

Technical Specification

**Transport and Main Roads Specifications
MRTS13 Bituminous Slurry Surfacing**

November 2018

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1 Introduction

This Technical Specification applies to the manufacture and laying of a bituminous emulsion / aggregate slurry road surfacing system. Two systems are covered by this Technical Specification:

- a) slurry seal, and
- b) micro-surfacing.

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

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

Bituminous slurry shall be:

- a) manufactured only by slurry manufacturers that are registered by Transport and Main Roads, and
- b) laid and compacted only by a bituminous slurry laying organisation that is registered by Transport and Main Roads.

For the requirements for registration and information regarding registered suppliers and products for the above items, refer to: asphaltmixdesign@tmr.qld.gov.au

2 Definition of terms

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

Table 2 – Definition of terms

Term	Definition
bituminous slurry	A processed mixture of bituminous emulsion binder (with or without a polymer modifier), continuously graded aggregate, mineral filler, additives and water, properly proportioned to form a slurry which can be laid evenly on a road surface.
break of an emulsion	The process during which the suspended droplets of bitumen in a bituminous emulsion become attached to any available solids, such as the particles of aggregate in a slurry, causing the water to be expelled from the mix. The process may be either physical, chemical or a combination of the two.
certified design grading	The combined aggregate / filler particle size distribution of the certified mix design.
certified mix design	The mix design, of a particular nominal size of bituminous slurry, which has been submitted by a manufacturer and approved by Transport and Main Roads.
certified residual binder content	The residual binder content of the certified mix design.

Term	Definition
cure of a bituminous slurry	A transitional state of a bituminous slurry during which expulsion of water from the mix occurs through either chemical or evaporative means, or both, and which is accompanied by an increase in cohesive strength of the slurry mat.
ISSA TB	Abbreviation for 'International Slurry Surfacing Association Technical Bulletin'.
manufacturer	An organisation which has the necessary plant and equipment to manufacture bituminous slurry to this Technical Specification.
microsurfacing	A bituminous slurry surfacing containing a polymer modified binder which is laid more than one stone thick.
mix design	The design of a bituminous slurry of a particular nominal size comprising the type and proportions of the constituent materials.
mix design certificate	A certificate issued by the department to a manufacturer confirming that the manufacturer has an certified mix design for a particular nominal size of bituminous slurry.
production slurry	The bituminous slurry, produced by the approved slurry manufacturer using the certified mix design, for use in work under the Contract.
QRS	Quarry Registration System as defined in MRTS50 <i>Specific Quality System Requirements</i>
registered slurry manufacturer	An organisation which has current registration from the Department of Transport and Main Roads for the relevant nominal size of bituminous slurry.
slurry seal	A thin bituminous slurry surfacing without a polymer modifier.

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
AS 2357	<i>Mineral fillers for asphalt</i>
ASTM C295	<i>Standard Guide for Petrographic Examination of Aggregate for Concrete</i>

4 Standard Test Methods

The Standard Test Methods listed in Table 4 shall be used in this Technical Specification.

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

Table 4 – Standard Test Methods

Property to be Tested	Test Method Number
Sand equivalent	AS 1289.3.7.1
Polished aggregate friction value	Q203
Wet Strength	AS 141.22
Wet / Dry Strength Variation	AS 1141.22

Property to be Tested	Test Method Number
Bitumen content and aggregate grading of cold mix	Q308C
Wet track abrasion	ISSA TB100
Loaded wheel test - sand adhesion	ISSA TB109
Wet stripping test	ISSA TB114
Modified cohesion test	ISSA TB139
Schulze-Breuer and Ruck procedure	ISSA TB144
Petrographic analysis	ASTM C295

5 Quality system requirements

5.1 Hold Points, Witness Points and Milestones

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

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 5.1.

