

Main Roads Technical Standard

MRTS11

Sprayed Bituminous Surfacing (Excluding Emulsion)

SUPERSEDED

June 09

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SUPERSSEDED

Sprayed Bituminous Surfacing (Excluding Emulsion)

1 INTRODUCTION

This Technical Standard applies to the application of sprayed bituminous surfacing but excludes the use of emulsions. The work covered includes primes, primerseals, seals, reseals and enrichments.

This Technical Standard shall be read in conjunction with MRTS01 *Introduction to Technical Standards*, MRTS50 *Specific Quality System Requirements* and other Technical Standards as appropriate. This Technical Standard forms part of the Main Roads Specifications and Technical Standards Manual.

2 DEFINITION OF TERMS

The terms used in this Technical Standard shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Standards*. Further definitions are as defined in Table 2.

Table 2 – Definition of Terms

Term	Definition
Actual Spray Rate	The spray rate of bituminous material actually achieved during the surfacing operation.
Actual Spread Rate	The spread rate of cover aggregate or prime cover material actually achieved during the surfacing operation.
Additive	Cutter oil, flux oil and/or adhesion agent.
Adjusted Designed Spray Rate	The spray rate of bituminous binder as adjusted by the Seal Designer's Delegate in accordance with Clause 6.
Adjusted Designed Spread Rate	The aggregate spread rate as adjusted by the Seal Designer's Delegate in accordance with Clause 6.
Binder	Bitumen and/or polymer modified bitumen which includes crumb rubber modified bitumen.
Bituminous material	Bitumen, cutback bitumen, bitumen with cutter oil and/or flux oil and/or adhesion agent, and polymer modified binder which includes crumb rubber binder.
Cover aggregate	Aggregate complying with the requirements of MRTS22 <i>Supply of Cover Aggregate</i> , and which forms a permanent wearing surface on a pavement.
Crumb Rubber Binder	Bitumen blended with crumb rubber. The bitumen is generally C170 and the crumb rubber is generally obtained from the shredding and grinding of scrap rubber from vehicle tyres.
Cutting back bitumen	The temporary reduction of binder viscosity by the addition of cutter oil.
Designed Spray Rate	The spray rate of bituminous binder as calculated by the Seal Designer in accordance with Clause 6.
Designed Spread Rate	The aggregate spread rate as calculated by the Seal Designer in accordance with Clause 6.
Double/double seal	A double/double seal consists of two applications of binder, each followed by an application of aggregate.
Estimated Spray Rate	The estimated spray rate of bituminous binder stated in Clause 2 of Annexure MRTS11.1. It is not to be used as an actual designed spray rate.
Estimated Spread Rate	The estimated spread rate for cover aggregate or prime cover material stated in Clause 2 of Annexure MRTS11.1. It is not to be used as an actual designed spread rate.

