SPECIFICATION 507

MICROSURFACING

REVISION REGISTER			
Clause Number	**Description of Revision**	**Authorised By**	**Issue Date**
Whole document	Reformatting	SCO	23/05/2017
Various changes made throughout the document	Whole of Document	PSM	29/01/2008
507.02	Update Austroads Test method references to current	PSM	06/09/2007
Table 507.3	Update Austroads Test method references to current	PSM	06/09/2007
507.44.03	Rewrite shape clause	PSM	06/09/2007
507.46	New clause for sampling not previously in document	PSM	06/09/2007
Whole document	Complete revision of Issue 2.2 to new format	MCP	01/08/2006

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SPECIFICATION 507

MICROSURFACING

GENERAL

507.01 SCOPE

1. The work under this specification consists of the supply and application of microsurfacing (bituminous slurry). The Works shall include surface preparation plus the design of the microsurfacing and sampling and testing in accordance with the Specification.

2. Where applicable, a separate Schedule of Works is included at Annexure 507A which provides details of specific microsurfacing treatments. ***Schedule of Works***

507.02 REFERENCES

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

Australian Standards

AS 1141.42	Pendulum friction test (PAFV)
AS 1160	Bitumen Emulsions for Construction and Maintenance of Pavements
AS 1289	Determination of the sand equivalent of a soil using a power operated shaker
AS 1672	Building limes
AS 2008	Residual Bitumen for Pavements
AS 2150	Hot-mixed asphalt
AS 2891.3.1	Bitumen content and aggregate grading – reflux method
AS 3972	Portland and blended cements

AUSTROADS Test Methods

AGPT-T221	Sampling of Bituminous Slurry
AGPT-T270	Consistency of Bituminous Slurry
AGPT-T271	Determination of Set and Cure for Bituminous Slurry (Cohesion Test)
AGPT-T273	Determination of Abrasion Loss of Bituminous Slurry (Wet Track Abrasion Test)

MAIN ROADS Test Methods

MRWA 200.1	Sampling Procedures for Aggregates
MRWA 210.1	Particle Size Distribution of Aggregate
MRWA 220.1	Los Angeles Abrasion Value
MRWA 310.1	Pavement Skid Resistance: British Pendulum Method
MRWA 311.1	Texture Depth
MRWA 313.2	Surface profile: 3 metre straight edge
MRWA 730.1	Bitumen Content and Particle Size Distribution of Asphalt- Centrifuge Method

Main Roads Specifications

Specification 201 QUALITY SYSTEMS

Specification 202 TRAFFIC

507.03 DEFINITIONS

1. Microsurfacing is a bituminous slurry, containing polymer, which is capable of being spread in variably thick layers for rut-filling and correction courses and for wearing course application where good surface texture is required to be maintained throughout the service life. The terms slurry, bituminous slurry or mix shall have the same meaning except where the context of any particular passage indicates otherwise.

507.04 – 507.05 NOT USED

PRODUCTS AND MATERIALS

507.06 AGGREGATE

1. The aggregate shall consist of crushed rock or crushed gravel but may include portions of natural sand. ***Supply***

2. The aggregate shall be clean, hard, angular, durable stone free from clay and other aggregations of fine material, soil, organic material and other deleterious material.

3. The aggregate shall comply with the requirements in Table 507.1 – *Aggregate Properties*. ***Physical Properties***

TABLE 507.1 AGGREGATE PROPERTIES

Property	Limit	Test Method
Los Angeles Abrasion value	30% maximum	WA 220.1
Sand equivalent	60% minimum	AS 1289.3.7.1
Pendulum friction test (PAFV)	50 minimum	AS 1141.42

4. The Contractor shall nominate the source of all aggregates together with NATA endorsed test reports that provide evidence that the material satisfies requirements in Table 507.1. Sampling of aggregates for testing purposes shall be carried out in accordance with WA 200.1. Materials source assessments shall be provided with each new mix design submitted for approval.