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
6	1. Use of quarry		Submit Quarry Registration Certificate
6			Submit aggregate production procedure
7.3	2. Slurry mix design		Submission mix design certificate (7 days)
9.1	3. Laying of slurry		Submission of laying procedure (7 days)
9.3.2		1. Surface preparation	
9.3.4		2. Repair of surface defects	
9.6.2		3. Surface finish	
10.2.2		4. Sampling of slurry	

5.2 Construction procedures

The Contractor shall prepare documented procedures for all construction processes in accordance with the quality system requirements of the Contract. A construction procedure for supply and laying of bituminous slurry surfacing, in accordance with the requirements of Clause 9.1, shall be submitted to the Administrator. A construction procedure for aggregate production, in accordance with the requirements of Clause 6, shall also be submitted to the Administrator.

5.3 Testing frequencies

The minimum testing frequencies for work covered by this Technical Specification are specified in Clause 11.

6 Quarry registration

Coarse aggregate shall be supplied by a quarry registered and operated in accordance with the department's Quarry Registration System requirements. The current Quarry Registration Certificate shall be submitted to the Administrator at least seven working days before a material's supply or use.

Milestone

Material from a quarry shall be neither supplied, nor used in the Works without written permission of the Administrator. **Hold Point 1**

The Contractor shall notify the Administrator within three days of any change to the Quarry Registration Certificate, including its Testing Frequency Schedule. **Hold Point 1** shall be re-applied.

For each quarry that will supply material(s) to be used in the Works, the Contractor shall prepare a construction procedure for aggregate production in accordance with Clause 6 of MRTS50 *Specific Quality System Requirements* and detail the following for each nominated material:

- a) area of the quarry from which the material in the lot will be won
- b) production process and method of winning the material
- c) procedures for stockpile management and traceability as part of lot control and, as applicable, stockpile subplot control, and
- d) quality control procedures.

The construction procedures shall be submitted to the Administrator at least seven days prior to the commencement of aggregate production for the Works. **Milestone**

7 Mix design

7.1 Constituent material requirements

7.1.1 General

The bituminous slurry mix shall incorporate aggregate, mineral filler and binder complying with the requirements of Clauses 7.1.2 to 7.1.5 inclusive and shall be designed in accordance with the requirements specified in Clause 7.2.

7.1.2 Aggregate

Aggregate shall consist of natural sand particles and / or crushed rock or stone.

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

The combined aggregate shall have the properties given in Table 7.1.2.

Table 7.1.2 – Aggregate properties

Property	Limit
Wet Strength (kN)	Minimum 150
Wet / Dry Strength Variation (%)	Maximum 30
Polished Aggregate Friction Value	Minimum 45
Sand Equivalent	Minimum 60

7.1.3 Mineral filler

Mineral filler shall consist of an approved material, such as portland cement, hydrated lime or fly ash, with a minimum of 85% passing a 0.075 mm test sieve.

The filler shall be dry and free from lumps, clay, organic material and any other deleterious material and shall comply in all other respects with the requirements of AS 2357.

7.1.4 Binder

Binder shall be proprietary grade bituminous emulsion. For microsurfacing, the binder shall be polymer modified so that the nominated mix meets the performance requirements of Clause 7.2.

Bituminous emulsion shall comply with the requirements of MRTS21 *Bituminous Emulsion*.

7.1.5 Water

Water shall be compatible with the other constituent materials such that the performance requirements of Clause 7.2 are met.

The water shall be potable and free from any deleterious material.

7.1.6 Additives

Additives may be used to control the break and setting times of the bituminous slurry mix, depending on ambient conditions and traffic requirements. The performance requirements of Clause 7.2 shall be met for the nominated mix containing the maximum or minimum amount of additive proposed to be used.

7.2 Mix design criteria

7.2.1 Grading

The grading of the combined aggregate and mineral filler shall be such that it complies with the requirements shown in Table 7.2.1.

The grading curve shall be smooth and shall be approximately parallel to the envelope limits.