Term	Definition
High Stress Seal (HSS)	A sprayed seal treatment used in situations where high traffic related stresses are applied to the sprayed seal such as tight curves, steep grades and heavy load intensities.
Homogeneous section	A continuous section of carriageway in one direction where – <ul style="list-style-type: none"> the Adjusted Designed Spray Rate, when designed in accordance with the design procedure stated in Clause 6.1.1, does not vary by more than 0.2 L/m² in the longitudinal section; and the underlying surface type does not change within the longitudinal section. For the purpose of testing for determining seal design inputs, the maximum size of each homogeneous section is one lot.
Lot	A spray run or series of spray runs applied on any calendar day.
Parts of additive	The number of parts by volume of additive to be added to 100 parts by volume of binder measured at 15°C.
Pavement Temperature	The temperature measured at the surface of the pavement to be sprayed.
Reseal	A seal applied to an existing seal or asphalt surface.
Roller Pass	One pass of both axles of a roller over a specific point in one direction.
Seal	A thin layer of sprayed bituminous material into which aggregate is incorporated.
Seal Designer	A competent, trained designer who shall complete the seal design and shall determine the Designed Spray Rate and the Designed Spread Rate. The Seal Designer shall have successfully attained the Australian Asphalt Pavement Association (AAPA) <i>Statement of Attainment</i> (prior to 2008 called <i>Certificate of Attainment</i>) for the course titled <i>Sprayed Sealing Selection and Design</i> .
Seal Designer's Delegate	A competent, trained nominee of the seal designer who may modify, on behalf of the Seal Designer, the Designed Spray Rate and/or the Designed Spread Rate as follows – <ul style="list-style-type: none"> determine the Adjusted Designed Spray Rate; determine the Adjusted Designed Spread Rate; and determine the parts of cutter oil to add prior to spraying. The Seal Designer's Delegate shall have successfully attained the Australian Asphalt Pavement Association (AAPA) <i>Certificate of Attendance</i> at the course titled <i>Sprayed Sealing Selection and Design</i> .
Single/single seal	A single/single seal consists of one layer of binder covered with a single layer of aggregate.
Spray rate	The following applies to all spray rates (including Estimated Design, Design, Adjusted Design and Actual), where the measured volume is the volume at 15°C – <ul style="list-style-type: none"> for primes and primer seals, rates include cutter and additives, if applicable; and for all other binders, spray rates are residual (excluding cutter and other additives).
Spray run	The area of pavement selected for coverage with a bituminous material during one continuous operation of a sprayer.
Spray sheet	Contractor's Bituminous Material Spraying Record Sheet.
Strain Alleviating Membrane (SAM)	A sprayed seal treatment with a polymer modified binder which is used to delay the onset of reflection cracking on existing cracked surfaces or where the potential for cracking exists.
Strain Alleviating Membrane Interlayer (SAMI)	A sprayed seal treatment with a polymer modified binder which is used as an interlayer between an asphalt wearing surface and its underlying layer. A SAMI is used to delay the onset of reflection cracking on existing cracked surfaces or where the potential for cracking exists.

3 STANDARD TEST METHODS

The standard test methods given in Table 3 shall be used in this Technical Standard.

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

Table 3 – Standard Test Methods

Property to be Tested	Method Number
Aggregate Flakiness Index	Q201B
Average Least Dimension	Q202
Ball Penetration	AGPT/T251
Bitumen Stripping Value – Modified Plate	Q212B
Degree Aggregate Precoating	Q216
Field spread rate of cover aggregate	Q711A
Measurement of loose aggregate on sprayed seals	AGPT/T452
Modified Surface Texture Depth (Pestle Method) (“sand patch”)	AGPT/T250
Particle Size Distribution	Q103B
Sampling of polymer modified binders, polymers including crumb rubber at point of discharge to project	AGPT/T101
Sampling of residual bitumen at point of discharge to project	AS 2008 Appendix B

4 REFERENCED DOCUMENTS

References used in this technical standard include, but are not limited to the latest versions of –

- a) AAPA Advisory Note 7, *Guide to the Heating and Storing of Binders for Sprayed Sealing*;
- b) AP-G41 *Bitumen Sealing Safety Guide* (Austroads);
- c) *Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders* (Australian Asphalt Pavement Association);
- d) Austroads Technical Report AP-T68/06 *Update of the Austroads Sprayed Seal Design Method*; and
- e) Austroads/AAPA Pavement Work Tip No.24.

Table 4 lists Australian Standards referenced in this Technical Standard.

Table 4 – Referenced Documents

Reference	Title
AGPT	Austroads test method
AS 2008	Residual Bitumen for Pavements

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 Standards*.

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

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2	1. Permission to use construction procedures.		Construction procedures submitted to the Administrator.
6.2	2. Contractor notified of Principal's seal design.		Contractor provides Principal with seal design test results.
6.3.2	3. Consideration of the Contractor's seal design.		Contractor seal design report submitted to the Administrator.
8.2		Care of cover aggregate.	
8.3.1		Binder storage temperature measured and recorded at delivery to site.	
8.3.2		Heating of bituminous materials.	
9	4. Plant to be used.		
10.1.2	5. Excessive Ball Penetration test results.		
11.1	6. Cover aggregate availability.		
11.2		Pavement temperature above minimum specified.	
12.4		Current Queensland Sprayer Certificate to be sighted and nozzles to comply.	
12.7		Nomination and recording of cutting requirements.	
14.1		Loading of cover aggregate into aggregate spreader.	
14.8	7. Loose aggregate/signage requirements prior to opening to traffic.		