Particle Size Distribution

5. The combined aggregate and mineral filler shall meet the particle size distribution limit requirements set out in Table 507.2 – *PSD Limits For Combined Aggregate and Mineral Filler* for the size of mix specified when tested in accordance with WA 210.1.

TABLE 507.2 PSD LIMITS FOR COMBINED AGGREGATE AND MINERAL FILLER

	Percent Passing by Mass				
Sieve Size	Size 3	Size 4	Size 5	Size 7	Size 10
13.2mm	100	100	100	100	100
9.50mm	100	100	100	100	95-100
6.70mm	100	100	100	85-100	85-90
4.75mm	100	90-100	90-100	70-90	60-85
2.36mm	90-100	65-90	50-70	45-70	40-60
1.18mm	65-90	45-70	30-50	28-50	28-45
0.60mm	40-65	30-50	20-35	19-34	19-34
0.30mm	25-42	18-30	12-25	12-25	12-25
0.15mm	15-30	10-21	7-18	7-18	7-18
0.075mm	10-20	5-15	4-10	5-15	4-8

507.07 MINERAL FILLER

1. Mineral filler shall consist of an approved material such as Portland cement conforming to AS 3972, hydrated lime conforming to AS 1672 or fly ash with a minimum of 85% passing a 0.075mm sieve.

2. The mineral filler shall be dry, free from lumps, clay organic material and any other deleterious material and shall in all other respects comply with the requirements of AS 2150.

3. The quantity of mineral filler added to the bituminous slurry during manufacture and placement shall not vary by more than 1% from the mineral filler content prescribed in the mix design.

507.08 SLURRY BINDER

1. The binder shall be an appropriate grade of polymer modified bitumen emulsion which provides a microsurfacing (bituminous slurry) conforming with this Specification. The Contractor shall nominate the type of emulsion and supply the Superintendent with sufficient information to be able to verify that the binder supplied is the same as that nominated in the mix design.

2. Bitumen used in emulsion manufacture shall comply with the requirements of AS 2008.

507.09 TACK COAT BINDER

1. Where specified, tack coat shall be a bitumen emulsion conforming to the requirements of AS 1160.

507.10 WATER

1. Water added to the bituminous slurry shall be compatible with the component materials such that the performance requirements specified are met.

507.11 ADDITIVES

1. The range of additive levels to be used shall be stated in the mix design. Where the use of additives is stated in the mix design, supportive test data shall be provided which shows that the wear loss and excess binder content of the mix design remains within the Specification for mixes containing additives at both extremes of the design range.

507.12 – 507.20 NOT USED

MIX DESIGN

507.21 MIX DESIGN

1. The Contractor shall develop a mix design for the microsurfacing in accordance to the requirements of the Specification and submit the nominated mix design to the Superintendent for approval.

Supply of Documents

2. The mix design shall satisfy the properties given in Table 507.3 – *Mix Properties* and shall also be easy to lay and finish to provide a stable, durable treatment which satisfies the skid resistance and texture depth requirements.

3. In submitting the mix design, the Contractor shall state the nominal size of the design mix, the aggregate source, the combined aggregate / mineral filler particle size distribution as a single grading (not a range), the bituminous emulsion content of the mix design, the residual binder content of the emulsion and the intended proportion of each component material.

507.22 MIX DESIGN APPROVAL

1. The mix design approved by the Superintendent shall be termed the *Approved Mix Design*. ***Definition***

2. The combined aggregate / mineral filler particle size distribution (single grading not a range) and the binder content of the approved mix design will be termed the approved particle size distribution and the approved binder content respectively. ***Definition***

3. The sourcing of materials for or production of the microsurfacing product shall not commence until the Superintendent has approved the nominated mix design. ***Approval***