Table 7.2.1 – Grading limits for combined aggregate and filter

Sieve size (mm)	Percentage passing by mass bituminous slurry nominal size (mm)			
	QS3	QS5	QS7	QS10
13.2				100
9.5			100	85 - 100
6.7		100	85 - 100	70 - 90
4.75	100	85 - 100	72 - 87	60 - 80
2.36	80 - 100	60 - 85	50 - 70	42 - 60
1.18	60 - 85	42 - 65	33 - 51	28 - 46
0.60	39 - 63	28 - 47	22 - 38	19 - 34
0.30	24 - 42	18 - 32	13 - 27	12 - 25
0.15	15 - 29	11 - 22	8 - 19	7 - 18
0.075	8 - 20	6 - 15	5 - 13	4 - 12

7.2.2 Mix properties

The mix design shall satisfy the property requirements stated in Table 7.2.2(a) for the design mix and for mixes prepared with the maximum permitted variations specified in Table 7.2.2(b) applied to the grading and binder content.

Table 7.2.2(a) – Bituminous slurry mix properties

Property	Test Method	Unit	Limit	Property value	
				Microsurfacing	Slurry seal
Wearing	Wet Track Abrasion: • 1 hour • 6 day	g/m ² g/m ²	Maximum Maximum	540	800
				800	Not applicable
Traffic time	Modified Cohesion Test: • at 30 minutes • at 60 minutes	kg.cm kg.cm	Minimum Minimum	12	12
				20	20
Adhesion	Wet Stripping Test Schulze-Breuer and Ruck Procedure	% points	Minimum Minimum	90	90
				11	Not applicable
Binder content under heavy traffic†	Loaded Wheel Test – Sand Adhesion	g/m ²	Maximum	540	540

† Traffic density > 3000 vehicles per day per lane AADT

Table 7.2.2(b) – Maximum permitted variations from the certified mix design

Sieve size (mm)	Maximum Permitted Variation (% by Mass)			
	QS3	QS5	QS7	QS10
13.2				Nil
9.5			Nil	± 7
6.7		Nil	± 7	± 7
4.75	Nil	± 6	± 6	± 6
2.36	± 5	± 5	± 5	± 5
1.18	± 5	± 5	± 5	± 5
0.60	± 4	± 4	± 4	± 4
0.30	± 3	± 3	± 3	± 3
0.15	± 2	± 2	± 2	± 2
0.075	± 1.5	± 1.5	± 1.5	± 1.5
Other properties Residual binder content	+ 1.0	+ 1.0	+ 1.0	+ 1.0
	- 0.5	- 0.5	- 0.5	- 0.5

7.3 Mix design assessment and certification

Bituminous slurry shall be manufactured to a certified mix design.

At least seven days before production slurry is required to be produced, the Contractor shall submit to the Administrator: **Milestone**

- a) the identity and address of the registered slurry manufacturer
- b) test certificates from a NATA registered laboratory which confirm that samples of the constituent materials available for use comply with the requirements of the certified mix design, and
- c) a copy of the mix design approval certificate issued by Transport and Main Roads for the certified mix design for the mix proposed for the Works.

Production of slurry shall be a seven day hold point. **Hold Point 2**

7.4 Responsibility for bituminous slurry

Notwithstanding the requirements herein specified for the production slurry to be manufactured by a registered slurry manufacturer, the Contractor shall take full responsibility for the mix design, manufacture, supply and laying of bituminous slurry surfacing under the Contract.

8 Plant

8.1 Provision of plant

All plant used in the manufacture and laying of bituminous slurry shall be provided and maintained in good working condition.

In particular, the requirements of Clauses 8.1.1 and 8.1.2 shall be met.

8.1.1 Paving unit

Prior to commencement of work, evidence to verify that the proposed equipment shall perform the work as specified and that all metering devices are accurately calibrated shall be submitted to the Administrator.