5.2 Construction Procedures

The Contractor shall prepare documented procedures for all required processes as defined in Clause 5 of MRTS50 *Specific Quality System Requirements*. These shall include procedures for –

- a) safe handling practices for bitumen products as described in and consistent with the following publications –
 - i) *Bitumen Sealing Safety Guide* (Austroads);
 - ii) *Austroads Pavement Technology Series: Sprayed Seals*;
 - iii) *Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders* (Australian Asphalt Pavement Association), and
 - iv) The manufacturer's published handling procedures for the product/s supplied by that manufacturer.

- b) manufacture, storage, handling and spraying of field blended or plant blended crumb rubber where this binder is to be sprayed. The construction procedure shall address at least –
- i) The method for achieving a homogeneous product that can be sprayed at a uniform application of binder across the pavement, free of streaking;
 - ii) the management of crumb rubber blending, digestion, and storage times and temperatures;
 - iii) the maximum time/temperature conditions that field produced/plant blended product can be stored and/or transported without loss of properties as indicated by the Australian Asphalt Pavement Association Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders;
 - iv) the maximum distance that the product can be transported from a blending site without loss of properties as indicated by the Australian Asphalt Pavement Association Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders;
 - v) circulation of the product during transportation; and
 - vi) requirements for spraying plant and spraying practices including adjustments to nozzles if required.

The Contractor shall establish an Inspection and Test Plan (ITP) for supply and delivery of binder. The Inspection and Test Plan shall address at least –

- a) traceability;
- b) conformance of binder supplied to the Site; and
- c) sampling and testing at the Site.

The Contractor shall submit the documented procedures and the ITP to the Administrator not less than 7 days prior to their proposed use. **Milestone**

Documented procedures and the ITP shall not be implemented until permission to use has been granted by the Administrator. **Hold Point 1**

5.3 Conformance Requirements

The conformance requirements which apply to materials and lots of work covered by this technical standard are detailed in Clauses 7.1, 7.2, 8, 10, 11, 12, 13 and 14. The conformance records for all lots of work shall be compiled on a spraying record sheet as specified in Clause 15.

6 SEAL DESIGN

6.1 General

6.1.1 Scope

The specific treatments for work under this Contract shall be as set out in Clause 2 of Annexure MRTS11.1 and the Drawings. Where the Principal nominates the binder types, cover aggregate types and estimated application rates to be used in the seal design, these shall be nominated in Clause 2 of Annexure MRTS11.1.

Unless otherwise stated in Clause 1 of Annexure MRTS11.1, the seal design will be carried out by the Principal.

Seal designs shall be determined in accordance with the requirements of Austroads Technical Report AP-T68/06 *Update of the Austroads Sprayed Seal Design Method*.

6.1.2 Seal Designer and Seal Designer's Delegate

The seal design shall be undertaken by the Seal Designer who is a competent, trained person that has attained the Australian Asphalt Pavement Association (AAPA) *Statement of Attainment* (prior to 2008 *Certification of Attainment*) for the course titled *Sprayed Sealing Selection and Design*. Prior to undertaking any seal design, the Seal Designer shall inspect each site in order to identify site-specific conditions for inclusion in design.

The Seal Designer's Delegate shall be a competent, trained person that has successfully attained the Australian Asphalt Pavement Association (AAPA) *Certificate of Attendance* at the course titled *Sprayed Sealing Selection and Design*. The Seal Designer's Delegate shall have facilities to be in communication with the Seal Designer at all times and shall be under supervision of the Seal Designer.

The Seal Designer's Delegate shall be on site during spraying to check designed rates and shall adjust the Designed Spray Rate and Designed Spread Rate where this is required for the existing field conditions including, but not limited to, adjustments for test results from the Ball Penetration tests. These adjusted rates shall be called the Adjusted Designed Spray Rate and the Adjusted Designed Spread Rate.

6.2 Seal Design by the Principal

For the properties that the Contractor shall test as nominated in Clause 3.1 of Annexure MRTS11.1, testing shall be undertaken by the Contractor at the test locations and minimum test frequency detailed in Table 6.2 and the following:

- a) The Contractor shall sample, test and report the Ball Penetration in accordance with the requirements of Table 6.2 and Clause 10.1.2;
- b) Aggregate samples shall be taken from the material that is to be used on the project;
- c) The Seal Designer shall determine the locations of homogenous sections and representative sites in homogenous sections; and
- d) Except for Ball Penetration testing in accordance with Clause 10.1.2, test results shall be submitted to the Administrator with sufficient lead time to allow a period of 7 days following submission of the test results for the Principal to carry out seal design **Milestone**. Test results for Ball Penetration testing completed in accordance with Clause 10.1.2 shall be reported to the Administrator immediately after testing.