TABLE 507.3 – MIX PROPERTIES

Property	Test Method	Limit
Abrasion loss (wet track abrasion)	AGPT-T272	
	6 day	800g/m^2 maximum
Set and cure time (cohesion test)	AGPT-T271	
	30 minutes	12kN.m minimum
	60 minutes	20kN.m minimum

507.23 MICROSURFACING PRODUCTION

1. Prior to the commencement of the production of the microsurfacing product in accordance with the approved mix design, the Contractor shall submit test certificates and records that certify to the Superintendent that: ***HOLD POINT***

   a. the properties of all materials comply with the Specification;

   b. the source of the aggregate shall comply with the Specification;

507.24 PRODUCTION TOLERANCES

Tolerances

1. Microsurfacing shall be manufactured to the approved mix design within the maximum permitted variations specified in Table 507.4 – *Maximum Permitted Variation From Approved Mix Design*.

TABLE 507.4 MAXIMUM PERMITTED VARIATION FROM APPROVED MIX DESIGN

	Maximum Permitted Variation from Approved Particle Size Distribution (% Passing by Mass)				
Sieve Size	Size 3	Size 4	Size 5	Size 7	Size 10
13.2mm	Nil	Nil	Nil	Nil	Nil
9.50mm	Nil	Nil	Nil	Nil	± 7
6.70mm	Nil	Nil	Nil	± 7	± 7
4.75mm	Nil	± 6	± 6	± 6	± 6
2.36mm	± 5	± 5	± 5	± 5	± 5
1.18mm	± 5	± 5	± 5	± 5	± 5
0.60mm	± 4	± 4	± 4	± 4	± 4
0.30mm	± 3	± 3	± 3	± 3	± 3
0.15mm	± 2	± 2	± 2	± 2	± 2
0.075mm	± 1.5	± 1.5	± 1.5	± 1.5	± 1.5
Maximum Permitted Variation from Approved Binder Content + 1.0% and –0.5%					

507.25 – 507.30 NOT USED

PLANT

507.31 PROVISION OF PLANT

1. All plant and equipment used in the performance of this work shall be provided and maintained in good working condition by the Contractor. The plant and equipment to be used shall be nominated by the Contractor 14 days before the commencement of work and shall not be changed without reference to the Superintendent. In particular, the following equipment requirements shall be met:

a. PAVING UNIT

i. The slurry shall be mixed by a self propelled machine able to accurately proportion and deliver the mineral aggregate, filler, bitumen emulsion, water and any other additives to a mixer and discharge the thoroughly mixed slurry on a continuous basis. The machine shall have sufficient storage capacity to be capable of delivering a minimum of 5 tonnes of slurry before replenishment of the components. Individual calibration controls for the proportioning of each component shall be provided. The slurry shall be spread uniformly by means of a mechanical type spreader box attached to or forming part of the mixing unit.

b. ANCILLARY EQUIPMENT

i. Ancillary equipment necessary for the performance of the work, such as rotary road brooms, rollers, signs, lamps, barricades, hand squeegees, shovels and hand brooms shall be provided by the Contractor and shall meet all statutory requirements.

507.32 PAVING UNIT CALIBRATION

1. Each paving unit to be used in performance of the work shall be calibrated with the component materials of the approved mix design prior to the commencement of application of the slurry. Previous calibration documentation covering the same approved mix design may be acceptable provided the calibration was carried out within the previous 12 months period. The documentation shall include an individual calibration for each component material at various settings that can be related to the paving unit's metering devices. ***Calibration***

2. **No paving unit shall undertake work under the Contract until the calibration has been completed and accepted by the Superintendent.** ***HOLD POINT***

507.33 – 507.40 NOT USED

OPERATIONS

507.41 PREPARATION OF EXISTING SURFACE

507.41.01 SET OUT

1. The Contractor shall place marks at intervals not exceeding 10 metres on the line to be followed by the paving. If the line is defined by a kerb or edge the marking will not be necessary.