Each paving unit shall be calibrated with the component materials of the certified mix design prior to the commencement of construction. Previous calibration documentation covering the same certified mix design may be acceptable provided the calibration was carried out within the previous 12 month period. The documentation shall include an individual calibration for each component material at various settings, which can be related to the paving unit's metering devices. No paving unit shall be allowed to produce and / or lay production slurry until the calibration has been completed in accordance with this clause.

8.1.2 Ancillary plant

Ancillary plant necessary for the performance of the work, such as rotary brooms, signs, lamps, barricades, hand squeegees, shovels and hand brooms, shall meet all statutory requirements.

9 Construction

9.1 Construction procedure

At least seven days prior to commencement of laying, the Contractor shall submit the identity and address of the registered slurry manufacturer and the procedure for surfacing operations detailing at least the following: **Milestone**

- a) all equipment to be used in mixing and laying the slurry
- b) laying program
- c) details of any required preliminary trial, and
- d) inspection and test plan.

Laying operations shall not commence until expiration of the seven day period. **Hold Point 3**

9.2 Specific surfacing treatments

The specific surfacing treatments to be installed under this Contract shall be as stated in Clause 1 of Annexure MRTS13.1.

9.3 Preparation of existing surface

9.3.1 Set out

Marks shall be placed on the existing surface at intervals not exceeding 10 m on the line to be followed by the paving unit while laying the slurry. If the line is defined by a kerb or edge, such marking is not necessary.

Care shall be taken to ensure straight lines along kerbs and shoulders and that no runoff of bituminous slurry onto these areas occurs.

Lines at intersections shall be kept straight to provide a neat appearance. If necessary, masking shall be used to provide straight lines.

9.3.2 Cleaning

Laying of bituminous slurry shall not commence until the pavement has been swept to ensure that the surface is free of loose material, stones, dirt, dust and foreign matter. **Witness Point 1**

9.3.3 Protection of services

All necessary precautions shall be taken to prevent bituminous slurry or other material used in the work from entering or adhering to gratings, hydrants, valve boxes, manhole covers, bridge or culvert decks or other road fixtures. After the bituminous slurry has been laid, any such material which has entered or adhered to road furniture and structures shall be removed.

9.3.4 Surface defects

Where so stated in Clause 2 of Annexure MRTS13.1, surface defects shall be repaired prior to laying of bituminous slurry in accordance with the details stated therein. This may include crack filling, pothole repairs and repairs to failed pavement. **Witness Point 2**

9.3.5 Tack coat

If so stated in Clauses 1 and / or 2 of Annexure MRTS13.1, the existing surface shall be covered with a fine sprayed coat of bituminous emulsion at the application rate stated in Clause 2 of

Annexure MRTS13.1. The bituminous emulsion shall be allowed to break and harden prior to the laying of bituminous slurry surfacing.

Bituminous emulsion shall comply with the requirements of MRTS21 *Bituminous Emulsion*.

9.3.6 Water fog coat

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 spray shall be adjusted to suit temperature, surface texture, humidity and dryness of the surface being covered.

9.4 Weather limitations

Bituminous slurry shall not be applied if either the pavement or air temperature is below 10°C and falling. Bituminous slurry may be applied when both pavement and air temperatures are above 7°C and rising. Laying shall not proceed during rain or when rain is imminent.

9.5 Rut-filling

Where wheel ruts are 15 mm or more in depth, a rut-filling course shall be applied, prior to placing the wearing course. Rut-filling shall be carried out using a spreader box capable of laying bituminous slurry across the varying cross-sectional depth such that it fills the rut and is stable. The mix designation to be used in rut-filling is given in Clause 3 of Annexure MRTS13.1.

9.6 Spreading

9.6.1 Process

The bituminous slurry shall be of the desired consistency when deposited in the spreading box and nothing more shall be added other than minor amounts of water for the purpose of overcoming temporary build-up of slurry in the corners of the spreader box. 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 sufficient rate to always maintain an ample supply across the full width of the strike-off. The strike-off shall be adjusted to provide an application rate which shall completely fill the surface voids and produce a nominal thickness of bituminous slurry as stated in Clause 1 of Annexure MRTS13.1.

9.6.2 Surface finish

Where increased surface texture is required as stated in Clause 1 of Annexure MRTS13.1, a fabric skirt of pre-dampened hessian, or similar material, shall be trailed behind the spreader box across the full width of the run. The skirt shall be hosed off thoroughly or immersed in water after each use to maintain its flexibility.

The surface texture shall be demonstrated on a short test run prior to full scale manufacture and laying of production slurry. When a satisfactory surface texture is achieved on a test run, then all subsequent work shall be finished to the same texture. **Witness Point 3**

9.6.3 Shape

The finished surface of the final wearing course shall not vary by more than two-thirds of the original average maximum deviation from a three metre straightedge.

9.6.4 Joints

Longitudinal joints in the wearing course shall be placed at either the edge or the centre of a traffic lane.

If necessary, the edges and joints shall be lightly screeded with a hand squeegee to achieve a smooth uniform appearance and to remove excess build-up of material. The end of each run shall be squared off at the point where there is insufficient material in the spreader box to maintain the full width of the spread.

9.6.5 Traffic time

Bituminous slurry shall be capable of carrying slow moving traffic (less than 40 km/h) within one hour of application without undue permanent damage occurring, such as rutting or ravelling. When the traffic time exceeds one hour, work shall cease.

9.6.6 Hand work

Areas which cannot be reached with the spreader box shall be surfaced using hand squeegees to provide complete and uniform coverage. If necessary, the area to be hand worked shall be lightly dampened or tack-coated prior to mix placement. Care shall be exercised to leave no unsightly appearance from hand work.

The same finish as applied by the spreader box shall be provided on hand worked areas. Hand worked areas shall be completed at the same time as the adjacent machine application process.

9.6.7 Clean up

All surplus slurry shall be removed from the Site. Any aggregate stockpile Site and / or loading area occupied for the construction the work shall be restored to a condition similar to that which existed prior to occupation.

10 Construction compliance testing

10.1 Process requirements

The process requirements shall be checked for compliance with the specified requirements during and after the construction operation as relevant.

10.2 Product standards

10.2.1 General

Compliance testing of the pavement shall be undertaken for each lot.

A lot shall be an essentially homogeneous section of the completed bituminous slurry surfacing, not greater than 25 m³, nor greater than half of one day's production.

10.2.2 Testing frequencies and number of tests

The Contractor is responsible for performing sufficient tests to ensure that the bituminous slurry surfacing complies with the Standards and requirements of this Technical Specification. However, the Contractor's testing program shall be such that not less than two samples are selected and tested from each lot. **Witness Point 4**

Testing frequencies for the following aggregate source rock property tests used in the slurry mix shall be in accordance with Clause 8.1.1 of MRTS50 *Specific Quality System Requirements*:

- a) Petrographic Analysis
- b) Wet Strength
- c) Wet / Dry Strength Variation
- d) Polished Aggregate Friction Value, and
- e) Sand Equivalent.

10.2.3 Geometrics

The geometric tolerances, except for surface evenness, shall be checked by a method of random stratified sampling.

10.2.4 Bituminous emulsion

Each bulk delivery of bituminous emulsion shall be accompanied by a certification of Standard compliance traceable to the relevant batch at the supplier's storage tank. Two 2 litre random samples shall be taken from each bulk delivery. If problems are experienced or suspected with the bituminous emulsion, the samples shall be tested for compliance with MRTS21 *Bituminous Emulsion*.

10.2.5 Bituminous slurry

Two 1.5 kg samples of bituminous slurry shall be taken from each lot at random intervals. The samples shall be taken from the discharge of the paving unit.

The samples shall be tested for residual binder content and particle size distribution in accordance with Test Method Q308C.

11 Supplementary requirements

The requirements of MRTS13 *Bituminous Slurry Surfacing* are varied by the supplementary requirements given in Clause 4 of Annexure MRTS13.1.