Table 6.2 – Testing for Determining Seal Design Inputs

Property to be Tested	Test Location(s)	Minimum Test Frequency
Particle Size Distribution Aggregate Flakiness Index Average Least Dimension	The test samples shall be sourced from the stockpiles to be directly used for the works.	Test frequency shall be – <ul style="list-style-type: none"> • one test for each aggregate type; and • repeat tests at every 2500 tonnes.
Modified Surface Texture Depth	In and between the wheelpaths – that is, 3 tests at each test chainage.	Test frequency shall be the greater of – <ul style="list-style-type: none"> • every 400 m; and • 3 test chainages per homogeneous section where the test sites selected are representative of the homogeneous section.
Ball Penetration	In the inner and outer wheelpaths- that is, 2 tests at each test chainage. Testing is required only for – <ul style="list-style-type: none"> • pavements in accordance with Clause 10.1.2; and • asphalt or slurry surfacings less than 6 months old. 	Test frequency shall be 5 test chainages per homogeneous section where the test sites selected are representative of the homogeneous section.

Spraying operations shall not commence until the Contractor has been notified by the Administrator of the Designed Spray Rate and Designed Spread Rate. **Hold Point 2**

6.3 Seal Design by the Contractor

6.3.1 Seal Design Inputs

Where the Contractor is nominated to undertake the seal design, the Contractor shall inspect each site and shall select inputs and associated design factors to be used in the seal design procedure. These inputs and factors shall be determined from –

- a) the requirements stated in Clause 3.2 of Annexure MRTS11.1;
- b) project site conditions; and

- c) sampling and testing completed by the Contractor in accordance with the requirements of Table 6.2, noting that –
 - i) in addition to the requirements of Table 6.2, testing shall be sufficient to comply with the design procedure requirements; and
 - ii) aggregate samples shall be taken from the material that is to be used on the project.

6.3.2 Seal Design Reporting

Except where Ball Penetration testing is required in accordance with Clause 10.1.2, the Contractor shall submit the seal design report to the Administrator at least 7 days prior to the commencement of bituminous spraying operations **Milestone**. Where Ball Penetration testing is required in accordance with Clause 10.1.2, the Contractor shall submit the seal design report to the Administrator prior to the commencement of bituminous spraying operations.

The seal design report shall detail –

- a) separate seal designs for variations in any and each of –
 - i) test results for seal design inputs stated in Table 6.2;
 - ii) binder types;
 - iii) cover aggregate size and source;
 - iv) homogeneity of sections of carriageway impacting on design in accordance with the design procedure; and
 - v) underlying pavement type on which sprayed bituminous surfacing is to be applied.
- b) test results, assumptions, inputs, the design method and calculations that were used to determine the Designed Spray Rate and the Designed Spread Rate;
- c) for each unique combination of binder type, aggregate type and location, the report shall detail the following in a tabular form consistent with the presentation in Clause 2 of Annexure MRTS11.1 –
 - i) the seal design binder types, aggregate types, reference and location; and
 - ii) the Designed Spray Rate of bituminous material and the Designed Spread Rate of cover aggregate.
- d) for double/double seals, the minimum period between bituminous treatments as required in the seal design method;
- e) documentary evidence of the Seal Designer's successful attainment of the Australian Asphalt Pavement Association (AAPA) *Statement of Attainment* (prior to 2008 *Certificate of Attainment*) for the course titled *Sprayed Sealing Selection and Design*; and
- f) nomination of the Seal Designer's Delegate and documentary evidence of this delegate's successful attainment of the Australian Asphalt Pavement Association (AAPA) *Certificate of Attendance* for the course titled *Sprayed Sealing Selection and Design*.

The seal design report shall include a statement signed by the Seal Designer that the seal design complies with the seal design method for the test results, assumptions and inputs used.

