Note No 15 – Design of Sprayed Seals

Document No. 71-06-137 - Use and Design of Geotextile Reinforced Seals

Austroads

AP-G41-15 Bitumen Sealing Safety Guide

AP-T262-14 Performance Requirements for Bitumen Sprayers

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

AP-T37/05 Austroads Technical Report - Geotextile Reinforced Seals

WA Government

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

MAIN ROADS Specifications

Specification 201 QUALITY SYSTEMS

Specification 202 TRAFFIC

Specification 203 OCCUPATIONAL SAFETY AND HEALTH

Specification 301 CLEARING

Specification 302 EARTHWORKS

Specification 508 COLD PLANING

Specification 509 POLYMER MODIFIED BITUMINOUS SURFACING

Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS

503.03 DEFINITIONS

Terminology

1. The terms “seal” and “reseal” have the same meaning except where the context of any particular passage indicates otherwise.

2. The term “binder” can mean bitumen, rubber bitumen, cutback bitumen or bitumen emulsion except where the context of any particular passage indicates otherwise.

503.04 – 503.05 NOT USED

PRODUCTS AND MATERIALS

503.06 BITUMEN

503.06.01 GENERAL

1. The supply of bitumen shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENT.

503.06.02 AUDIT SAMPLING AND TESTING

1. The Superintendent may take audit samples at any stage of the production, storage, delivery, or application process. The frequency and timing of sampling will be at the Superintendent’s discretion. The Contractor shall provide the Superintendent with ready access for sampling of bitumen.

2. 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 bitumen 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.

503.07 BITUMEN EMULSION

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

503.08 RUBBER BINDER

1. A rubber binder to be used in a geotextile reinforced seal shall consist of a blend of 5% by mass of rubber granules in Class 170 bitumen with component materials meeting the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

503.09 PROTECTIVE PAPER

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

503.10 MEDIUM CURING CUTTING OIL

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

503.11 SLOW CURING CUTTING OIL

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

503.12 PRECOATING FLUID

1. Except for fine aggregates such as sands and crusher dust, all aggregate used as cover material with bitumen, rubber binder or cut-back bitumen shall be precoated with a distillate or bitumen based precoating fluid meeting the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENT.

2. Crushed aggregate for bitumen emulsion surfacing work shall not be precoated with precoating fluid. However, the aggregate may be prewetted with water to assist adhesion of the binder. ***Emulsion Seals***

503.13 ADHESION AGENT

1. The adhesion agent shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS. ***Approved Adhesion Agents***

503.14 RUBBER GRANULES

1. The rubber granules shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

503.15 NOT USED

503.16 AGGREGATES

503.16.01 COARSE AGGREGATES

1. Crushed aggregate, including its source rock, shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

2. Where Principal-supplied aggregate cover material is made available to the Contractor the Contractor shall use all supplied aggregate cover material before use is made of Contractor-supplied aggregate cover material. Details of Principal-supplied aggregate are given in Annexure 503B. ***Principal Supplied Aggregate***

3. The source of aggregate supplied by the Contractor shall be nominated with the Tender.

4. The Contractor shall make all necessary arrangements with the nominated supplier concerning load size, rate for supply, timing of the delivery, payment and documentation.

5. **Prior to the on-site delivery of crushed aggregate, the Contractor shall provide certification to the Superintendent that the aggregate conforms to specified requirements.** ***HOLD POINT***

6. 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***

7. The maximum size of a lot shall be no more than one day's production when applicable, or no more than approximately 2000 m^3, whichever is the lesser. ***Lot Size***

8. Any contamination of aggregate after acceptance that is due in any way to the Contractor's activities shall be corrected at no cost to the Principal. ***Contamination***

503.16.02 CRUSHER DUST/SAND

1. Crusher dust/sand used for primer-sealing shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

503.17 GEOTEXTILE FABRIC

1. The supply and storage of geotextile fabric shall meet the requirements of Specification 511 MATERIALS FOR BITUMINOUS TREATMENTS.

503.18 – 503.19 NOT USED

DESIGN OF SPRAYED SEALS

503.20 GENERAL

1. Unless otherwise specified in Table 503C1 the sprayed seal shall be designed by the Principal. Where Table 503C1 specifies design by the Contractor, then the Contractor shall be responsible for and shall carry out the design for the type of treatment specified. ***Design Responsibility***

503.21 DESIGN METHODS

1. The design of sprayed seals shall include selection of binder and design of binder and aggregate application rates unless otherwise specified. Design of binder application rates and aggregate spread rates shall be in accordance with the following:

    a. Primerseals (Sand and Metal dust)

    The primerseal design, binder composition, binder application rate and aggregate application rates shall be in accordance with the requirements of the Main Roads' "Primersealing with Cutback Bitumen Design Manual" (1985). ***Primerseals***

    b. Primerseals (Aggregate)

    The Primerseal design, binder composition, binder application rate and aggregate application rates shall be in accordance with the requirements of Engineering Road Note No. 15 or the Main Roads' "Primersealing with Cutback Bitumen Design Manual" (1985). ***Primerseals***

    c. Seals and Reseals

    Single and Double/Double seal design binder composition, binder application rates and aggregate spread rates shall be in accordance with the requirements of Engineering Road Note No 15. ***Single and Double/ Double Seals***

d. Geotextile Reinforced Seals ***GRS***

Guidance on binder application rate designs for GRS and the apportionment of BARs is provided in Austroads Technical Report AP-T37/05 and Main Roads document 71-6-137.

2. Testing for Average Least Dimension (ALD) shall be carried out in accordance with WA 215.1 or AS 1141.20.1. Sampling for testing of ALD shall be in accordance with either AS1141. 3.1 or WA 200.1. 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. ***Test Methods***

503.22 DESIGNED BY THE 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, order any variations to such design

2. Such amended details may include, but will not be necessarily limited to: ***Design Variables***

   a. Average Least Dimension (ALD) of the aggregate

   b. Aggregate precoating rate

   c. Binder Application Rate (BAR)

   d. Binder composition

   e. Aggregate spread rate

   f. Rolling and sweeping requirements

503.23 DESIGNED BY THE CONTRACTOR

503.23.01 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 Clause 503.21. ***Design Methods***

503.23.02 PRELIMINARY DESIGN

1. The Contractor shall carry out a preliminary design based on the following as applicable:

   a. The type of treatment and the 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 seal 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. Climatic data relevant to the Site.

503.23.03 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 Clause 503.23.02.

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 Clause 503.21.** ***HOLD POINT***

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.

TRANSPORT AND HANDLING OF BINDER

503.24 TRANSPORT AND SAMPLING

503.24.01 GENERAL

1. The handling, transport and heating of 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 binders, 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***

503.24.02 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 WA 700.1 such that each is similar and represents the 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 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.

503.25 NOT USED

PREPARATORY OPERATIONS

503.26 STORAGE AND DISPOSAL FACILITIES for BITUMINOUS MATERIALS

503.26.01 STORAGE SITES

1. **The Contractor shall select suitable sites for bulk storage of bituminous materials and notify the Superintendent at least five (5) days in advance of establishment or use.** ***HOLD POINT***

2. The Contractor shall ensure that site layout and safe handling procedures conform to requirements detailed in Austroads document AP-G41-05.

3. The Contractor shall provide and maintain the necessary equipment to receive, hold, heat, circulate, handle and protect bulk bituminous materials as required by his method of working from the time of receipt to prevent misuse, damage, deterioration or loss. ***Equipment***

4. Heating and storage tanks shall be fitted with dipsticks for volume measurement and suitable thermometers for indicating the temperature of the bitumen.

5. Suitable equipment shall be supplied by the Contractor to facilitate removal of liquid used to flush pumps and lines to authorised waste 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 indicating temperature.

7. The accuracy of volume and temperature measurement facilities shall be sufficient to ensure that the binder constituents (adhesion agent excepted) proportions (expressed as percentages) are those ordered ± 0.5%. ***Required Accuracy***

503.26.02 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.

503.27 AGGREGATE DUMP SITES

503.27.01 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 works.

2. Where aggregate is supplied in stockpile by the Principal, the locations of the stockpile sites are as detailed in Annexure 503B. 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***

503.27.02 SITE PREPARATION

1. The Contractor shall prepare aggregate stockpile sites such that they incorporate a firm, smooth, plane, well-drained surface. Stockpile areas shall be of sufficient size to allow a 4m clear margin around each stockpile. ***Site Requirements***

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. ***Clearing and Compaction***

APPLICATION OF PRIME OR SEAL

503.28 GENERAL

1. The application of a prime or 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 503A and 503C.

503.29 BITUMEN BINDERS

503.29.01 GENERAL

1. A prime or seal using bitumen as the principal binder shall consist of one or more of the following treatments:

503.29.02 PRIME COATS

1. Class 170 bitumen shall be mixed with medium curing cutting oil and adhesion agent in the proportions as detailed in Annexure 503C. The blend and application rate of the binder shall be varied according to the base and the temperature at the time of application to ensure penetration of the base. ***Prime Coats***

503.29.03 PRIMERSEAL COATS

1. Class 170 bitumen mixed with slow curing cutting oil, and/or medium curing cutting oil, and adhesion agent in the proportions as detailed in Annexure 503C. To ensure a stable aggregate mat, the blend and application rate of the binder shall be varied for each sand/crusher dust primerseal according to the temperature at the time of application and the particle size distribution of the sand/crusher dust. ***Primerseals***

503.29.04 SEAL AND RESEAL COATS

1. Class 170 bitumen mixed with adhesion agent as detailed in Annexure 503C. ***Seals and Reseals***
2. Cutting oil shall not be added to the binder unless approved by the Superintendent. ***Cutting Oil***
3. Where rubber binder is specified for a geotextile reinforced seal the binder shall incorporate 5% by mass of rubber granules, Class 170 bitumen and shall be blended with adhesion agent. ***Rubberised Binder***

503.30 BITUMEN EMULSION BINDERS

503.30.01 GENERAL

1. A prime or seal using bitumen emulsion as the principal binder shall consist of one or more of the following treatments:

503.30.02 PRIME COATS

1. Bitumen emulsion prime coats used on concrete structures such as culverts or floodways prior to subsequent bituminous surfacing treatments shall be applied in accordance with Annexure 503C. ***Concrete***

503.30.03 PRIMERSEAL COATS

1. Double/double bitumen emulsion primerseal using the nominal sized crushed aggregates as specified in Annexure 503C. Binder Application Rates (BAR) shall be as specified at Annexure 503C. ***Primerseals***

2. Bitumen emulsion primerseals shall not be subject to any vehicular traffic until the emulsion has completely broken and cured to form a stable primerseal leaving no water in the binder. ***Traffic Ban***

503.30.04 SEAL COATS

1. Either single coat or double/double bitumen emulsion seals using the nominal sized crushed aggregate as specified in Annexure 503C. Binder Application Rates (BAR) shall be as specified in Annexure 503C. ***Seals***

2. Bitumen emulsion seals shall not be subject to any vehicular traffic until the emulsion has completely broken and cured to form a stable primerseal leaving no water in the binder. ***Traffic Ban***

503.31 – 503.32 NOT USED

503.33 PLANT AND EQUIPMENT

503.33.01 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.

503.33.02 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 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***

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 in 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 ± 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 ± 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. ***Sprayer Conformity***

6. The Contractor shall use Copley EAN 18 (W) End Nozzles for use in spraying edges. The Copley EAN18 End Nozzle shall not be used in spraying edges. Copley AN18 nozzles shall be fitted to the remainder of the spray bar. 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.. ***Spray Nozzles***

7. The sprayer shall be capable of passing over protective paper doing a running start without damaging or moving the paper.

503.33.03 MANUFACTURE OF RUBBER BINDER

1. The rubber binder shall be supplied from a bulk mixing facility. The facility shall be capable of mixing the rubber blend to ensure that the rubber is thoroughly mixed into the bitumen before it is transferred to a road tanker or sprayer. ***Bulk Supply***

503.33.04 ROLLERS

1. The size of multityred rollers to be used is specified in Annexure 503C 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. Multityred rollers for the application of the seal on geotextile fabric shall have a minimum mass of 18 tonnes. ***Rubber Tyred Rollers***

503.33.05 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 and its prime mover shall each be equipped with an amber flashing lamp visible from all directions in accordance with Specification 203 OCCUPATIONAL SAFETY AND HEALTH. ***Flashing Lamp***

503.33.06 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. 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.

503.33.07 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 bitumen sprayer(s).

2. The precoater shall also be capable of screening dirt/foreign matter (both oversize and undersize materials) from the aggregate during its operation. ***Screening***

3. **Prior to the use of the precoater on the Works, the Contractor shall notify the Superintendent of such intention.** ***HOLD POINT***

503.33.08 GEOTEXTILE FABRIC APPLICATOR

1. The Geotextile fabric shall be spread using a purpose built machine mounted fabric spreader. An example is shown in Austroads Technical Report AP-T37/05. The fabric spreader shall keep the fabric taut during spreading such that when laid on the bond coat the width of the applied fabric is within 100mm of the ordered width of the fabric.

503.33.09 SURFACE DAMAGE

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

503.34 – 503.35 NOT USED

503.36 SURFACE PREPARATION

503.36.01 BASECOURSE SURFACE

1. The pavement 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 bituminous binder.

3. 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 503C. The Contractor shall provide such additional markers as are necessary to achieve the specified tolerances. ***Line Spotting***

4. Application of a light water spray shall precede the application of either a prime or primerseal. The application of the light spray shall be consistent across the width of the proposed seal Works. ***Light Water Spray***

5. **Prior to the application of bituminous binder as an initial surfacing treatment, the Contractor shall certify to the Superintendent that the basecourse complies in all respects with the requirements of the Specification, including the surface finish as described in Specification 501 PAVEMENTS. Specified requirements for dryback shall comply at the time of application of a bituminous binder.** ***HOLD POINT***

6. **At the completion of the Basecourse surface being swept and prior to the application of the bituminous binder, the Contractor shall certify to the Superintendent that the basecourse complies with the surface finish requirements as described in Specification 501 PAVEMENTS 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 basecourse is completed and at least one (1) hour prior to the application of the bituminous binder.** ***HOLD POINT***

503.36.02 BITUMINOUS SURFACE

1. Where the pavement surface is a primed basecourse, a seal, asphalt or microsurfacing 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. **A minimum of one (1) hour prior to application of the bituminous binder, the Contractor shall certify to the Superintendent that any required sweeping and/or necessary repairs of the underlying surface have been completed, and that the surface is suitable to receive the seal.** ***HOLD POINT***

4. Where encountered in resealing works, the Contractor shall remove and dispose of existing raised pavement markers, both permanent and temporary, prior to resealing. 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 area of the pavement damaged by the Contractor shall be repaired by the Contractor at no cost to the Principal. ***Raised Pavement Markers***

503.36.03 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. ***HOLD POINT***
   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.

503.36.04 CONCRETE SURFACE

1. 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. ***Prime***
   The surface shall be primed with a cationic 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 an average rate of 0.6 L/m² applied in a uniform film over the entire surface of the bridge deck. No binder shall be applied on the prime until the emulsion has broken and has evaporated.

3. All traffic shall be kept off the concrete surface until application of the binder is complete and conforms to all requirements.

503.37 AGGREGATE PREPARATION

503.37.01 PRECOATING

1. ***Timing***
   Aggregate precoated with a distillate precoating fluid shall be precoated at least 24 hours but not more than seven (7) days before its intended use. Aggregate precoated with a bitumen based precoating fluid shall be precoated a minimum of four (4) days but not more than twenty eight (28) days prior to its intended use. The type of precoating fluid to be used is stated in Table 503.1.

2. ***Rate of Application***
   The rate of application of precoating fluid shall be sufficient to coat the entire surface area of all of the aggregate particles but shall not be less than the minimum rates of application of precoating fluid as stated in Table 503.1. At the time of spreading the precoated aggregate shall not be covered with excess precoat fluid such that aggregate particles stick together or pick up on vehicle tyres or causes a delay in adhesion.

3. Care shall be taken to minimise aggregate losses and to ensure dust does not blow back onto precoated aggregate.

TABLE 503.1 TYPE OF PRECOAT FLUID AND APPLICATION RATE

Seal Type	**Type of Precoat Fluid**	
Primerseal	Distillate	
Seal/Reseal	Distillate	
Geotextile Reinforced Seal	Distillate	
Emulsion Seals	None (refer 503.12)	
Nominal Size Aggregate (mm)	**Distillate Precoat Fluid**	**Bitumen Based Precoat Fluid**
	Minimum Application Rate (litres/m³ loose)	Minimum Application Rate (litres/m³ loose)
7	6	12
10	5	10
14	5	8
16	4	6

503.37.02 HEATED AGGREGATE

Aggregate

1. The aggregate shall be clean 7 or 10mm sealing aggregate, as specified, 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.

Heating and Mixing

2. The aggregate shall be heated, dried and coated with Class 170 or Class 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.

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.

503.38 NOT USED

503.39 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 damaging 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. ***Signing***

4. Signs shall remain in position until after the seal is 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.

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 any proposed traffic control measures for the Works, particularly temporary speed restrictions, the Contractor shall notify the Superintendent of such proposed measures.** ***HOLD POINT***

503.40 NOT USED

503.41 BINDER PREPARATION

503.41.01 HOT BINDERS

1. Bitumen, cutback bitumen or 5% rubber binder and other constituents, as detailed in Annexure 503C 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. ***Mixing***

2. Adhesion agent shall be added to the sprayer on site, dissolved in the hot binder and thoroughly mixed. 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 to bitumen or cutback bitumen at a rate of 0.5% by volume of the binder. ***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 + 0.5%. ***Mix Tolerance***

4. The binder spraying temperature shall be as specified in Annexure 503C. ***Spraying Temperature***

503.41.02 BITUMEN EMULSION

1. Bitumen emulsion shall be mixed by circulation in the mechanical sprayer for not less than ten minutes or such longer period as may be necessary to ensure a uniform and homogeneous mixture. ***Mixing***

2. Where a pressurised sprayer is used circulation in the site storage or road tanker shall be permitted as a substitute for circulation in the sprayer. Such circulation shall take place immediately prior to the loading of the sprayer.

503.42 APPLICATION - BITUMEN OR CUTBACK BITUMEN

503.42.01 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: ***Weather***

    a. 25°C for seals and reseals, or ***Minimum Pavement Temperature***

    b. 40°C for a geotextile reinforced seal when applied during daytime hours or 25°C when applied during nightworks. When applied during nightworks the pavement temperature for the next day shall be a minimum of 40°C, or

    c. 20°C for primes or primerseals.

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.

3. **The Contractor shall demonstrate compliance with the bitumen property requirements for each batch of bitumen prior to the bitumen being used on the Contract. This requirement does not apply to rubberised binder. Audit testing undertaken by the Principal shall not be used to demonstrate compliance.** ***HOLD POINT***

503.42.02 APPLICATION RATE

1. The binder application rate (BAR) for tender purposes shall be as detailed in Annexure 503C. Where adjustments to the binder application rates in excess of 7.5 percent of the rates detailed in Annexure 503C are ordered by the Superintendent then changes to the Contractor's rates for sealing shall be made as follows:

URN = URT + (ARN - ART)L

Where :

URN = New Rate for prime, primerseal or seal ($ per m^2).

URT = Tendered rate for prime, primerseal or seal as applicable ($ per m^2)

ARN = New binder application rate (Litres per m^2).

ART = Tendered binder application rate (Litres per m^2).

L = Rate per litre tendered 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 503.53.

503.42.03 VOLUME CONVERSION

1. Table 503.2 (for prime coats) and Table 503.3 (for primerseals, seals and reseals) give 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 503.2 CONVERSION FACTORS - PRIME COATS BINDER

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	0.9543	145	0.9105
20	0.9964	85	0.9509	150	0.9072
25	0.9929	90	0.9475	155	0.9039
30	0.9893	95	0.9441	160	0.9007
35	0.9857	100	0.9407	165	0.8974
40	0.9822	105	0.9373	170	0.8942
45	0.9787	110	0.9339	175	0.8909
50	0.9752	115	0.9305	180	0.8877
55	0.9717	120	0.9272	185	0.8845
60	0.9682	125	0.9238	190	0.8813
65	0.9647	130	0.9205	195	0.8781
70	0.9612	135	0.9171	200	0.8749
75	0.9578	140	0.9138		

NOTE: Factors for intermediate temperatures may be obtained by direct interpolation.

TABLE 503.3 CONVERSION FACTORS - PRIMERSEALS, SEALS & RESEALS

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 may be obtained by direct interpolation.

503.42.04 SPRAYING

1. **Binder shall not be applied until the Contractor has sufficient spreader trucks to comply with 503.44.01(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***

2. The binder shall be bar circulated for at least three (3) minutes immediately prior to spraying.

3. 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 bitumen shall be removed and disposed of in a suitable manner. ***Sprayer Speed***

4. 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.

5. The volume of binder sprayed for each run shall be determined by dipping the tank after each run and recording the volume of binder in the tank to the nearest 50L. The sprayer must be dipped whilst parked on level ground. ***Sprayed Volume***

6. All outside edges of the seal, parallel to the road centreline shall be sprayed with Copley EAN18 (W) edge nozzles.

7. When applying a seal over laid and rolled geotextile fabric where there are two or more spray runs the first spray run shall be overlapped by 100mm of binder from the subsequent spray run. ***GRS***

8. 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.

9. The binder shall be sprayed onto areas as detailed in the drawings, or as otherwise specified in Annexure 503A. The sprayed binder edge shall conform to the following requirements: ***Spraying Tolerances***

    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, which shall be at one in twenty (1:20).

10. Cutting oil shall not be used in the bitumen for the first coat of a double/double seal. ***Double/ Double Seals***

11. Where a double/double seal is being applied the second coat of the seal shall overlap the larger aggregate of the first coat as detailed below:

a. where spraying is not completed for the full width of the road at the same time a longitudinal overlap shall be constructed. The overlap must be along the edge of a lane or the centreline of the road;

b. on a longitudinal overlap the second coat of the seal shall overlap the first (larger aggregate size) coat by between 100mm and 200mm;

c. on a transverse overlap the second coat of the seal shall overlap the first (larger aggregate size) coat by 300mm.

12. 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. ***Damage***

503.42.05 APPLICATION OF PRIMER COAT ***Prime Coats***

1. Construction traffic shall not be allowed on newly sprayed areas until the prime has penetrated and the sprayed surface is no longer tacky

2. Where construction traffic must be allowed on areas that remain tacky and on isolated slick spots, the prime shall be dusted over with a dry sand or fine aggregate cover material and lightly rolled prior to trafficking

3. Public traffic shall not be allowed on primed areas without the approval of the Superintendent.

4. The Contractor shall repair at no cost to the Principal any damage to the prime coat caused by construction or public traffic.

5. All tacky or slick spots shall be blinded with dry sand or fine aggregate prior to the application of the next specified bituminous surface treatment.

6. The prime coat shall be cured for a period of three (3) to seven (7) days prior to the application of a subsequent bituminous surfacing treatment. Dependent upon factors such as the blend to be used, climatic conditions and the porosity of the basecourse, a reduced curing time of not less than 24 hours may be approved by the Superintendent.

503.42.06 EXISTING GUIDEPOSTS

1. Where necessary existing guideposts shall be removed and stored safely by the Contractor to allow bituminous surfacing operations to proceed. ***Guidepost Removal***

2. Where not being replaced with new guideposts, the Contractor shall reinstate removed guideposts in 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. ***Reinstatement***

503.43 APPLICATION OF GEOTEXTILE FABRIC

1. A bond coat shall be applied to the prepared surface in accordance with 503.42. Class 170 bitumen or a 5% rubber binder shall be used for the bond coat without the addition of cutting oil. ***Bond Coat***

2. The Geotextile fabric shall be spread on to the bond coat as soon as practical. The fabric shall be kept as low as possible to the ground during spreading. The edge of the fabric shall not deviate from the specified edge by more than 50mm. Where the fabric is creased after placement the creases shall be broomed out or cut and respread. Both sides of the crease shall be cut and then butt joined. ***Spreading***

3. Longitudinal joins of the fabric should be overlapped by 100 to 200mm with the overlapped join receiving additional binder at the rate of the bond coat for the first layer of fabric. The fabric in the join area shall not be loose. An area of loose fabric shall receive additional binder. Joins shall not occur in wheel path areas. The overlapped fabric shall be nailed down every 10m on the longitudinal join and on the transverse join five flat head nails shall be used to hold down the fabric including each corner. ***Joins***

4. The longitudinal join shall not be located within a traffic lane. Joins shall be located along lane lines or centrelines.

5. The fabric shall be rolled with a multi tyred roller immediately after the fabric has been spread. Rolling shall cover the entire area of fabric and continue until the bond coat has been absorbed into the fabric as indicated by a darkening in colour of the fabric. Where the bond coat bleeds to the surface of the fabric rolling shall cease. Construction vehicles must not stand on the fabric and public traffic shall not be allowed on the fabric. ***Rolling***

6. Bitumen or a 5% rubber binder for the seal coat shall be sprayed on to the fabric in accordance with 503.42. Where the fabric is wet it shall be air dried before a seal coat is applied.

503.44 APPLICATION OF COVER MATERIAL – BITUMEN SEALS

503.44.01 AGGREGATE PRIMERSEALS AND SEALS

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 means of a suitable type of 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. In order to meet this requirement it may be necessary to apply the aggregate initially at a rate slightly less than appears optimum so that some binder is visible between the stones. Specified aggregate application rates are nominal and should be adjusted to suite the aggregate used to give the correct stone mosaic.

    c. The sprayed binder shall be totally covered with the exception of approved lapping strips with aggregate within 8 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 complete coverages of rubber tyred rolling. ***Timing***

   c. If there are surplus loose particles on any portion of the sealed area, such portion shall be swept lightly to move the loose particles but not disturb the aggregate embedded in the binder.

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 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***

   Aggregate Cost

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

   where:

   A = actual area (m²) covered at rate S_a

   R = rate (in $/m³) stated in Annexure 503B

   S_o = ordered aggregate spread rate in m²/m³

   S_a = actual aggregate spread rate in m²/m³

   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 503B.

503.44.02 ROLLING AND DRAG BROOMING

1. Immediately after application of the cover material, the surface shall be rolled with rubber tyred rollers to the minimum number of complete coverages as stated in Annexure 503C over the whole area. Where the roller size is not specified then 11 tonne rollers shall be used except for geotextile seals. 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 complete coverage of rolling except on a geotextile reinforced seal where only hand sweeping will be used to correct inconsistent spreading of aggregate.

Rolling Sequence

2. The Superintendent may order additional rolling and drag brooming and such extra work shall be paid for at Daywork rates.

3. For double/double seals, the rolling shall comply with the requirements of this section for each coat of the seal and any aggregate not incorporated in the first coat of the seal shall be removed in such a manner as to prevent removal of aggregate incorporated therein. Public traffic shall not be allowed on the first coat of a double/double seal. 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

503.44.03 SURFACE SWEEPING

1. Any loose cover material not incorporated in the seal after the completion of rolling shall be swept off the seal surface to beyond the outer edge of each shoulder without damage to 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 take place 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. For GRS works initial sweeping shall not take place until after 24 hours of trafficking. 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 a line of the guide posts.

Repeated Sweeping

4. The Contractor shall install symbolic "loose stones" 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

503.44.04 SAND/CRUSHER DUST PRIMERSEALS

1. General

a. The cover material shall be dry at the time of application and shall be uniformly spread by means of a suitable type of mechanical spreader. The time lag between spraying and spreading shall be kept to a minimum and all sprayed areas, with the exception of approved lapping strips, shall be covered with material within ten (10) minutes of spraying the binder. The length of spray runs shall be limited to ensure compliance with this requirement.

b. Sufficient loaded trucks shall be at the site to provide the full cover for the area to be sprayed at the time. Prior to the spreading of the cover material, the load in a truck representative of those to be used for the Work shall be levelled in the body for measurement purposes. ***HOLD POINT***

2. Additional Cover Material

a. Additional cover material shall be applied to any bare or insufficiently covered areas as necessary to provide a uniform and complete cover. Sufficient cover material shall be spread to fully absorb the binder applied and to ensure that there is no picking-up under traffic.

3. Cover Material Spread Rate and Drag Brooming

a. For tender purposes, the cover material spread rate shall be as stated in Annexure 503B. The actual cover material spread rate shall be calculated from the volume of cover material spread and the actual area covered as measured on the ground in accordance with the requirements detailed in Annexure 503B.

b. Sufficient cover material (sand or crusher dust) must be spread and rolled into the binder to fully absorb the bituminous material applied. To achieve this result it may be necessary to slightly overspread the aggregate and broom off any excess once a stable bitumen-aggregate mat has been achieved.

4. Rolling

a. Immediately after application of the cover material, the surface shall be rolled with rubber tyred rollers for the minimum number of complete coverages stated in Annexure 503C over the whole area. Rollers shall not be operated at speeds in excess of 7km per hour for the first four complete coverages.

5. Sweeping

a. Any loose cover material not incorporated in the primerseal after the completion of rolling shall be swept off the surface to beyond the outer edge of each shoulder without damage to the primerseal or shoulder and spread evenly down the batter slope.

b. The Contractor shall not install guideposts prior to the sweeping of loose cover material down the batter slope.

c. The time lapse between the completion of rolling and final surface sweeping shall be determined by the Superintendent. However, such time lapse shall not be greater than one week and may be as short as one day.

503.45 APPLICATION - BITUMEN EMULSIONS

503.45.01 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. ***Weather***

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.

3. **Prior to the binder being used on the Contract the Contractor shall demonstrate to the Superintendent compliance with the emulsion binder property requirements for each batch of binder. Audit testing undertaken by the Principal shall not be used to demonstrate compliance.** ***HOLD POINT***

503.45.02 BINDER APPLICATION

1. **Binder shall not be applied until the Contractor has sufficient spreader trucks to comply with 503.45.03(1a) 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***

2. Binder shall be applied only when the pavement temperature is between 10°C and 40°C. Application of emulsion at a temperature above 40°C shall only be done when it can be shown by demonstration that the emulsion will not form a skin or break rapidly. ***Pavement Temperature***

3. The binder spraying temperature range shall be 35°C to 50°C for 60% emulsions, 50°C to 80°C for 67% or 70% high bitumen content emulsions or greater than 90°C for polymer modified emulsions. ***Spraying Temperature***

4. The emulsion binder rates at 15°C for tender purposes shall be as specified at Annexure 503C.

5. The spraying of the binder for each run of the sprayer shall start and finish on protective paper. The sprayer shall start each run at least 10 m before the protective paper and shall cross the paper at its correct spraying speed. The paper so used and any spilt binder shall be removed and disposed of in an approved manner. All tapers and fillets shall be sprayed after masking with protective paper. All outside edges shall be sprayed with Copley EAN18 (W) edge nozzles. .Where the direct use of the mechanical sprayer is impracticable, the binder may be applied using a hand lance fed from the mechanical sprayer.

6. The volume of binder sprayed for each run shall be determined by dipping the tank after each run and recording the volume of binder in the tank to the nearest 50L. The sprayer must be dipped whilst parked on level ground. ***Sprayed Volume***

7. The binder shall be sprayed onto areas as detailed in the drawings, or as otherwise specified in Annexure 503A. The sprayed binder edge shall conform to the following requirements: ***Spraying Tolerances***

    a. the sprayed edge shall not deviate from the specified edge by more than 50 mm;

    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, which shall be at one in twenty (1:20).

8. The Contractor shall take all necessary precautions to prevent binder from adhering to any existing structure. Any damage or defacement shall be made good immediately upon completion of sealing work at no cost to the Principal.

9. In double/double seals, the binder for the second coat shall not be applied until the binder in the first coat has completely broken and cured to form a stable seal leaving no water in the binder. ***Double/ double Seals***

503.45.03 APPLICATION OF AGGREGATE – DOUBLE/DOUBLE SEAL

1. General

    a. The sprayed binder shall be totally covered with aggregate within 8 minutes of the application of the binder. The length of spray runs shall be limited to comply with this requirement. ***Timing of Application***

2. First Coat (Larger Aggregate)

    a. The first aggregate coat shall be uniformly spread by means of a suitable type of mechanical spreader. The aggregate shall be applied commencing at the low edge of the pavement in successive runs parallel to that edge.

    b. This requirement may be waived at tapers depending upon the method of application of the binder for the taper.

    c. The aggregate shall be placed to form a uniform stone mosaic of single particle thickness, in almost continuous interlocked contact, with the particles generally oriented with their least dimension vertical. In order to meet this requirement it may be necessary to apply the aggregate initially at a rate slightly less than appears optimum so that some binder is visible between the stones. Additional aggregate shall be applied to any bare or insufficiently covered areas as necessary.

    d. The additional aggregate shall be applied before the completion of four complete coverages of rubber tyred rolling.

e. Immediately after application of the cover material the surface, shall be rolled with rubber tyred rollers to the minimum number of complete coverages as stated in Annexure 503C over the whole area. For the first four complete coverages, rollers shall be operated at speeds less than 7 km per hour.

f. All loose aggregate not incorporated in the mat at the completion of rolling and brooming shall be removed from the pavement prior to the application of the binder for the second coat but after the binder has completely broken and cured. The loose aggregate shall be removed in such a manner as to prevent removal of aggregate incorporated in the first coat.

3. Second Coat (Smaller Aggregate)

a. The second aggregate coat shall not be applied to the first coat until the binder of the first coat has completely broken and cured to form a stable seal leaving no water in the binder.

b. The first coat of aggregate may require to be sprayed with water prior to the application of the binder for the second coat.

Time Lapse between Coats

c. The second aggregate coat shall be spread and rolled as specified for the first coat. This work shall be completed within 15 minutes of the application of the second binder coat.

d. The new seal should not be swept or trafficked until the emulsion has completely broken leaving no water and the binder has had adequate curing to attain full strength, ensuring stone retention after unrestricted trafficking.

503.45.04 SURFACE SWEEPING

1. Any loose aggregate not incorporated in the seal mat after the completion of rolling and curing of the second aggregate coat shall be swept off the seal surface without damage to seal or shoulder and shall then be removed from the roadway. Where the roadway to be sealed is kerbed the excess aggregate may be swept hard against the kerb during interim sweeping operations but shall be picked up and removed during the final sweeping.

Excess Cover

2. Where the roadway to be sealed is kerbed, the excess cover material shall be picked up by suction broom, without damage to the seal. The excess cover material may be swept hard against the kerb during interim sweeping operation, but shall be picked up and removed by a suction broom to an approved location.

3. The initial sweeping shall take place prior to the completion of the day's work. A second sweeping shall be carried out at the commencement of the following days work. The Contractor shall carry out subsequent sweepings as necessary for the following 7 days to ensure that no loose stones remain on the road surface. All loose aggregate shall be swept clear of the sealed surface.

4. The Contractor shall install symbolic “loose stones“ 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 7 days after completion of sealing. ***Signing***

503.46 – 503.51 NOT USED

503.52 NONCONFORMING TEST RESULTS

1. Where defects arising in a seal or reseal may be in any way, either in part or in full, attributable to bitumen for which test results are non-conforming, then within 60 days of completion of the works on which that bitumen 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 refrain from making payment to the Contractor for the Schedule of Rates item for bitumen supply and delivery related to that delivery for 60 days after the work was 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.

503.53 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 503.4 for Class 170 Primes and Primerseals, and Table 503.5 for Seals and Bitumen Emulsion Primerseals.

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 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 tabular form in Tables 503.4 and 503.5 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 the Clause 503.42.04.

TABLE 503.4 PAY FACTORS FOR CLASS 170 PRIMES & PRIMERSEALS

Actual Binder Application Rate (BAR) L/m² @ 15°C	Quality Level	Pay Factor (PF)
(OAR - 0.16) or less	Non-Conformance	N/A
(OAR - 0.15) to (OAR - 0.11)	Conditional Conformance Level 3	0.80
(OAR - 0.10) to (OAR + 0.10)	CONFORMANCE	1.00
(OAR + 0.11) to (OAR + 0.15)	Conditional Conformance Level 1	0.95
(OAR + 0.16) to (OAR + 0.20)	Conditional Conformance Level 2	0.85
(OAR + 0.21) to (OAR + 0.25)	Conditional Conformance Level 4	0.70
(OAR + 0.26) or more	Non-Conformance	N/A

(OAR = Ordered Application Rate @ 15°C)

TABLE 503.5 PAY FACTORS FOR BITUMINOUS SEALS & RESEALS

Actual Binder Application Rate (BAR) L/m² @ 15° (Converted)	Quality Level	Pay Factor (PF)
(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 15ºC)

503.54 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.

503.55 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.

503.56 – 503.80 NOT USED

AS BUILT AND HANDOVER REQUIREMENTS

503.81 WORKS RECORDS

1. The Contractor shall accurately record the information required on Record Forms similar to those shown in Annexure 503D, 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.

503.82 – 503.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

503.91 – 503.99 NOT USED

ANNEXURE 503A

SCHEDULE OF WORKS – SEAL / RESEAL)

Works Item (Section Nos)	From [1] (SLK)	To [1] (SLK)	Length (km)	Width (m)	Side [2] (L,C,R)	Area (m^2)	BAR at 15°C (l/m^2)	Cover Material (Type)	Cover Size (mm)	Comments
Road Name 1										
1										
2										
Etc. etc.										
Road Name 2										
1										
2										
Etc. etc.										
Road Name 3										
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 503B

COVER MATERIALS – SUPPLIED BY THE PRINCIPAL

503B.1 AGGREGATE DUMPSITE LOCATIONS

1. Details of aggregate supplied by the Principal are shown in Table 503B1.

TABLE 503B1 DUMPSITE DETAILS

Location (SLK)	Offset (m)	Quantity Available (m^3)	Size (mm)	Type

503B.2 RATE OF DEDUCTION

1. The rates for deduction for over-spreading the Principal's aggregate are as shown in Table 503B2.

TABLE 503B2 RATES FOR DEDUCTION

Nominal Size of Aggregate (mm)	Rate for Deduction ($/m^3$)
Sand/Dust	
5	
10	
14	
16	
20	

ANNEXURE 503C

503C.1 RESPONSIBILITY FOR SEAL DESIGN

TABLE 503C1 DESIGN RESPONSIBILITY

Seal Type	Location	Design Responsibility
Prime	All Works	Principal
Primerseal	All Works	Principal
Seal/Reseal	All Works	Principal
Bridge Deck	All Works	Principal

503C.2 BINDER AND AGGREGATE APPLICATION RATES

1. The percentage of each binder constituent and binder application rates for tender purposes shall be as detailed in Table 503C2.

TABLE 503C2 BINDER COMPOSITION AND APPLICATION RATES

Surface Type	Binder Composition % by Volume			Binder Application Rate (BAR) @ 15°C (L/m^2)
	Class 170 Bitumen	Medium Curing Cutting Oil	Slow Curing Cutting Oil	
Prime	40	60		0.6
Primerseal				As per design
Single coat seal				As per design
Double/Double seal:				
First coat				
Second coat	100 100			As per design As per design

Rates to be modified in accordance with 503.22 or 503.23

2. The type of cover material, nominal size and spread rate for Tender purposes shall be as detailed in Table 503C3.

TABLE 503C3 AGGREGATE TYPE AND SPREAD RATE

Surface type	Cover material and size (mm)	Aggregate spread rate (m^2/m^3)
Primerseal		
Seal/Reseal - Single coat		
Seal Reseal – Scatter Coat		
Seal/Reseal – Double/ Double:		
First coat		
Second coat		

Rates to be modified in accordance with 503.22 or 503.23

Note 1: Where bitumen or bitumen cutback is delivered to site at a temperature higher than the upper limit of the recommended spraying temperature range, the spraying of the product shall be delayed until such time as the temperature of the product has cooled to the recommended upper limit.

Note 2: In certain circumstances, the Superintendent may allow the spraying of binder at temperatures above those listed below. In such cases, the binder application rate will be adjusted as directed by the Superintendent.

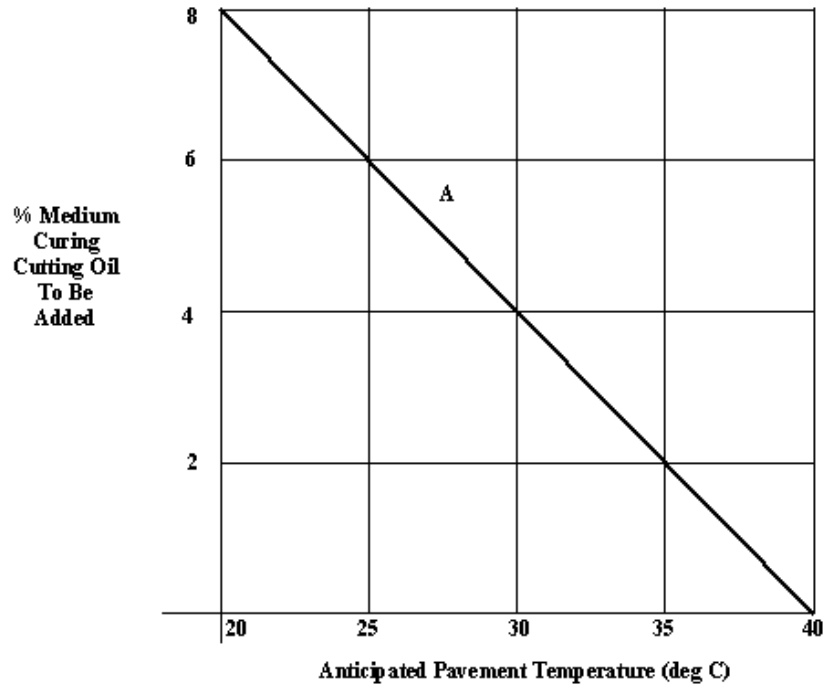
UNDER NO CIRCUMSTANCES SHALL THE PRODUCT BE RE-HEATED IF THE TEMPERATURE IS ALREADY WITHIN THE SPECIFIED SPRAYING RANGE.

503C.3 SEALS AND CUTBACK PRIMERSEALS

503C.3.1 ADDITION OF MEDIUM CURING CUTTING OIL

1. Where approved by the Superintendent Medium Curing Cutting Oil shall be added to Class 170 Bitumen used for seals and reseals depending on pavement surface temperature at the time of sealing as shown in Figure 503C1 Addition of Medium Curing Cutting Oil. Medium Curing Cutting Oil shall be added to the binder for primerseals as shown in Table 503C2.

FIGURE 503C1 ADDITION OF MEDIUM CURING CUTTING OIL



LEGEND : Line A Class 170 bitumen

Note:1: Minimum desirable pavement temperature for seals and reseals is 25°C.

Note 2: If the anticipated pavement temperature is likely to rise, decrease the Medium Curing Cutting Oil percentage obtained from the chart.

Note 3: If the aggregate is clean and freshly precoated, reduce the Medium Curing Cutting Oil proportion by 1%.

503C.3.2 BINDER SPRAY TEMPERATURE

1. Binder Spraying Temperatures for seals and primerseals using Class 170 bitumen shall be in accordance with Table 503C4.

TABLE 503C4 BINDER SPRAYING TEMPERATURE

Pavement Temperature (°C)	Binder Composition (Bitumen/MC Cutter)	Ideal Spraying Temperature Range (°C)
40 +	100/0	175-185
35	98/2	165-175
30	96/4	160-170
25	94/6	150-160
20	92/8	145-155

503C.4 BITUMEN EMULSION SEALS

1. Binder application rates for Bitumen Emulsion seals shall be in accordance with Table 503C5. Binder application rates for 14/7mm double/double emulsion seals shall be in accordance with the design BAR.

TABLE 503C5 BINDER APPLICATION RATES (BITUMEN EMULSION)

Surface Type	Binder Application Rate (BAR) @ 15°C (L/m²)
Primerseal - 1st coat - 10mm	0.9
Primerseal - 2nd coat - 5mm	1.1

503C.5 ROLLING

1. Rolling of the seal surface shall be to the minimum number of complete coverages shown in Table 503C6. 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.

TABLE 503C6 ROLLING

Minimum Mass of Roller	Minimum No. of Complete Coverages
11 or 18T	10

503C.8 GEOTEXTILE REINFORCED SEALS (GRS)

1. Type of binder, binder application rate, aggregate size and aggregate spread rate for GRS shall be in accordance with Table 503C7.

TABLE 503C7 GRS APPLICATION DETAILS

	Type of Binder	BAR at 15°C (L/m²)	Aggregate Size (mm)	Aggregate Spread Rate m^2/m^3
Double/Double Seal				
Bond Coat	C170 Bitumen or 5% Rubber			
1st Seal Coat	C170 Bitumen or 5% Rubber			
2nd Seal Coat	C170 Bitumen or 5% Rubber			

503C.9 LINE SPOTTING

1. Primes, primerseals, seals and reseal sections are spotted at the following intervals:

TABLE 503C8 LINE SPOTTING INTERVAL

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

ANNEXURE 503D

RECORD FORMS

The following records are attached;

503D.1 Bituminous Surfacing - Contractors Daily Surfacing Record

503D.2 Bituminous Surfacing - Contractors Sprayer Loading Record

503D.1 BITUMINOUS SURFACING - CONTRACTORS DAILY SURFACING RECORD

DATE:	BASE MATERIAL	PAVEMENT SURFACE	COVER AGGREGATE	BITUMEN	TOTAL QTY OF BITUMEN USED
			TYPE	TYPE ** 50 / 170 / Emulsion	
CONTRACT NO:	TYPE	TYPE	SIZE DUMP	SOURCE	
TIE IN POINTS FROM TO		CONDITION	CONDITION ** Dusty / Precoated / Damp	ADHESION AGENT	LITRES AT 15.0°C

Spray No.	DISTANCE From	DISTANCE To	SIDE OF ROAD Left/ Right Full Width	SPRAYED AREA Length	SPRAYED AREA Width	SPRAYED AREA Area	Road Temperature	BINDER COMPONENTS Component No.1	Component No.2	Component No.3	Additive Adhesion Agent	ORDERED APPLICATION RATES Binder at 15 °C	Cover Aggregate	Spray Temperature	BINDER QUANTITY USED Dip Before Spraying	Dip After Spraying	Quantity Sprayed Hot	Quantity Sprayed at 15°C	Cover Aggregate Used	ACTUAL APPLICATION RATES Binder Hot	Binder at 15° C	Cover Aggregate	% OF ORDERED APPLICATION RATES Binder at 15° C	Cover Aggregate	BINDER COMPONENT QUANTITIES USED AT 15° C Component No. 1	Component No. 2	Component No. 3	Additive
	m	m		m	m	m²	□C	%	%	%	%	l /m²	m²/m³	°C	l	l	l	l	m³	l /m²	l /m²	m²/m³	%	%	l	l	l	kg
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
		TOTALS																										

* Description Of Component No. 1 _____ Remarks: _____

Component No. 2 _____

Component No. 3 _____

SIGNATURE CONTRACTORS REPRESENTATIVE:

** = Tick Appropriate Box

SUPERINTENDENT:

503D.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

1 Pavement Temp _____ °C Design Blend ___ / __ / __

2 Application Rate (Hot) _____ L/M² Spray Temp (Hot) ___ °C

3 Volume Required In Sprayer _____ L @ ____ °C

_____ L @ 15°C

4 Components To Be Added (15°C)

Component 1 _____ L ***OR*** _____ L @ _____ °C

Component 2 _____ L ***OR*** _____ L @ _____ °C

Component 3 _____ L ***OR*** _____ L @ _____ °C

Adhesion Agent _____ L

ACTUAL COMPONENTS ADDED

A				B			
Component 1	___	L @	___ °C	Component 1	____	L @	___ °C

B. LOADING INTO SPRAYER CONTAINING PRIMER

1 Pavement Temp _____ °C Design Blend ___ / ___ / ___

2 Application Rate (Hot) _____ L/M² Spray Temp (Hot) __ °C

3 Volume Required In Sprayer _____ L @ ____ °C

_____ L @ 15°C

4 Components To Be Added (15°C)

Component 1 _____ L ***OR*** _____ L @ _____ °C

Component 2 _____ L ***OR*** _____ L @ _____ °C

Component 3 _____ L ***OR*** _____ L @ _____ °C

5 Primer Remaining In Sprayer

_____ L ____ °C _____ L @ 15°C

6 Actual Primer Composition ___ / ___ / ___

7 Components Remaining in Sprayer

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	

8

Component 1		L	Component 3		L		
Component 3		L					
Components To Be Added	(15°C)						
Component 1		L	***OR***		L @		°C
Component 2		L	***OR***		L @		°C
Component 3 Adhesion Agents		L L	***OR***		L @		°C

Description of Components

1

2

3

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 Pavements and Surfacing Manager.

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1. GENERAL EDITING

When one or more of the sealing applications specified in Clause 503.01.1 is not required for a contract, all the relevant sections/clauses dealing with the sealing application **must be deleted.** All section/ clause numbers shall be retained and **marked as "NOT USED".** The following table is a guide:

Treatment NOT required	**Sections to be marked as "NOT USED"**
Prime coat on basecourse	503.29.02 503.30.02 503.42.05 Annexure 503C : part Table 503C1 and 503C2
Primerseal with cutback bitumen	503.21.1(a) and 1(b) 503.29.03 503.44.01 503.44.04 Annexure 503C : part Table 503C1, 503C2 and 503C3
Emulsion Seals including primersealing	503.21.1(b) 503.41.02 503.30 503.45 Annexure 503C : Part Table 503C1, Part Table 503C3 and Table 503C5
Bitumen Seals and Reseals	503.21.1(c) 503.29.04 503.42 503.44 (retain if applying a prime, GRS or cutback primerseal) Annexure 503C : part Table 503C1, 503C2 and 503C3
Geotextile Reinforced Seals	503.17 503.21(d) 503.33.08

Treatment NOT required	Sections to be marked as "NOT USED"
	503.42 503.44 (retain if applying a prime, cutback primerseal or seal) 503.43 Annexure 503C : Table 503C7

2. BITUMINOUS SURFACING INTENT

Clause 503.01.2 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 503.01.1. 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, though the quantum will be different between a primerseal and a reseal for example.

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. GEOTEXTILE REINFORCED SEALS

Insert details for a Geotextile Seal in Table 503C8. Refer to Austroads Report AP-T37/05 and Main Roads guideline 71-6-137 for guidance on the use and design of geotextile seals.

4. AGGREGATE

4.1. PRINCIPAL SUPPLIED AGGREGATE

4.1.1. If screening of Principal-supplied aggregate is required, include Clause 503.91 as a **Contract Specific Requirement.**

4.1.2. Insert any other requirements concerning Principal-supplied aggregate as necessary in Clause 503.92 as a further **Contract Specific Requirement**, e.g. .care of dumpsites:

4.1.3. Provide aggregate spread rates. Base on test results where known calculated using the formula:

Spread rate (m^2/m^3) = 900/Average Least Dimension (AS 1141.20.1)

The provided rate should be adjusted in the field to give the correct stone mosaic.

Typical values are:

Aggregate Size	Aggregate Application Rate
Sand or Dust	up to 200 m²/m³
5mm	130 to 140 m²/m³ (*See Note*)
7mm	150 to 250 m²/m³
10mm	120 to 180 m²/m³
14mm	100 to 120 m²/m³
16mm	to 90 m²/m³

(Note: 5mm aggregate is neither intended nor expected to be spread as a single layer.)

4.1.4. Provide rate of deduction to allow for the cost of wastage in $/m³ for over-spreading aggregate. A typical value might be of the order of $50/m³, and would represent the production cost of the aggregate.

4.1.5. Nominate in **Table 503.1** the type of precoat fluid to be used. Distillate precoat fluid is used for most hot bitumen or cutback bitumen sealing or primersealing. A bitumen based precoat fluid may be used where a higher level of initial adhesion is required such as geotextile seals.

4.2. CONTRACTOR SUPPLIED AGGREGATE

In the Conditions of Tender (currently Schedule L) include:

a. an item to cover the Contractor's response to Clause 503.16.01.3 re source of Aggregate, and

b. an item to cover the Contractor's response to Clause 503.13.1 re Adhesion Agent (cross referenced in the note to Table 503.6), and

c. an item to cover the Contractor's response to Clause 503.33.07.2 re Aggregate Screen sizes.

5. RESPONSIBILITY FOR SEAL DESIGN

Amend Table 503C1 to show whether the Principal or Contractor is responsible for the design of sprayed seals and what types of seals.

6. BITUMEN EMULSION APPLICATION (refer Clause 503.45)

6.1. Where a double/double emulsion primerseal is used for a new pavement the typical treatment is:

First Coat: 10mm crushed aggregate (usually Perth granite),

BAR 0.9 litres/m² @ 15°C

Second Coat: 5mm crushed aggregate (usually Perth granite),

BAR 1.1 litres/m² @ 15°C

6.2. Double/double emulsion seals using 14mm and 7mm sized aggregates should be applied using a 70% emulsion (CRS/170-70). CRS/170-60 (60% bitumen content) bitumen emulsion is far more liquid and less viscous than the 70% emulsion and will flow on the road at emulsion application rates in excess of 1.3 L/m^2. This makes it problematic for spraying the first coat of a 14/7mm emulsion seal when binder run off will occur. The 70% emulsion allows an emulsion application rate of up to about 1.7-1.8 L/m^2 before run off may occur. The direct application of CRS/170-70 on to a basecourse without a prime is not recommended as the increased viscosity of the 70% emulsion can impair the coating ability on the surface potentially leaving pinholes that facilitate moisture ingress into the basecourse.

7. RUBBER SEALS

7.1. Where a rubberised seal is used as a Stress Alleviating Membrane (SAM), a Stress Alleviating Membrane Interlayer (SAMI) or for waterproofing membrane on a bridge deck it is specified in Specification 509 POLYMER MODIFIED BITUMINOUS SURFACING.

7.2. 5% rubber binder can be used in a GRS in lieu of Class 170 bitumen where the GRS is subject to large numbers of heavy vehicles. The use of 5% rubber binder in a GRS is specified in this document.

8. ROLLING WITH STEEL WHEEL ROLLERS

8.1. **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. Steel wheel rollers travel slower than multi tyred rollers and delay the rolling process.

9. NOTES RE ANNEXURES

9.1. ANNEXURE 503A SCHEDULE OF WORKS

Use only if required (e.g. Minor Works sealing/resealing contract), and insert details on a road-by-road basis. This schedule is not normally required in Major Works, but could be adapted to suit if necessary. When Annexure 503A is NOT used, the text of Clause 503.01.3 and the title of Annexure 503A should be replaced with "NOT USED", while the table in Annexure 503A should also be deleted.

9.2. ANNEXURE 503B COVER MATERIALS - PRINCIPAL SUPPLY

Insert relevant details of Principal-supplied aggregate. Insert **CONTRACT SPECIFIC REQUIREMENTS** into the text of the Specification as noted in Item 4 of these Notes.

9.3. Annexure 503C Application Details

Cutters should not be specified for inclusion in the binder blend of the first coat of a double/double seal, therefore the binder specified in Table 503C2 is 100% bitumen.

10. MINOR WORKS CONTRACTS

10.1. WORKING HOURS (Clause 503.93)

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.

10.2. CLEARING (Clause 503.94)

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.

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 when tested in accordance with WA 210.1.

503.91 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 when tested in accordance with WA 210.1.

503.92 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.

503.93 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).

AMENDMENT CHECKLIST

Specification No. **503** Title: **BITUMINOUS SURFACING** Revision No:_____

Project Manager:_____ Signature:_____ Date:_____

Checked by: _____ Signature:_____ Date:_____

Contract No: _____ Contract Description:_____

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

Signed: _____ *(Project Manager)* Date:_____