2. Edges or joints shall be parallel to kerbs and shoulders and run off of the slurry from the operation shall be prevented from occurring. Lines at intersections will be kept straight to provide a good appearance. If necessary masking shall be used to provide straight lines.

507.41.02 CLEANING

1. Prior to any application of slurry, the pavement shall be swept to ensure that the surface is free from loose material, stones, dirt, dust and foreign matter**.** ***Cleaning***

2. **Spreading the slurry shall not commence until the pavement has been prepared in accordance with the Specification and approved by the Superintendent.** ***HOLD POINT***

507.41.03 PROTECTION OF SERVICES AND ROAD FIXTURES

1. The Contractor shall take all necessary precautions to prevent the slurry or other material used on the work from entering or adhering to gratings, hydrants, valve boxes, manhole covers, bridge or culvert decks or other road fixtures. After the slurry has been spread, the Contractor shall remove any such material entering or adhering to gratings, manholes and other road fixtures.

507.41.04 SURFACE DEFECTS

1. The Contractor shall repair surface defects including crack patching, pothole repairs and repairs to failed pavement, as detailed in Annexure 507A - Schedule of Works or as directed by the Superintendent, prior to the spreading of slurry. ***Repairs***

507.41.05 TACK COAT

1. A tack coat is not required unless the surface to be covered is extremely oxidised and ravelled or comprises concrete or brick. A tack coat of bitumen emulsion shall be applied at a rate of 0.2 to 0.24 L/m² of residual binder at 15°C. Such work shall only be carried out when specified in Annexure 507A – Schedule of Works. ***Tack Coat***

507.41.06 WATER FOG COAT

1. The surface may be pre-wet by fogging ahead of the spreader box. Water used for pre-wetting the surface shall be applied so that the entire surface is damp with no apparent flowing water ahead of the spreader box. The application rate of the fog water shall be adjusted to suit temperature, surface texture, humidity and dryness of the surface being covered.

507.42 WEATHER LIMITATIONS

1. The slurry shall not be applied if either the pavement or air temperature is below 10°C and falling. However, slurry may be applied when both the pavement and air temperatures are above 7°C and rising. Spreading shall not proceed during rain or when rain appears imminent. ***Weather***

507.43 RUT-FILLING AND CORRECTION

1. Where wheel ruts are 15 mm or more in depth, a rut filling or correction course shall be carried out using a spreader box capable of laying slurry across the varying cross sectional depth such that it fills the rut and is stable. ***Rut Filling***

507.44 SPREADING

507.44.01 PROCESS

1. The mixing time shall be sufficient to produce a complete and uniform coating of the aggregate and the resulting mixture shall be conveyed into the moving spreader box at a rate sufficient to always maintain an ample supply across the full width of the strike off screed. The slurry shall be at the final laying consistency when deposited in the spreading box. Minor amounts of water may be added for the purpose of overcoming temporary build up of slurry in the corners of the spreader box. The strike off shall be adjusted to provide an application rate which will completely fill the surface voids and provide a nominal application rate of slurry as scheduled.

507.44.02 SURFACE FINISH

1. The surface of the slurry shall be smooth and true to the specified crown and grades. Any section of slurry that is loose or broken, mixed with dirt or other impurities or is any way defective shall be removed and replaced.

Surface Criteria

2. After trafficking for one month the slurry (wearing course) shall have average skid resistance and texture depths not less than those specified in Table 507.5 – *Surface Finish Requirements for Wearing Courses* in the wheel paths based on the average of a minimum of 4 tests per lot.

TABLE 507.5 SURFACE FINISH REQUIREMENTS FOR WEARING COURSES

Property	Limit	Test Method
Skid Resistance		WA 310.1
Size 3	45 minimum	
Sizes 4, 5, 7 and 10	50 minimum	
Texture Depth		WA 311.1
Size 3	Not applicable	
Sizes 4 and 5	0.4 mm minimum	
Size 7 and 10	0.8 mm minimum	

507.44.03 SHAPE

Shape

1. When tested in accordance with WA313.2, the maximum deviation using a 3 metre straight edge shall not exceed 5mm for the finished surface or the final wearing course.

507.44.04 JOINTS

1. The longitudinal joints of the wearing course shall be placed at either the edge or the centre of a traffic lane. If necessary, the edge and joints shall be lightly screeded with a hand squeegee to achieve a smooth uniform appearance and to remove excess build up of material.

507.44.05 TRAFFIC TIME

1. The slurry shall be capable of carrying slow moving traffic (less than 40km/h) within one hour of application without undue damage occurring, such as rutting or ravelling. When the time before the slurry is capable of carrying moving traffic exceeds sixty minutes, work shall cease unless otherwise directed by the Superintendent. ***Traffic Time***

507.44.06 ROLLING

1. Where rolling of the slurry is specified, it shall be undertaken when the mix has cured sufficiently to prevent pick-up on the roller tyres.

507.45 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 the microsurfacing is stable and able to withstand traffic without damage or pick up and if applicable sufficient rolling has taken place to prevent damaging the freshly applied bituminous mat.

2. Roadworks Signs shall remain in position until after the surfacing is complete and stable.

507.46 SAMPLING

1. Samples shall be taken in accordance with the procedures set out in AAGPT-T221 Sampling of Bituminous Slurry.

2. The sampling and testing frequency shall be in accordance with the requirements of Specification 201 Quality Systems.

507.47 – 507.50 NOT USED

ACCEPTANCE

507.51 CONFORMANCE RECORDS

1. Unless otherwise approved by the Superintendent, all tests shall be performed in laboratories registered with the National Association of Testing Authorities (NATA) to perform the specified tests and the results shall be presented on NATA endorsed reports.

2. The Contractor shall submit test results and conformance records to the Superintendent within five working days of the associated lot being laid except for texture depth conformance records. ***Conformance Records***

3. The Contractor shall submit texture depth conformance records to the Superintendent within five working days of testing. Testing for texture depth shall be carried out one month after the slurry is opened to traffic.

507.52 NON-CONFORMANCE

Non-Conformance

1. Any lot of slurry that fails to achieve conformance with any property specified or which incorporates materials that fail to achieve conformance with any property specified shall constitute a non-conformance in accordance with Specification 201 QUALITY SYSTEMS.

Replacement

2. The lot of non-conforming slurry shall be replaced or corrected unless conditionally acceptable subject to a reduction in price as specified.

3. The cost of all replacement or correction works including any restoration work to the underlying or adjacent pavement, surface or structure shall be borne by the Contractor. Slurry removed from the Works shall be replaced by slurry conforming to the Specification.

507.53 CONDITIONAL ACCEPTANCE

1. Conditional acceptance is not applicable where the non-conformance applies to the following properties:
    a. Skid Resistance
    b. Texture Depth
    c. Mix properties specified in Table 507.3

Conditional Acceptance Penalties

2. The reduction in price shall be based on the number of defects in the lot in accordance with Table 507.7. - *Reduction In Value* Lots with more than 6 defects shall not be accepted. Lots with less than 3 defects shall be accepted with no reduction in price.

TABLE 507.7 REDUCTION IN VALUE

Number of Defects in a Lot	3	4	5	6	>6
% Reduction in price	5	10	15	20	Replace or correct

3. The number of defects in a lot shall be calculated from the number of variations of test results from the specified properties in accordance with Table 507.8 - *Number of Defects*, of all samples taken and tested to represent the lot except where the Contract or the Contractors approved Quality Procedures specifies more than one sample be taken to determine a particular property. Where this is the case the number of defects for that property shall be based on the variation of the mean of the test results from the Specification.

TABLE 507.8 NUMBER OF DEFECTS

Property / Measurement	Variation Increment	Number of Variations from Specification	Number of Defects
Slurry Binder Properties	-	1 measurement 2 measurements >2	1 2 Not acceptable
Aggregate Properties (excluding Particle Size Distribution)	-	1 measurement 2 measurements >2	1 2 Not acceptable
Slurry Particle Size Distribution %Passing 13.2 to 0.150 mm Sieves (per sieve size)	1%	(Note) 1 or 2 increments 3 increments >3	1 2 Not acceptable
%Passing .075 mm Sieve	0.5%	1 or 2 increments 3 increments >3 increments	1 2 Not acceptable
Slurry Binder Content %	0.3%	1 increment 2 increments >3 increments (Note)	1 2 Not acceptable
Surface Shape	1mm	2 increments >2 increments	1 Not acceptable
Skid Resistance	1 Skid Resistance Value (SRV) unit	1 increment 2 increments >3 increments	1 3 Not acceptable
Texture Depth	0.1mm	1 increment 2 increments >3 increments	1 2 Not acceptable

Note: Variation of the test results from the approved mix design particle size distribution (mid point) and binder content (mid point) after allowance for the permitted variations in clause 507.12 Table 507.5.

507.54 – 507.80 NOT USED

AS BUILT AND HANDOVER REQUIREMENTS

507.81 – 507.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

507.91 – 507.99 NOT USED

ANNEXURE 507A

SCHEDULE OF WORKS

Works Item (Section Nos)	From [1] (SLK)	To [1] (SLK)	Length (km)	Width (m)	Side [2] (L,C,R)	Area (m^2)	Comments
Road Name 1							
1							
2							
3							
Etc.							
Road Name 2							
1							
2							
3							
Etc.							
Road Name 3							
1							
2							
3							
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.

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. SPECIFICATION FRAMEWORK

This Specification is based on the model Specification published by AUSTROADS (1997). This publication is accompanied by a Guidelines document which should be referred to assist in mix selection and practice.

2. STANDARD METHOD OF MEASUREMENT (SMM)

Measurement and payment is based on the volume (in m^3) of dry mineral aggregate used in completing the Works. Estimates of the quantities required for use in a Schedule of Rates may be based on an assumed thickness of slurry over the nominated area. This will depend on the nature of the works but for typical resurfacing works will be of the order of 1.5 times the nominal mix size.

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.

XXX.XX SUB HEADING (H2 SP)

1. Insert text (Main Table SP) ***Keyword SP***

2. Insert text (Main Table SP)

XXX.XX SUB HEADING (H2 SP)

1. Insert text (Main Table SP)

2. Insert text (Main Table SP)

AMENDMENT CHECKLIST

Specification No. **507** Title: **MICROSURFACING** 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.		
1.	Project Manager has reviewed Specification and identified Additions and Amendments.	
2.	**CONTRACT SPECIFIC REQUIREMENTS** addressed? Contract specific materials, products, clauses added? (Refer Specification Guidance Notes for guidance).	
3.	Any unlisted materials/products proposed and approved by the Project Manager? If "Yes" provide details at 16.	
4.	Standard clauses amended? **MUST SEEK** approval from Manager Commercial.	
5.	Clause deletes shows as **"NOT USED"**.	
6.	Appropriate **INSPECTION AND TESTING** parameters included in Spec 201 (Text Methods, Minimum Testing Frequencies verified).	
7.	**ANNEXURES** completed (refer Specification Guidance Notes).	
8.	**HANDOVER** and **AS BUILT** requirements addressed.	
9.	Main Roads QS has approved changes to **SMM**.	
10.	Project Manager certifies completed Specification reflects intent of the design.	
11.	Completed Specification – independent verification arranged by Project Manager.	
12.	Project Manager's review completed.	
13.	**SPECIFICATION GUIDANCE NOTES** deleted.	
14.	**TABLE OF CONTENTS** updated.	
15.	**FOOTER** updated with Document No., Contract No. and Contract Name.	
16.	Supporting information prepared and submitted to Project Manager.	
Further action necessary:		

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