The Administrator will consider the seal design report and spraying operations shall not commence prior to the Administrator releasing a hold point for this consideration. **Hold Point 3**

For each lot or homogeneous section, at the time before spraying commences, the Seal Designer's Delegate shall determine the adjustments to be made to arrive at the Adjusted Designed Spray Rates and any addition of additives including cutter and the Adjusted Designed Spread Rates. The Seal Designer's Delegate shall record these adjustments and modifications on the Contractor's spray sheet. If no adjustments or modifications are made to the designed rates, the spray sheet record shall record the non-adjusted rates accordingly. The Contractor shall certify with a signature that the Seal Designer's Delegate has approved the spray sheet record of the adjustments and modifications.

7 MATERIALS

7.1 Standards and Associated Payment

Contractor-supplied bitumen cutter oils and flux oils, cutback bitumen, adhesion agent, prime cover material and cover aggregate shall comply with the requirements of the technical standards stated in Table 7.1.

Table 7.1 – Material Technical Standards

Material	Standard
Adhesion agent	As specified in Clause 4.1 of Annexure MRTS11.1
Bitumen	MRTS17
Bitumen cutter oils and flux oils	MRTS19
Cutback bitumen	MRTS20
Multigrade bitumen	Project specific technical standards to be issued by the Principal
Polymer modified binder	MRTS18
Prime cover material and cover aggregate	MRTS22

Contractor-supplied bitumen, multigrade bitumen and polymer modified binder shall be sampled, tested and comply with requirements detailed in Table 7.1. For payment for supply of these binders, the additional requirements of Clause 4.2 of Annexure MRTS11.1 apply, where either –

- a) Payment shall be made for complying binder sampled at the point of release by the manufacturer in accordance with the requirements of either MRTS17 or MRTS18 as applicable; or
- b) Payment shall be made for complying binder sampled at the point of delivery to Site in accordance with the requirements of either MRTS17 or MRTS18 as applicable.

7.2 Supply of Material

The Principal will supply the materials stated in the Principal Supplied Material List (Form C6827). All other materials shall be supplied by the Contractor.

7.3 Transport of Material

The responsibility for transport to the Site of materials supplied by the Principal will be as stated in the Principal Supplied Material List (Form C6827). Transport to the Site of all other materials shall be the responsibility of the Contractor.

8 CARE OF MATERIALS

8.1 Bitumen Cutter Oil

Bitumen cutter oil shall be handled and stored in a way which prevents any ingress of water. Water detection paste shall be available at all times and used if water contamination of the cutter oil is suspected.

Bitumen cutter oil which is suspected as being water contaminated shall be investigated and, if found to be water contaminated, shall not be used.

8.2 Cover Aggregate

Cover aggregate shall not be exposed to contaminating agents, particularly dust, and shall be handled so as to avoid contamination and any other deleterious effects. Unless otherwise stated in Clause 4.3 of Annexure MRTS11.1, cover aggregate, except for prime cover material, shall be protected with a light plastic or similar material to prevent the ingress of moisture and other contaminants. The protective material shall be sufficiently anchored to ensure the optimal fixture that can be achieved consistent with the protective material properties. **Witness Point**

8.3 Bituminous Materials

8.3.1 Storage and Transport

Bituminous materials shall be stored and transported in purpose-built containers in such a way that any change to material properties are within the limits specified in the respective bituminous material Standard. If a property change outside the specified limits is suspected, the Administrator may order testing to be carried out in accordance with relevant Standards to check for contamination.

When changing or adding bituminous materials in the same container, including additions to a storage tank, the Contractor shall comply with the requirements of the Austroads AP-G41 *Bitumen Sealing Safety Guide*, Section 9: Procedures for Product Changeover. For polymer modified binders, where a binder to be added is a different type or class, the container shall be drained in accordance with Method C of the Austroads AP-G41 *Bitumen Sealing Safety Guide*, Section 9: Procedures for Product Changeover.

Binder that has been held in storage shall not be used (either mixed or unmixed) unless records are kept, made available to and acceptable to the Administrator. These records shall include the binder's composition and history, including (as relevant) dates and composition of intakes and outtakes to and from the storage container, duration of storage, temperature over time and degree of agitation. Binder storage times and temperatures shall not exceed those as given in the current version of AAPA Advisory Note 7, *Guide to the Heating and Storing of Binders for Sprayed Sealing*.

In the event that adequate records of the composition of stored bituminous material are not available, the quality of the stored bituminous material shall be determined before it is used for any application (with or without mixing with other materials).

The temperature at delivery to site shall be measured and recorded. **Witness Point**

8.3.2 Heating

The Contractor shall ensure that strict controls are applied to heating of bituminous materials in accordance with the requirement of Austroads AP-G41 *Bitumen Sealing Safety Guide*, current version, Section 7: Heating, and the Contractor's Safety Plan.

Heating requirements shall be strictly observed. **Witness Point**

8.3.3 Incorporation of Additives

Volatile additives, e.g. cutter and flux oils, shall not be heated and shall be introduced into the sprayer tank through the sprayer's pumping system. Volatile additives shall not be added to the top of hot bitumen.

Non-volatile additives, e.g. adhesion agent, shall be introduced into the sprayer tank through the sprayer's pumping system in accordance with any relevant standards and/or manufacturer's instructions.

Where additive is used –

- a) the additive shall be dissolved in hot binder; and
- b) the hot binder and additive shall be circulated, after the addition of the last component, at a rate of at least 1000 litres per minute for a period until the sprayer contents have been circulated twice.

Where adhesion agent is to be used, the binder shall then be sprayed as promptly as field circumstances allow and within three hours. If the binder and adhesion agent has not been sprayed within three hours, additional adhesion agent may be added to the remaining binder at a dosage concentration then equivalent to one third of the original adhesion agent dosage.

9 PLANT

The Contractor shall have on the Site and in use as required the plant necessary for the performance of the particular operation. The respective minimum requirements for the plant listed in Table 9 shall apply. Additional minimum requirements for plant shall apply if such are specified in Clause 5 of Annexure MRTS11.1.

Not less than 3 days prior to sealing operations, the Contractor shall submit details of all plant to be used in the operations. **Hold Point 4**

Table 9 – Minimum Requirements for Plant

Plant Item	Minimum Requirements
aggregate spreader	A mechanical spreader capable of accurately spreading a uniform layer of aggregate and, on the day of spreading, satisfactorily meets the requirements of the Field Spread Rate of Cover Aggregate test (Q711A). Additional requirements are detailed in Clause 14.4 and Clause 7.2 of Annexure MRTS11.1.
bitumen tank	A tank suitable for the storage and/or transport of bitumen.
field production of crumb rubber binder	Mobile plant consisting of a crumb rubber binder blending mill and agitated digestion and storage tanks.
road broom	A drawn rotary broom or self-propelled rotary broom suitable for sweeping or cleaning road surfaces. Where suitable, a vacuum system may be used.
rubber-coated steel-wheeled roller	A steel-wheeled roller with rubber-coated steel wheels.
rubber-tyred roller	A dual axle, multi-wheeled roller with a minimum load of one tonne per tyre. Tyres shall be smooth and be able to operate at a pressure of at least 550 kPa.
sprayer	A bitumen sprayer which has a current Queensland Sprayer Certificate issued by Department of Transport and Main Roads, Queensland. The spray bar width of the bitumen sprayer shall not operate beyond the width range for which the spray bar has been certified.
steel-wheeled roller	A roller with steel wheels having a minimum diameter of 0.9 m and a maximum axle load of 5 tonnes. Vibratory equipment shall not be used unless approved by the Administrator.

10 PREPARATION PRIOR TO SPRAYING

10.1 Surface Preparation

10.1.1 General

The surface to be prepared shall include the surface to be sprayed plus either an area which is a minimum of 250 mm beyond the surface to be sprayed, or one which extends to the edge of the formation, whichever is the lesser.

The preparation work shall be carried out in a manner which will promote the adhesion of the bituminous material to the surface of the pavement. Such preparation work shall include that set out in Clauses 10.1.2 to 10.1.4 inclusive.

10.1.2 Initial Bituminous Treatment (No Existing Bitumen Treatment)

All foreign and loose material, including lenses of pavement material, shall be removed from the surface. The surface shall be swept with a road broom until the larger particles in the surface of the pavement are slightly exposed but ensuring excessive erosion of the surrounding finer material does not occur.

A light watering shall be carried out on dry or dusty surfaces just prior to spraying.

For initial seals on new unbound granular or stabilised pavement layers, Ball Penetration testing of the pavement surface shall be completed:

- a) 24 to 48 hours prior to spraying;
- b) in accordance with the requirements of Table 6.2; and
- c) after priming or before primer sealing.

Where a Ball Penetration test result exceeds 4.0 mm, the surface shall not be sprayed until approved by the Administrator. **Hold Point 5**

10.1.3 Re-treatment with Bituminous Material (Over an Existing Bituminous Treatment)

All foreign and loose material shall be removed from the surface using a road broom.

On surfaces where a prime coat has been covered by a cover material, all loose cover material shall be removed without damage to the prime coat.

10.1.4 Disposal of Foreign and/or Loose Material

All foreign and/or loose material shall be removed from the road formation and utilised/disposed of in accordance with the requirements of Clause 11 of MRTS01 *Introduction to Technical Standards*.

10.2 Protection of Road Furniture and Roadside Facilities

The Contractor shall take all necessary precautions to prevent any bituminous or other material used on the Works from entering or adhering to any road furniture or roadside facility.

If any bituminous material does adhere to any road furniture or roadside facility, the Contractor shall remove all such bituminous material so that the road furniture or roadside facility is left in an as-found condition.

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.

10.3 Limit of Work and Setting Out

The Contractor shall set out sufficient marks on the pavement surface to permit the spraying of bituminous material on the sections of pavement described in the Contract and in accordance with the requirements of this Technical Standard.

The Contractor shall set out the work so that longitudinal joints coincide with lane lines, unless shown otherwise in the Contract. Tapers may be sprayed separately.

The start and finish point of each spray run shall be marked.

Unless otherwise specified, the Works shall include all existing traffic lanes, sealed shoulders, pavement widenings (including turn lanes), tapers, and bell mouths at intersecting roads.

10.4 Programming Spray Runs

The Contractor shall program the operations to ensure that –

- a) sufficient loaded aggregate trucks are ready to follow the sprayer to cover the spray run immediately (refer to Clause 14.3); and
- b) not less than the minimum specified rolling is achieved (refer to Clause 14.5).

Additional requirements, if any, relating to programming of spray runs are given in Clause 6.1 of Annexure MRTS11.1.

11 RESTRICTIONS TO SPRAYING

11.1 Availability of Cover Aggregate

Prior to commencement of bitumen spraying operations on any day, the Contractor shall provide the Administrator with evidence that sufficient uncontaminated, precoated cover aggregate of the relevant category, nominal size and specified properties is available for the extent of bitumen spraying work to be undertaken on that day. **Hold Point 6**

11.2 Pavement Surface Temperature

Spraying shall not commence until the temperature of the pavement surface shall be rising or stable and is above the temperature given in Clause 6.2 of Annexure MRTS11.1 or, if not so given, the pavement surface temperature shall be rising or stable and above **Witness Point** –

- a) 10°C for primes;
- b) 15°C for primer seals; or
- c) 20°C for bitumen and polymer modified binders. With the approval of the Administrator, and where the Contractor undertakes sufficient construction practices to ensure adhesion of the binder to the underlying pavement substrate and to the cover aggregate, this limit may not apply to seals that are overlaid with a final asphalt surfacing prior to trafficking.

11.3 Weather Conditions

Spraying shall not take place during rain or if rain is likely to fall prior to the spreading of cover aggregate and the completion of rolling.

Should unforeseen rainfall occur during sealing operation, the Contractor shall stop sealing immediately. Any seal sprayed during rainfall or on a wet surface shall be rejected.

Spraying shall not take place during winds of greater than 30 km/hr or during dust storms.

11.4 Time Periods between Bituminous Treatments

Unless stated in Clause 6.3 of Annexure MRTS11.1, the time periods between bituminous treatments shall comply with the following –

- a) A prime shall not be covered with another bituminous treatment until both of the following conditions are satisfied –
 - i) The prime shall be completely dry and only trafficked by light construction traffic (< 20 vehicles per day); and
 - ii) The prime has been placed for a minimum period of 3 days.
All traffic shall be kept off the primed surface unless prime cover material has been applied.
- b) Between cutback primerseal or a bituminous treatment containing cutter oil and subsequent bituminous treatment (including seal and asphalt) at the same location, the minimum period is –
 - i) 3 months in warm weather (minimum nightly temperatures > 10°C); and
 - ii) at least 6 months in cooler conditions (minimum nightly temperatures ≤ 10°C).
- c) Prior to asphalt overlay, SAMI seals shall not be left exposed for more than 2 days when subject to traffic other than construction vehicles. Where SAMI seals are trafficked by only construction traffic, aggregate removed from the SAMI binder by construction traffic shall be replaced prior to asphalt overlay; and
- d) For single/single seals with a locking coat, the locking coat aggregate shall be applied on the same day.

For double/double seals, the time periods between bituminous treatments shall comply with:

- i) For seal designs completed by the Principal, as stated in Clause 6.4 of Annexure MRTS11.1; and
- ii) For seal design's completed by the Contractor, as stated in the Contractor's seal design report.

12 SPRAYING

12.1 General

The Contractor shall spray the bituminous material in a uniform manner and in a way which promotes adhesion of the material to the pavement surface and to the cover aggregate, in accordance with Clauses 12.2 to 12.9 inclusive.

The sprayer shall maintain a constant road speed throughout the length of each sprayer run (except where permitted by an approved Construction Procedure for achieving a specified variable application rate).

12.2 Method of Application

Bituminous materials shall be applied by a certified bitumen sprayer. Hand spraying is only permitted for areas where the bitumen sprayer cannot access.

12.3 Joints between Spray Runs

All joints, transverse and longitudinal, shall abut in a manner to ensure that the Adjusted Designed Spray Rate is applied uniformly across the joint.

Spraying on each spray run shall start on a protective strip of heavy paper, with a minimum mass of 120 g/m² and a minimum width of 500 mm. The paper shall be laid across the pavement surface for the full width of the spray run and shall be held securely in place.

The sprayer shall commence moving at a sufficient distance in advance of the protective strip to ensure that the road speed for correct application is attained prior to the commencement of spraying.

The spraying for each spray run shall terminate on a protective strip of paper as specified above.

After spraying, the protective strips of paper shall be removed, ensuring no excess bituminous material is deposited on the pavement surface. The Contractor shall dispose of the strips of paper at the end of each day's operation in accordance with the waste management requirements of MRS51 *Environmental Management*.

12.4 Spraybar Nozzles

The Queensland Sprayer Certificate for the sprayer shall be sighted by the Superintendent and the spraybar nozzles used shall be appropriate for each spray run and shall comply with the Queensland Sprayer Certificate for the sprayer. **Witness Point**

Any nozzles that are damaged or become unduly worn or defective shall be replaced by new nozzles of the same type and size. A sufficient number of nozzles for this purpose shall be available on site at all times.

The type and positioning of spray nozzles to be used on the spray bar of the sprayer shall be compatible with the nature of the binder to be sprayed and its application rate.

Where either blockages or partial blockages of nozzle/s occur, spraying shall cease immediately. If the blockage is due to the condition of the binder being sprayed, the condition shall be rectified sufficiently to avoid future blockages.

12.5 Spraying Temperature

The temperature range for spraying bituminous material is listed in Table 12.5. Spraying of bituminous material shall not occur below the relevant minimum temperature nor heated on site above the relevant maximum temperature in Table 12.5. However, when cutback bitumen manufactured by an Approved Manufacturer is delivered to the Works above the maximum temperature indicated in Table 12.5, spraying is permitted within the temperature range of the minimum given in Table 12.5 and the delivered temperature, provided no further heating occurs. Any binder delivered to site at a temperature above 200°C shall be rejected.

Table 12.5 – Spraying Temperature Range

Material	Grade	Spraying Temperature Range (°C)	
		Minimum	Maximum
Cutback Bitumen	AMC00	Ambient	Ambient
	AMC0	35	55
	AMC1	60	80
	AMC2	75	100
	AMC3	95	115
	AMC4	110	135
	AMC5	120	150
	AMC6	135	160
	AMC7	150	175
Bitumen	Class 170	160	190
	Class 320	170	195
Multigrade Bitumen	Class M500/170	175	200
Crumb Rubber Bitumen	S15RF and S18RF	190	200
Polymer Modified Bitumen	Refer to AAPA Advisory Note 7 or binder manufacturer's recommendations		

12.6 Faults During Spraying

Spraying shall cease immediately if any fault develops in the spraying equipment or operation and shall not recommence until the fault has been rectified.

12.7 Cutting Back Binder

To achieve the essential initial wetting of aggregate, a sufficiently low viscosity is required. