Coates Road, Wundowie Shoulder Widening Specification

Road section slk 0.500 to slk 1.700

1 TRAFFIC CONTROL
Traffic control to be supplied by contractor, any road closures are to follow the Shire of Northam road closure process documented on the website, traffic management plan for lane closures are to be submitted for approval 21 days prior to procession of site has been granted.

2 VEGETATION
Remove vegetation to enable shoulder widening and drainage construction.

3 SHOULDER WIDENING
Box out shoulder to a depth of 200mm to a width of 1500mm to allow for 500mm seal (plus 200mm overlap) and a 1m gravel shoulder, dispose of boxed out material to shingle Hill Road, Bakers Hill the Shire of Northam Quarry

Edge of existing seal to be profiled to a clean edge to enable a uniform edge seal connection with no deformation between seals

Gravel to be certified MRWA specification spread to a consistent 200mm depth and to a consistent level allowing for compaction, compaction to be NATA tested at 98% MDD and certificate provided – Hold Point

4 DRAINAGE
2 x 300mm DIA concrete pipe culverts to be extended, culvert headwalls to be precast headwalls and constructed as per manufacturers specification, the pipe joins to be concrete incased – Hold Point prior to back fill of pipe extensions

Construct Type 1A vee drain the length of works ensuring culverts are clear of debris and free flowing, compacted to 95%MDD as to not leave any loose material and prevent erosion – hold point
SPECIFICATION 502 – SPRAY SEAL WORKS

SPECIFICATION 101 - MANAGEMENT
SPECIFICATION 201 - QUALITY & TESTING
SPECIFICATION 202 - TRAFFIC MANAGEMENT & CONTROL
SPECIFICATION 203 - OCCUPATIONAL HEALTH AND SAFETY
SPECIFICATION 204 - ENVIRONMENT
SPECIFICATION 301 - ASSOCIATED WORKS – VERGES & IRRIGATION
SPECIFICATION 401 - ASSOCIATED WORKS – DRAINAGE
SPECIFICATION 402- ASSOCIATED WORKS – FOOTPATHS
SPECIFICATION 403- ASSOCIATED WORKS – KERBS & LINTELS
SPECIFICATION 404- ASSOCIATED WORKS – CROS Overs
SPECIFICATION 501- ASPHALT WORKS

SPECIFICATION 502- SPRAY SEAL WORKS

SPECIFICATION 503 – BITUMINOUS SURFACING

<table>
<thead>
<tr>
<th>Version</th>
<th>Amendments</th>
<th>Last Reviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial release</td>
<td>7/1/2015</td>
</tr>
</tbody>
</table>
1 SPRAY SEAL SCOPE

The work to be executed under this Contract consists of the supply and application of the following sprayed bituminous treatments:

a) Conventional Seals; and
b) Reseals.

The sprayed bituminous treatment must provide a durable surface that:

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.

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

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

The durability value is defined as the time in days to reach the specified apparent viscosity level when determining the “Long term effect of heat and air” in accordance with AS2341.13 and 2341.5.

The monthly average durability value for a source of bitumen supply is defined as the average of all durability values determined over the previous 6 months prior to the supply of bitumen under this Contract, and updated monthly throughout the Contract by including the latest months test results and deleting the test results from the first month used in the calculations in accordance with Clause 2.1.5 Sampling And Testing At Refinery Or Bulk Depot.

1.2 REFERENCES

Austroads Provisional Sprayed Seal Design Method Revision 2000 (AP-T09)

Australian Standards

AS 1141 Methods for Sampling and Testing Aggregates
AS 1152 Specification for Test Sieves
AS 1160 Bituminous Emulsions for the Construction and Maintenance of Pavements
AS 1726 Geotechnical Site Investigations
Shire of Northam - Specification 502 Spray Seal Works

Contract Name: Shoulder Widening Coates Road, Wundowie

Tender No. T2017090

AS 2008  Residual Bitumen for Pavements
AS 2341  Methods of Testing Bitumen and Related Road Making Products

**MRWA Test Methods**

MRWA0.1  Random Sample Site Location
MRWA 133.1  Dry Density/Moisture Content Relationship: Modified Compaction
MRWA 200.1  Sampling Procedures for Aggregates
MRWA 201.1  Sampling and Preparation of Granulated Rubber
MRWA 210.1  Particle Size Distribution of Aggregate
MRWA 212.1  Aggregate Moisture Content: Convection Oven Method
MRWA 212.2  Aggregate Moisture Content: Microwave Oven Method
MRWA 216.1  Flakiness Index
MRWA 220.1  Los Angeles Abrasion Value
MRWA 223.1  Crushing Test Value
MRWA 235.1  Bulk Density of Granulated Rubber
MRWA 236.1  Particle Size Distribution of Granulated Rubber
MRWA 237.1  Steel Content of Granulated Rubber
MRWA 238.1  Rubber Content of Bitumen/Rubber Blends
MRWA 250.1  Colour of Aggregate
MRWA 310.1  Pavement Skid Resistance: British Pendulum Method
MRWA 311.1  Texture Depth
MRWA 312.1  Ball Embedment
MRWA 340.1  Sprayed Binder Application Rate: Carpet Tile Method
MRWA 700.1  Sampling Procedures for Bitumen and Oils
MRWA 756.2  Stone Coating and Water Resistance Test - Cationic Bitumen Emulsions

**Other Publications**

NAASRA  Bituminous Surfacing Sprayed Work (January 1989)
AUSTROADS  Bitumen Sealing Safety Guide
AUSTROADS  Specification for Mechanical Sprayers of Bituminous Materials
WA GOVT  Dangerous Goods Regulations 1992
2 MATERIALS

2.1 CLASS 170 BITUMEN

2.1.1 Bitumen Supply

The bitumen shall be a straight run, slightly blown or blended product prepared by distillation from crude bituminous base oils. The bitumen shall be homogeneous. It shall not foam when heated to 205°C. The formation of a thin layer of bubbles will not be regarded as foaming.

Prior to the proposed use of bitumen, the Contractor shall notify the Superintendent in writing including full details of the nominated bitumen supplier, bitumen supply source and typical test results demonstrating conformance to the specification.

The Contractor shall demonstrate compliance with bitumen property requirements by supplying copies of the nominated bitumen supplier’s relevant reports as per Clause 2.1.5 - Sampling And Testing At Refinery Or Bulk Depot for each batch supplied during the Contract and, when requested by the Superintendent, by carrying out testing in accordance with Clause 2.1.5 - Sampling And Testing At Refinery Or Bulk Depot.

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.

2.1.2 Safety Measures in Loading

In order to avoid the danger of mixing incompatible bituminous products in any cartage vehicles provided by the Contractor for the purpose of transporting bitumen, the Contractor shall ensure that the bitumen supplier’s loading procedures are understood and the Bitumen 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.

2.1.3 Bitumen Properties
Bitumen properties shall conform to the specification for Class 170 residual bitumen shown in AS 2008 and to the properties shown in Table 1 - Properties of Class 170 Bitumen (Clause 2.1.4).

The durability requirements are applicable only to final surface sealing or resealing treatments and are based on a target value of 10 days with a minimum value of 9.5 days and no maximum value.

2.1.4 TABLE 1 – Properties of Class 170 Bitumen

<table>
<thead>
<tr>
<th>Method Of Test</th>
<th>Property</th>
<th>Range of Product Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>AS 2341.2</td>
<td>Viscosity at 60°C, Pa.s</td>
<td>140</td>
</tr>
<tr>
<td>AS 2341.2</td>
<td>Viscosity at 135°C, Pa.s</td>
<td>0.25</td>
</tr>
<tr>
<td>AS 2341.12</td>
<td>Penetration at 25°C, (100g, 5s), pu (1 pu = 0.1 mm)</td>
<td>62</td>
</tr>
<tr>
<td>AS 2341.7</td>
<td>Density at 15°C, kg/m³</td>
<td>1000</td>
</tr>
<tr>
<td>AS 2341.14</td>
<td>Flash Point, °C</td>
<td>250</td>
</tr>
<tr>
<td>AS 2341.8</td>
<td>Matter insoluble in toluene, percent</td>
<td>-</td>
</tr>
<tr>
<td>AS 2341.10</td>
<td>Short-term effect of heat and air (Rolling Thin Film Oven Test)</td>
<td>-</td>
</tr>
<tr>
<td>AS 2341.2 or AS 2341.3 or AS 2341.4</td>
<td>Viscosity of residue at 60°C as percentage of original</td>
<td>-</td>
</tr>
<tr>
<td>AS 2341.13 and AS 2341.5</td>
<td>Long term effect of heat and air, days (durability value)</td>
<td>9.5</td>
</tr>
</tbody>
</table>

2.1.5 Sampling and Testing At Refinery or Bulk Depot

Sampling is to be carried out at the refinery or at the bulk storage depots to provide the basis for the nominated bitumen supplier’s reports demonstrating compliance to the specification. The
samples shall be taken so as to be representative of the bitumen to be supplied.

Where the Contractor elects to demonstrate conformance with durability value requirements by providing the relevant monthly average durability value, the minimum number of samples to be taken and tested each month for determination of the monthly average durability values shall be related to the anticipated output from each source each month in accordance with the following:

(a) Refinery Depots or Storage

Output greater than 1000 tonnes  
2 samples

Output less than 1000 tonnes  
1 sample

(b) Bulk Storage Depots

Where supply is from a bulk storage depot sourced from overseas or interstate, the minimum number of samples shall be 2 from any delivery to the bulk depot. This sampling will comprise of one sample from the first half of the delivery and the second sample will be collected from the second half of the delivery to the bulk depot.

The Contractor shall provide the Superintendent with duplicate samples of all samples used to determine monthly average durability values, for the purpose of audit testing.

Where the Superintendent performs audit testing, these test results shall be included with the suppliers results to collectively meet testing requirements for monthly average durability value.

Where the monthly average durability value is used, the calculation shall include all relevant durability values available, and the average monthly durability value and individual durability values shall be reported to the Superintendent.

All testing shall be carried out in laboratories NATA accredited to perform the relevant tests. All results for relevant tests shall be reported on NATA endorsed reports.

2.1.6 Sampling and Testing At Delivery

All bitumen delivery road tankers to be used during the contract shall have a permanent sampling cock. The sampling cock shall enable the Contractor and Superintendent to obtain representative samples of bitumen in accordance with Main
Roads WA Test Method WA 700.1 “Sampling Procedures for Bitumens and Oils”. Where delivery is in a bitumen sprayer, then equivalent suitable sampling facilities shall be provided.

Prior to mixing or blending Class 170 bitumen to be used for sealing or resealing, with any cutters, flux or adhesion agent, the Contractor shall sample a minimum of one (1) load per jobsite or road. Two samples shall be taken from each load immediately following one another in accordance with Main Roads WA Test Method WA 700.1 “Sampling Procedures for Bitumens and Oils”, such that each is similar and represents the bitumen in the load.

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 bitumen is used so that traceability between samples and road is maintained.

The Contractor shall forward one of each set of samples to the Superintendent without charge.

Unless the Contractor has provided the relevant monthly average durability value, the Contractor shall determine the durability value and the viscosity at 60°C of each set of samples based on testing one sample in each set. Where the relevant monthly average durability value has been provided the Contractor shall determine the viscosity at 60°C. Testing shall be carried out in accordance with the specified test methods by a laboratory NATA accredited to perform the tests. The test reports shall be "NATA endorsed" and shall be supplied to the Superintendent within 1 week of use of the bitumen.

Where testing shows a non-conformance, the minimum level of sampling and testing shall be increased until the test results demonstrate that the bitumen conforms to the specification.

2.1.7 Audit Sampling and Testing

In addition to audit samples provided by the Contractor in accordance with Clause 2.1.5 - Sampling and Testing at Refinery or Bulk Depot or Clause 2.1.6 - Sampling and Testing at Delivery, 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 at all times within the hours of work of the Contractor or its Sub-contractors.
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.

When taking audit samples, three samples will be taken from a load immediately following one another in accordance with sampling procedure WA 700.1 “Sampling Procedures for Bitumens and Oils”. They will be taken in such a manner that each is similar and represents the bitumen in the load.

Each of the three sample containers will be marked with an identical reference number. One sample will be given to the Contractor and the other two retained by the Superintendent.

The Superintendent may test any of the samples provided by the Contractor in accordance with Clause 2.1.5 - Sampling And Testing At Refinery or Bulk Depot or Clause 2.1.6 - Sampling And Testing At Delivery, or audit samples taken for any or all of the properties specified in Clause 2.1.3 - Bitumen Properties, or other tests as required. Such testing shall be performed by a laboratory NATA accredited to perform the tests. The test reports will be "NATA endorsed" and the Superintendent will supply copies to the Contractor.

When tests carried out by the Superintendent are included in the determination of the monthly average durability value then non-conformances shall be determined based on the monthly average value and not individual values. Except as allowed in Clause 2.1.7 - Audit Sampling And Testing and Clause 2.1.8 - Transport of Bitumen, when tests carried out by the Superintendent show a non-conformance, the result is disputed by the Contractor, and agreement cannot be reached, the third sample, whether held in the Contractor’s store or held by the Superintendent, shall be submitted to an agreed independent NATA accredited laboratory for testing. The average of all test results shall be calculated and this result shall be deemed the correct result. The cost of testing by the independent laboratory shall be shared equally by the Contractor and the Principal.
2.1.8 Transport of Bitumen

Bitumen shall be loaded into road tankers at temperatures between 185°C and 205°C.

Road tankers for use under this Contract shall be logged, and shall have calibrated thermometers located at the top, middle and bottom thirds of the product tank. If heating in a road tanker is necessary to maintain or achieve a satisfactory delivery temperature, the tanker shall be provided with heating tubes and pipework to allow circulation of the product during heating.

2.1.9 Delivery/Dispatch Documentation

All bitumen or bitumen cutback supplied under this Contract must be accompanied by a delivery/dispatch docket clearly indicating the following:

(a) name of the bitumen supplier;
(b) location of the dispatch facility;
(c) date and time of product loading;
(d) supplier's batch number for the bitumen loaded;
(e) product type(s);
(f) quantity or mass of each product loaded; and
(g) temperature of the product at time of loading.

A copy of the delivery/dispatch docket must be supplied to the onsite Superintendent's Representative at time of delivery to the site.

A copy of the Supplier's ‘Certificate of Quality’ for each bitumen batch supplied shall be submitted to the onsite Superintendent’s Representative at time of delivery to site.

2.1.10 Bitumen Handling

In respect to the loading, transporting, heating, circulation, blending, transfer and sampling of bitumen and bitumen cutbacks the Contractor is advised to follow procedures as detailed in the AUSTROADS “Bitumen Sealing Safety Guide” publication and the Shire’s safety guidelines.

The Contractor shall also observe the provisions of the Dangerous Goods Regulations 1992 in respect to the cartage of Dangerous Goods including Flammable Liquids.

2.1.11 Heating and Circulating
Heating of bitumen between the loading and delivery sites shall be avoided and, except in emergency circumstances, shall only be permitted at nominated circulating depots.

Prior to any proposed heating of bitumen between loading and delivery sites, the Contractor shall nominate to the Superintendent the proposed location of circulating depots for such heating to take place.

The heating and circulating of bitumen shall be done only by properly trained personnel. The circulating rate shall not be less than 450 litres per minute. Circulating shall continue for at least twenty minutes after heating ceases. The heating rate shall not exceed 30°C per hour at any stage during the heating process. Burners shall not be used unless the level of the material in the heating tank is at least 150 mm above the tops of the heating tubes.

If it becomes necessary to heat bitumen after loading or in storage on site, under no circumstances shall the temperature be raised greater than 205°C. Any bitumen that has been reheated to a temperature higher than 205°C after loading into road tankers, or that has been otherwise contaminated, shall not be used in the Works and shall be removed from site by the Contractor at no cost to the Principal.

2.2 BITUMEN EMULSION

2.2.1 General

The bitumen used for the manufacture of the bitumen emulsion shall be a straight run, slightly blown or blended product prepared by distillation from crude bituminous base oils. The bitumen shall be homogeneous and shall not foam when heated to 205°C. The formation of a thin layer of bubbles will not be regarded as foaming.

The properties of the bitumen shall conform to the requirements for Class 170 Residual Bitumen set out in AS 2008. The requirement for density at 15°C shall be a minimum of 1000 kg/m³.

The Contractor shall notify the Superintendent in writing, prior to any proposed change in the source of the crude or crudes from which the bitumen emulsion is being produced and supplied to the Works, or to changes in the manufacturing process.

2.2.2 Inspection and Sampling
In the case of the Class 170 bitumen to be used in the bitumen emulsion manufacture, all sampling shall be conducted in accordance with WA 700.1. In the case of all other bitumen emulsion, sampling shall be conducted in accordance with AS 1160, except that one representative sample only shall be prepared from each delivery using suitable sized glass or plastic containers.

2.2.3 Transportation of Bitumen Emulsion

Bitumen shall be loaded into road tankers at a temperature that ensures the product remains stable. Road tankers for use under this Contract shall be lagged and shall have thermometers located to give a representative temperature of the product in the tanker. The tanker shall be provided with facilities to enable circulation and mixing of bitumen emulsion prior to unloading.

2.2.4 Heating and Circulating of Bitumen Emulsion

The heating and circulating of bitumen shall be done only by properly trained personnel. The circulating rate and heating rates shall be such that no premature breaking of the bitumen emulsion occurs. It is not anticipated that the bitumen emulsion will require heating above 50°C. Circulating shall be continuous while heating is in progress. Circulating shall continue for at least ten minutes after heating ceases. Burners shall not be used unless the level of the material in the heating tank is at least 150 mm above the tops of the heating tubes. The circulatory pipework shall be such that no foaming or air entrapment occurs during circulation.

Any bitumen emulsion heated in excess of 80°C, after leaving the place of manufacture, shall not be used in the Works and shall be removed from site by the Contractor at no cost to the Principal. The quantity of bitumen emulsion heated shall be that quantity that is to be applied to the pavement within six (6) hours of the heating being carried out. However, if bitumen emulsion is held in site storage for prolonged periods, then such heating as may be necessary to prevent the bitumen emulsion temperature falling below 10°C shall be permitted.

2.3 PROTECTIVE PAPER

A heavy-duty protective paper, such as a bitumen-laminated paper, shall be used for all start, finish and taper operations. The paper shall be held securely in place during spraying operations,
and shall be of sufficient width and strength to prevent overspray and spillage during removal.

2.4 **MEDIUM CURING CUTTING OIL**

Medium curing cutting oil shall be a petroleum product conforming to the requirements shown in Table 2 – Medium Curing Cutting Oil (Clause 2.5).

2.5 **TABLE 2 - MEDIUM CURING CUTTING OIL**

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirements</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillation</td>
<td></td>
<td>ASTM D86</td>
</tr>
<tr>
<td>Initial Boiling Point</td>
<td>132 - 160°C</td>
<td></td>
</tr>
<tr>
<td>Final Boiling Point</td>
<td>265°C max</td>
<td></td>
</tr>
<tr>
<td>Temperature at 50% Recovery</td>
<td>220°C max</td>
<td></td>
</tr>
<tr>
<td>Flash Point (Pensky Martin Closed)</td>
<td>35°C min</td>
<td>AS 2106</td>
</tr>
<tr>
<td>Viscosity at 40°C</td>
<td>1.0 - 1.4 mm²/s</td>
<td>ASTM D445</td>
</tr>
<tr>
<td>Density at 15°C</td>
<td>780 - 820 kg/m³</td>
<td>AS 2341.7</td>
</tr>
<tr>
<td>Miscibility with Equal Parts of Class 170 Bitumen</td>
<td>Complete No Precipitation</td>
<td></td>
</tr>
<tr>
<td>Water Content</td>
<td>0.05% max</td>
<td>AS 2341.9</td>
</tr>
<tr>
<td>Percentage Aromatics</td>
<td>15% min. (Vol)</td>
<td>ASTM D1319</td>
</tr>
</tbody>
</table>

**NOTE:** Alternatively, supply of certified Aviation Turbine Fuel-Jet A1 with a statement that it had been denatured and supplied without other change as Medium Curing Cutting Oil is acceptable.

2.6 **SLOW CURING CUTTING OIL**

Slow curing cutting oil shall be the recognised petroleum product distillate fuel oil conforming to the requirements shown in Table 3 – Slow Curing Cutting Oil (Clause 2.7).

2.7 **TABLE 3 - SLOW CURING CUTTING OIL**
<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillation</td>
<td></td>
<td>ASTM D86</td>
</tr>
<tr>
<td>Initial Boiling Point</td>
<td>170 - 195°C</td>
<td></td>
</tr>
<tr>
<td>Final Boiling Point</td>
<td>360 - 400°C</td>
<td></td>
</tr>
<tr>
<td>Temperature At 50% Recovery</td>
<td>250 - 290°C</td>
<td></td>
</tr>
<tr>
<td>Flash Point (Pensky Martin Closed)</td>
<td>65°C min</td>
<td>AS 2106</td>
</tr>
<tr>
<td>Viscosity At 40°C</td>
<td>2.0 - 4.0 mm²/s</td>
<td>ASTM D445</td>
</tr>
<tr>
<td>Miscibility With Equal Parts Of Class 170 Bitumen</td>
<td>Complete No Precipitation</td>
<td></td>
</tr>
<tr>
<td>Water Content</td>
<td>0.05% max</td>
<td>AS 2341.9</td>
</tr>
</tbody>
</table>

NOTE: Alternatively, supply of certified Automotive Distillate, with a statement that it had been supplied without change as SC Cutting Oil, is acceptable.

2.8 PRECOATING AGENT

Except for fine aggregates such as sands and crusher dust, all aggregate used as cover material with Class 170 bitumen or cutback Class 170 bitumen shall be precoated with slow curing cutting oil and adhesion agent to the requirements of TABLE 3 - SLOW CURING CUTTING OIL (Clause 2.7) and TABLE 4 - ADHESION AGENTS (Clause 2.10). The proportion of mixing and rate of precoating shall be as detailed in Annexure B.

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

2.9 ADHESION AGENT

An adhesion agent shall be supplied from the list of approved adhesion agents given in Table 4 – Adhesion Agents (Clause 2.10). The Contractor shall nominate in the Tender the brand name of the adhesion agent proposed to be used.

Adhesion agent shall be added to hot bitumen, rubberised bitumen and cutback bitumen binders used for primes, primerseals and conventional seals or reseals, in the proportion given in Annexure B.
2.10 **TABLE 4 - ADHESION AGENTS**

<table>
<thead>
<tr>
<th>Adhegen 572/60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitumite</td>
</tr>
<tr>
<td>Bitumite 3995/60</td>
</tr>
<tr>
<td>Bitumite Concentrate *</td>
</tr>
<tr>
<td>Megamine BA</td>
</tr>
<tr>
<td>Radiamine 6681 *</td>
</tr>
<tr>
<td>Radiamine 6681/40</td>
</tr>
<tr>
<td>Radiamine 6681/60</td>
</tr>
<tr>
<td>Redicote N422 *</td>
</tr>
<tr>
<td>Redicote 422/60</td>
</tr>
<tr>
<td>TAA 2500</td>
</tr>
<tr>
<td>Wetfix F</td>
</tr>
</tbody>
</table>

(* Approved for use in bitumen scrap rubber seals)

2.11 **AGGREGATES**

2.11.1 General

Aggregate cover material shall be a fresh clean crushed and/or screened aggregate of uniform quality and free from soft or weathered particles, clay or other deleterious matter. In the case of aggregates for sand/crusher dust primerseals the cover aggregate should contain a range of particle sizes so as to approximate a maximum density grading (excluding clay and silt fraction).

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

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

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

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.

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

All aggregate shall be sampled in accordance with MRWA WA 200.1. The aggregate shall be tested in accordance with the test methods detailed in Table 5 – Source Rock Requirements (Clause 2.11.3) and Table 6 – Physical Properties (Clause 2.11.5).

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.

### 2.11.2 Properties of Source Rock

The Contractor shall select source rock from an approved quarry site such that the feed to the primary crusher is fresh, hard, durable rock free from clay, organic matter, weathered (except as allowed below) or friable material.

A classification system for rock material weathering is defined in Table A9 of AS 1726. The proportions of weathered rock material in the source rock shall not exceed the following limits by mass:

- Slightly weathered rock: 10% max
- Distinctly weathered rock: 0.1% max
- Extremely weathered rock: 0.1% max
- Residual soil: 0.0% max

Sand used for primer sealing applications may contain a percentage of clay or silt, although preference should normally be given to materials free of an excess of these fractions. There is need to test naturally occurring sand for conformance to source rock requirements as detailed in Table 5 – Source Rock Requirements (Clause 2.11.3).

Selection of source rock shall be such that other requirements shown in Table 5 – Source Rock Requirements (Clause 2.11.3) are satisfied.
### 2.11.3 TABLE 5 - Source Rock Requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>Limit</th>
<th>Method Or Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Abrasion Value</td>
<td></td>
<td>MRWA Test Method</td>
</tr>
<tr>
<td>Basalt</td>
<td>25% max *</td>
<td>WA 220.1</td>
</tr>
<tr>
<td>Granite and other rock types</td>
<td>35% max *</td>
<td></td>
</tr>
<tr>
<td>Wet Strength</td>
<td>100 kN min *</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td>Wet/Dry Strength Variation</td>
<td>35% max *</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td>Unsound Particles</td>
<td>5% max</td>
<td>AS 1141.32</td>
</tr>
<tr>
<td>Stripping Test Value (with 0.5% Adhesion agent in binder)</td>
<td>10% max</td>
<td>AS 1141.50</td>
</tr>
<tr>
<td>Pendulum Friction Test (PAFV)</td>
<td>45 min *</td>
<td>AS 1141.42</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>2% max</td>
<td>AS 1141.6.1</td>
</tr>
</tbody>
</table>

**NOTES:** These values may be varied by the Superintendent to suit rock availability, type or condition of use. Approved adhesion agents for use in the stripping test AS 1141.50 are listed in Table 4 – Adhesion Agents (Clause 2.10).

### 2.11.4 Properties of Crushed Aggregate

The Contractor shall process the source rock to produce crushed aggregate satisfying specified requirements. The aggregate shall be clean, hard and durable. It shall be free from clay, organic matter and elongated particles.

The aggregate shall be of a uniform colour for the whole of the Works.

Physical properties of crushed aggregates shall conform to the requirements of Table 6 – Physical Properties (Clause 2.11.5).
## 2.11.5 TABLE 6 – Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content</td>
<td>Dry (free of visible surface moisture)</td>
<td>WA 212.1 or 212.2</td>
</tr>
<tr>
<td>Los Angeles Abrasion Value - *</td>
<td>35% max.(granite)</td>
<td>WA 220.1</td>
</tr>
<tr>
<td>(Not applicable for crusher dust, sand, 7mm and 5mm aggregate)</td>
<td>25% max.(basalt) *</td>
<td></td>
</tr>
<tr>
<td>Flakiness Index</td>
<td>35% maximum</td>
<td>WA 216.1</td>
</tr>
<tr>
<td>(Not applicable for crusher dust, sand, 7mm and 5mm aggregate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particle Size Distribution</td>
<td>As per Table 7</td>
<td>WA 210.1</td>
</tr>
<tr>
<td>Water Absorption of Fine and Coarse Aggregate</td>
<td>2% maximum</td>
<td>AS 1141 6.1</td>
</tr>
<tr>
<td>Unsound Particles</td>
<td>5% maximum</td>
<td>AS 1141.32</td>
</tr>
</tbody>
</table>

**NOTE:** *These values may be varied by the Superintendent to suit rock availability, type or condition of use.*

The specification for Flakiness Index shall be applicable to the mean of the three results determined for each lot.

The Average Least Dimension (ALD) of the aggregate in each on site stockpile shall be determined in accordance with AS 1141.20.1 at a frequency of not less than 5 increments per 1000m³ of the stockpile or part thereof. The ALD values shall be used in calculating the Binder Application Rate (BAR), as referenced in Clause 3.2 Design Methods.

The particle size distribution of the crushed aggregate shall comply with Table 7 – Particle Size Distribution Percentage By Mass Passing Each Sieve (Clause 2.11.6). The specification shall apply to the mean of the three results determined for each lot.
2.11.6 TABLE 7 – Particle Size Distribution Percentage By Mass Passing Each Sieve (Mean of Three Samples)

<table>
<thead>
<tr>
<th>AS Sieve Size (mm)</th>
<th>20 mm</th>
<th>16 mm</th>
<th>14 mm</th>
<th>10 mm</th>
<th>7 mm</th>
<th>5 mm</th>
<th>3 mm</th>
</tr>
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<tbody>
<tr>
<td>26.50</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>19.00</td>
<td>80-100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>16.00</td>
<td>0-20</td>
<td>80-100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>13.20</td>
<td>0-20</td>
<td>0-20</td>
<td>80-100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.50</td>
<td>0-2</td>
<td>0-20</td>
<td>80-100</td>
<td>100</td>
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<td></td>
<td></td>
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<td>6.70</td>
<td>0-2</td>
<td>0-20</td>
<td>80-100</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.75</td>
<td>0-2</td>
<td>0-25</td>
<td>80-100</td>
<td>100</td>
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</tr>
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<td>2.36</td>
<td>0-2</td>
<td>0-30</td>
<td>80-100</td>
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<tr>
<td>1.18</td>
<td>0-0.5</td>
<td>0-0.5</td>
<td>0-0.5</td>
<td>0-0.5</td>
<td>0-1.0</td>
<td>0-30</td>
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</tr>
<tr>
<td>0.60</td>
<td>0-5</td>
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<td></td>
</tr>
<tr>
<td>0.425</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

(Test sieves shall comply with the requirements of Grade B sieves defined in AS 1152)

3 DESIGN OF BITUMINOUS SURFACING

3.1 GENERAL

The bituminous surfacing shall be designed by the Contractor. The Contractor shall be responsible for and shall carry out the design for the type of treatment(s) specified by the Principal.

3.2 DESIGN METHODS

The design of bituminous surfacing shall include selection of binder class 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) Seals and Reseals (Class 170 bitumen)
Single and Double – Double seal design, binder composition, binder application rates and aggregate spread rates shall be in accordance with the requirements of the \textit{Austroads Provisional Sprayed Seal Design Method Revision 2000 (AP-T09)}. Testing for Average Least Dimension (ALD) shall be carried out in accordance with AS 1141.20.1. Sampling for testing of ALD shall be in accordance with either AS1141.20.1 or Main Roads WA Test Method WA 200.1. Testing for surface texture shall be in accordance with Main Roads WA Test Method WA 311.1 or equivalent current Austroad test methods. Testing for ball embedment the test shall be in accordance with Main Roads WA Test Method WA 312.1 or equivalent test methods as recommended in the current Austroad Publication.

\textbf{3.3 DESIGNED BY THE PRINCIPAL (In the unlikely event where the Shire decided to undertake the design for a particular road)}

Where Binder Application Rate(s) and other aspects of the bituminous surfacing treatment have been provided by the Principal, the Superintendent will as necessary, order any variations to such design.

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

(a) Average Least Dimension (ALD) of the aggregate;
(b) Aggregate precoating rate;
(c) Binder Application Rate (BAR);
(d) Binder composition;
(e) Aggregate spread rate; and
(f) Rolling and sweeping requirements.

\textbf{3.4 DESIGNED BY THE CONTRACTOR}

\textbf{3.4.1 General}

Where the Contractor is responsible for the design of the bituminous surfacing treatment, the design shall be in accordance with the procedures described in Clause 3.2 Design Methods.

\textbf{3.4.2 Preliminary Design}

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 treatment is to be applied;
(d) Traffic volume and composition data provided by the Principal on request;
(e) A visual assessment of the condition of the surface on which the treatment is to be applied and the defects present; and
(f) Climatic data relevant to the Site.

3.4.3 Final Design

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 3.4.2 Preliminary Design.

Prior to the application of any bituminous surfacing, the Contractor shall provide the Superintendent with evidence of the application of appropriate design methods as outlined in Clause 3.2 Design Methods including the comprehensive reference of Austroads Provisional Sprayed Seal Design Method Revision 2000 (AP-T09).

During application of a treatment 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.

4 PREPARATORY OPERATIONS

4.1 BITUMEN STORAGE AND DISPOSAL FACILITIES

4.1.1 Bitumen Storage Sites (if required)

The Contractor shall select suitable approved sites for bitumen storage (if required) and notify the Superintendent at least five (5) days in advance of establishment or use.

The Contractor shall ensure that site layout and safe handling procedures conform to the Principal’s safety requirements and Austroads "Bitumen Sealing Safety Guide" (1995).
The Contractor shall provide and maintain the necessary equipment to receive, hold, heat, circulate, handle and protect bulk bitumen as required by his method of working from the time of receipt to prevent misuse, damage, deterioration or loss.

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

The Contractor shall keep on the site for independent measurement of temperature, one mercury glass maximum recording thermometer calibrated up to 260°C, complete with a protective casing with cut out and lifting ring and one refill for the thermometer.

Suitable equipment shall be supplied by the Contractor to facilitate removal of liquid used to flush pumps and lines to approved disposal sites.

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.

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 $\pm 0.5\%$.

### 4.1.2 Bitumen Disposal Sites

The Contractor shall be responsible for the disposal and tipsite related expenditures for bitumen, bituminous products and other disposable items such as protective paper and shall notify the Superintendent of these sites at least five (5) days in advance of work commencement. There is no allowance for the use of any of the Shire’s tipsites or properties for such disposals in this contract.

Any area so used without the approval of the Superintendent shall be made good to the Principal’s satisfaction immediately at no cost to the Principal.

### 4.2 AGGREGATE DUMP SITES

#### 4.2.1 General
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 in any way. Surplus aggregate shall be removed from temporary stockpiles and the aggregate stockpile sites shall be fully cleaned and rehabilitated.

For holding aggregate supplied by the Contractor, temporary stockpile sites shall be prepared and maintained in good condition by the Contractor.

Prior to the stockpiling of aggregate, the Contractor shall nominate to the Superintendent the proposed location of the stockpile sites for approval. Stockpile sites not included on the Principal’s Stockpile site list will not be approved for stockpiling use.

4.2.2 Site Preparation

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.

Clearing of sites shall be in accordance with the Superintendent’s requirements relevant to each individual site.

4.2.3 Precoating

All aggregate shall be precoated at least 24 hours but not more than seven (7) days before its intended use. The rate of application of precoating agent shall be as stated in Annexure B.

The application rate of precoating agent shall be within 20% of the ordered rate.

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

5 BITUMINOUS SURFACING APPLICATION

5.1 GENERAL

The application of bituminous surfacing 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 A and B.
5.2 CLASS 170 BITUMEN BINDERS

5.2.1 General

Bituminous surfacing using Class 170 bitumen as the principal binder shall consist of one or more of the following treatments:

(a) Prime coats; and
(b) Seal and Reseal Coats.

5.2.2 Prime Coats

Class 170 residual bitumen shall be mixed with medium curing cutting oil in the proportions as detailed in Annexure B. In addition, adhesion agent shall be added to the binder in accordance with Clause 2.9 Adhesion Agent. 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.

5.2.3 Seal and Reseal Coats

Class 170 residual bitumen mixed with adhesion agent as detailed in Annexure B.
Depending on the anticipated road temperature, medium curing cutting oil shall be added to the binder in accordance with Figure B1 “ADDITION OF MEDIUM CURING CUTTING OIL” of Annexure B (Item 5).

5.3 BITUMEN EMULSION BINDERS

5.3.1 General

Bituminous surfacing using bitumen emulsion as the principal binder shall consist of the following treatment:

5.3.2 Seal Coats

Either one or two coat bitumen emulsion seals using the nominal sized crushed aggregate as specified in Annexure B. Binder Application Rates (BAR) shall be as specified in Annexure B.

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.

5.4 PLANT AND EQUIPMENT
5.4.1 Mechanical Sprayer

5.4.1.1 General

Binder shall be applied using a bulk bitumen sprayer of minimum capacity 5000 litres. The sprayer shall comply with the relevant sections of “Specification for Mechanical Sprayers of Bituminous Materials” issued by AUSTROADS. 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.

The sprayer shall have been tested to MRWA requirements for uniformity of transverse distribution and calibrated for overall rates of application. The tests shall have been performed within the past twelve (12) months for spray rates at least 15 per cent higher than required for the Works.

Prior to the use of the sprayer on the Works, the Contractor shall make available to the Superintendent the certificates and charts (preferably MRWA issued) relating to the performance of the sprayer.

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 MRWA Test Method 340.1 “Sprayed Binder Application Rate – Carpet Tile Method”. 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; and

(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.

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.

The Contractor shall, except as otherwise provided for in the Clause Sealed Shoulders, have available Copley EA4 MRWA End Nozzles or suitable equivalents for use in spraying edges. Copley A4 nozzles or suitable equivalents shall be fitted to the remainder of the spray bar.

### 5.4.1.2 Sealed Shoulders

The Contractor may use various configurations of A4, A5, B6 and B8 spray nozzles for the spraying of the sealed shoulders and carriageway simultaneously. The use of these spray nozzles shall be in accordance with the requirements of this Clause.

The Contractor shall carry out, to the satisfaction of the Superintendent, preliminary trials of the intended use of the Copley A4, B5, B6 and B8 nozzle configurations. The trials may determine the bar configuration needed to achieve the desired Binder Application Rate (BAR).

The Contractor shall carry out the trials for each sprayer intended to be used. The trial sections will be located within the works area. The length and width of the sections will be determined by agreement between the Superintendent and the Contractor. The trial method shall be MRWA WA 340.1 or other such method as agreed with the Superintendent.

All costs for conducting the test shall be the responsibility of the Contractor.

### 5.4.2 Rollers

Rollers shall be rubber tyred rollers, and shall be self-propelled with minimum mass of 11 tonnes and have multi wheels each exerting a minimum load of 10 kN. The wheels shall have smooth pneumatic tyres inflated to pressures of at least 700 kPa. Rollers shall be equipped with twin amber flashing lamps visible from both the front and rear of the unit. These lamps shall be of a standard equivalent to the North American Signal Company Amber Revolving Sealed Beam Emergency Lite, Model 300 or those approved by the Shire.

### 5.4.3 Road Broom
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.

The broom, or its prime mover, shall be equipped with twin amber flashing lamps visible from both the front and rear of the unit. These lamps shall be of a standard equivalent to the North American Signal Company Amber Revolving Sealed Beam Emergency Lite, Model 300 or those approved by the Shire. The Contractor's attention is drawn to the need to obtain the approval of the Commissioner of Police prior to fitting and operating a flashing amber lamp under Regulation 1210 of the Road Traffic Code 1975.

5.4.4. Drag Broom

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.

5.4.5 Precoater

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).

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

5.4.6 Screening

The precoater shall also be capable of screening dirt/foreign matter (both oversize and undersize materials) from the aggregate during its operation. The Contractor shall detail in its tender the aperture of the screens to be used for this task.

5.4.7 Surface Damage

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

5.5.1 Existing Bitumen Surface

Where the pavement surface to be surfaced is an existing bitumen surface, or has been surfaced or sealed with bitumen as part of previous operations, 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. Brooming shall extend at least 300mm wider than the binder width. Traffic shall be kept off swept area. If this is not possible, traffic travel speed shall be kept below 20km/hr.

Loose material shall be swept a sufficient distance off the pavement to permit execution of the bitumen surfacing.

A minimum of one (1) hour prior to the bituminous surfacing as a subsequent surfacing treatment being applied, 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 subsequent bituminous treatment.

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.

5.6 PROVISION FOR TRAFFIC

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.

The Contractor shall supply MRWA registered traffic controllers, signs, lights, plus any other necessary equipment, and erect and maintain same in good condition in accordance with AS 1742. 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.
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.

Proposals to impose temporary (40 or 60 kilometres per hour) speed restrictions must be notified to the Superintendent prior to their implementation.

5.7 BINDER PREPARATION

5.7.1 Conventional Binders

Bitumen and other constituents as detailed in Annexure B 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.

Adhesion agent shall be dissolved in the hot binder and thoroughly mixed within three (3) hours prior to the binder being sprayed on the road. The amount of adhesion agent shall be as specified in Annexure B. 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%.

The binder spraying temperature shall be as specified in Annexure B.

5.7.2 Bitumen Emulsions

Bitumen emulsion as specified in Clause 2.2 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.

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.

5.8 APPLICATION - CLASS 170 BITUMENS

5.8.1 General
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. No binder shall be applied whilst the pavement surface temperature is less than:

(a) 25°C for seals and reseals; and
(b) 20°C for primes or primerseals.

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.

5.8.2 Application Rate

The binder application rate (BAR) for tender purposes shall be as detailed in Annexure B. Where adjustments to the binder application rates in excess of 7.5 percent of the designed rates are ordered by the Superintendent then changes to the Contractor's rates for sealing shall be made as follows (if a $ per m² unite of rates is used):

\[
URN = URT + (ARN - ART)L
\]

Where:

- **URN** = New Rate for prime, primerseal or seal ($ per m²).
- **URT** = Tendered rate for prime, primerseal or seal as applicable ($ per m²).
- **ARN** = New binder application rate (Litres per m²).
- **ART** = Tendered binder application rate (Litres per m²).
- **L** = Rate per litre tendered for variation in the Schedule of Rates ($ per litre).

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

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.

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 the Clause 5.13 NON-CONFORMANCE IN BINDER APPLICATION.

5.8.3 Volume Conversion
Table 8 - Conversion Factors - Prime Coats Binder Blend Of 40% Bitumen – 60% Mc Cutter (Clause 5.8.4) and Table 9 - Conversion Factors - Primerseals, Seals & Reseals (Clause 5.8.5) 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) \text{Volume or spray rate at 15°C equals the Volume or spray rate at } T \degree C \text{ multiplied by the Factor for } T \degree C

(b) \text{Volume or spray rate at } T \degree C \text{ equals the Volume or spray rate at 15°C divided by the Factor for } T \degree C

**TABLE 8 - Conversion Factors - Prime Coats Binder Blend Of 40% Bitumen – 60% Mc Cutter**

<table>
<thead>
<tr>
<th>Observ(\text{ed Temp } T \degree C)</th>
<th>Factor For (T \degree C)</th>
<th>Observ(\text{ed Temp } T \degree C)</th>
<th>Factor For (T \degree C)</th>
<th>Observ(\text{ed Temp } T \degree C)</th>
<th>Factor For (T \degree C)</th>
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<tr>
<td>15</td>
<td>1.000</td>
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<td>0.9543</td>
<td>145</td>
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<td>0.9578</td>
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</table>
TABLE 9 - Conversion Factors - Primerseals, Seals & Reseals

<table>
<thead>
<tr>
<th>Observed Temp T °C</th>
<th>Factor For T °C</th>
<th>Observed Temp T °C</th>
<th>Factor for T °C</th>
<th>Observed Temp T °C</th>
<th>Factor For T °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1.000</td>
<td>80</td>
<td>0.9597</td>
<td>145</td>
<td>0.9207</td>
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<td>0.9446</td>
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<td>0.9060</td>
</tr>
<tr>
<td>45</td>
<td>0.9813</td>
<td>110</td>
<td>0.9416</td>
<td>175</td>
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</tr>
<tr>
<td>50</td>
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<td>0.9385</td>
<td>180</td>
<td>0.9002</td>
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<tr>
<td>55</td>
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<td>120</td>
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<td>60</td>
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<tr>
<td>65</td>
<td>0.9689</td>
<td>130</td>
<td>0.9296</td>
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<td>0.8915</td>
</tr>
<tr>
<td>70</td>
<td>0.9658</td>
<td>135</td>
<td>0.9266</td>
<td>200</td>
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<td>75</td>
<td>0.9628</td>
<td>140</td>
<td>0.9236</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Factors for intermediate temperatures in Tables 10 and 11 may be obtained by direct interpolation.

5.8.6 Spraying

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

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 10m before the protective paper and shall cross the paper at its correct spraying speed. The sprayer shall maintain its correct spraying speed over the full length of each run and shall cross the finish paper at this speed. 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.

All outside edges of the seal, parallel to the road centreline shall be sprayed with Copley EA4 MRWA edge nozzles or suitable equivalent.

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.
The binder shall be sprayed onto areas as requested by the Superintendent, or as otherwise specified between two lines as defined by the line markers and thesurfacing widths given in Annexure B. The sprayed binder edge shall conform to the following requirements:

(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); and

(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).

The Contractor shall take all necessary precautions to prevent binder from adhering to any existing structure or vehicles nearby. 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.

5.8.7 Existing Guideposts

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

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.

5.9 APPLICATION OF COVER MATERIAL

5.9.1 Aggregate Primerseals and Seals

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. 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 aggregate within ten (10) minutes of spraying the binder. The length of spray runs shall be limited to ensure compliance with this requirement.

Prior to the spreading of the aggregate, the load in a truck representative of those to be used for the Work shall be levelled in the body for measurement purposes. A level indicator (with conversion to volume) on the inside wall of the tray will be preferable.

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.

5.9.2 Rolling and Drag Brooming

Immediately after application of the cover material, the surface shall be rolled with rubber tyred rollers only to the number of passes as stated in Annexure B over the whole area. For the first four passes, rollers shall be operated at speeds less than 7 km per hour. Drag brooming shall be carried out after every second pass of rolling.

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

5.9.3 Surface Sweeping

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.

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.

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. 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.

The Contractor shall install “LOOSE STONE” signs and other temporary traffic management signs in accordance with the requirements of this Tender. The signs shall remain in place on each section of the Works for the following seven (7) days after completion of sealing.

5.10 APPLICATION - BITUMEN EMULSIONS

Binder shall not be applied during wet or rainy conditions, nor when adverse weather conditions may prevail at any time during such work. Binder shall be applied only when the pavement temperature is between 10°C and 40°C.

The binder spraying temperature range shall be 35°C to 50°C for conventional emulsions, and shall be 50°C to 80°C for high bitumen content emulsions.

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

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 EA4 edge nozzles or suitable equivalent. Where the direct use of the mechanical sprayer is impracticable, the binder may be applied using a hand lance fed from the mechanical sprayer.

The binder shall be sprayed onto areas as detailed in the drawings, or as otherwise specified between two lines as defined by the line markers and the surfacing widths given in Annexure B. The sprayed binder edge shall conform to the following requirements:

(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); and
(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).

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.

In two-coat applications, 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 primerseal leaving no water in the binder.

5.11 WORKS RECORDS

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

5.12 NON-CONFORMING TEST RESULTS

When supplier reports, monthly average durability values, testing at delivery or audit test results indicate a non-conformance then a hold point shall apply except when:

(a) Durability value determinations are included in the calculation of the average monthly durability value and the average value is conforming; and

(b) The viscosity at 60°C measured in accordance with Clause 06.05 is not more than 10% higher than specified in Clause 2.1.3 Bitumen Properties.

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.

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.

The Superintendent may initiate testing of other samples retained but not previously tested.

5.13 NON-CONFORMANCE IN BINDER APPLICATION

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 10 - PAY FACTORS FOR BITUMINOUS SEALS & RESEALS (Clause 5.14) for Seals and Bitumen Emulsion Primerseals.

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 Table 10 - PAY FACTORS FOR BITUMINOUS SEALS & RESEALS (Clause 5.14), 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.

Where sprayed work is deemed non-conforming, the Contractor shall apply corrective action subject to the procedures contained in the Quality System Specification.

No payment shall be made for binder sprayed outside the 50mm margin specified in the Clause 5.8.6 Spraying.

5.14 TABLE 10 - PAY FACTORS FOR BITUMINOUS SEALS & RESEALS
Shire of Northam - Specification 502 Spray Seal Works  
Tender No. T2017090

Contract Name: Shoulder Widening Coates Road, Wundowie

### Actual Binder Application Rate (BAR) L/m² @ 15° (Converted)

<table>
<thead>
<tr>
<th>OAR Range</th>
<th>Quality Level</th>
<th>Pay Factor (PF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(OAR - 0.16) or less</td>
<td>Non-Conformance</td>
<td>N/A</td>
</tr>
<tr>
<td>(OAR - 0.15) to (OAR - 0.11)</td>
<td>Conditional Conformance Level 2</td>
<td>0.90</td>
</tr>
<tr>
<td>(OAR - 0.10) to (OAR + 0.10)</td>
<td>Conformance</td>
<td>1.00</td>
</tr>
<tr>
<td>(OAR + 0.11) to (OAR + 0.15)</td>
<td>Conditional Conformance Level 1</td>
<td>0.90</td>
</tr>
<tr>
<td>(OAR + 0.16) to (OAR + 0.20)</td>
<td>Conditional Conformance Level 3</td>
<td>0.70</td>
</tr>
<tr>
<td>(OAR +0.21) or more</td>
<td>Non-Conformance</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(OAR = Ordered Binder Application Rate at 15oC)

### 5.15 CRUSHED AGGREGATE

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.

### 6 MEASUREMENT AND PAYMENT

#### 6.1 BITUMINOUS SURFACING

In accordance with the "General Directions" of the Preambles to the Schedules of Rates/Bills of Quantities the rates and prices for the respective items shall be the full inclusive value of the work described in the Technical Specification and/or shown on the drawings.

Prime coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre.

Primerseal coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre.
Unless otherwise specified on the schedule of rates, Seal coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre.

Unless otherwise specified on the schedule of rates, Reseal coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre.

Removal and disposal of existing raised pavement markers shall not be measured or paid separately.

Removal, storage and reinstatement of guideposts shall not be measured or paid separately.
1 DESIGN METHODS

The design method provided in the Austroads provisional sprayed seal design method revision 2000 publication shall be used by the contractor to design all the relevant data required in this contract. Any additional required data not covered in this publication may be sourced using the information provided in this annexure.

2 CLASS 170 BITUMENS

Binder and aggregate application details – to be designed by the contractor and approved by the principal for each road to be sealed or resealed.

The percentage of each binder constituent and binder application rates (for each job) in the format as detailed in Table B1 - BINDER COMPOSITION AND APPLICATION RATES (below) shall be submitted to the Principal for approval before site works commence.

3 TABLE B1 - BINDER COMPOSITION AND APPLICATION RATES

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Binder Composition % by Volume</th>
<th>Binder Application Rate (BAR) @ 15°C (L/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 170 Bitumen</td>
<td>Medium Curing Cutting Oil</td>
</tr>
<tr>
<td>Prime</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Primerseal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seal/Reseal - Single coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seal/Reseal – Double</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second coat</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4 **TABLE B2 - AGGREGATE TYPE AND SPREAD RATE**

The type of cover material, nominal size and spread rate for Tender purposes shall be as detailed in the following Table B2 - AGGREGATE TYPE AND SPREAD RATE.

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Cover Material and size (mm)</th>
<th>Aggregate spread rate (m²/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal/Reseal – Single Coat</td>
<td>7mm, 10mm and 14mm</td>
<td>To be designed by the Contractor and approved by the Principal</td>
</tr>
</tbody>
</table>

**NOTES:**
Medium curing cutting oil shall be added to the seal/reseal coat binder in accordance with Figure B1 - ADDITION OF MEDIUM CURING CUTTING OIL. To compensate for the cutter added to the binder, the binder application rates shall be increased or decreased as advised or agreed by the Superintendent to preserve the designated residual bitumen application rate.

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.

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.**
5 FIGURE B1 - ADDITION OF MEDIUM CURING CUTTING OIL

LEGEND: Line A Class 170 bitumen

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

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

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

6 BINDER SPRAY TEMPERATURE

Binder Spraying Temperatures shall be in accordance with Table B3 – Binder Spraying Temperature.
TABLE B3 - Binder Spraying Temperature

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

7  ROLLING

Rolling of the seal surface shall be to the number of passes shown in Table B4 – Rolling (below).

TABLE B4 - Rolling

<table>
<thead>
<tr>
<th>Type of Roller</th>
<th>No. of Passes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber Tyred Roller</td>
<td>10</td>
</tr>
</tbody>
</table>

8  PRECOATING OF AGGREGATE

8.1  Precoating Agent

For all aggregates, the precoating agent shall comprise 100% slow curing cutting oil to the requirements of Clause 2.6 Slow Curing Cutting Oil, plus 1% by volume of approved adhesion agent to the requirements of Clause 2.9 Adhesion Agent.

8.2  Application Rate

The Application Rate of Precoating Agent shall be as shown in Table B5 – Application Rate for Precoating (below).
Shire of Northam - Specification 502 Spray Seal Works

Contract Name: Shoulder Widening Coates Road, Wundowie

Tender No. T2017090

TABLE B5 - Application Rate For Precoating

<table>
<thead>
<tr>
<th>Nominal Size Aggregate (mm)</th>
<th>Application Rate (litres/m$^3$ loose)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(To be designed by the Contractor for the approval of the Principal prior to commencement of site works for each road)</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

8.3 Alternative Precoating Agents

Alternative precoating agents may be considered on application by the Contractor. Any such application must list:

a) the name of the product;
b) the proposed application rate of the product;
c) the proposed time between precoating and the use of the aggregate (aggregate precoated with bitumen based products shall be stockpiled for a period of at least 1 week before use.);
d) the proposed means and timing of application of the product; and
e) a description of the components in the product and their proportions (bitumen based products shall always contain an adhesion agent).

9 ADHESION AGENT

In cutback prime, primerseal and conventional seal binders the proportion of adhesion agent shall be 0.5% of the binder volume at 15°C, or as directed by the Superintendent. In binders used for rubberised seals, the proportion of adhesion agent shall be 1.0% of the binder volume at 15°C, or as directed by the Superintendent.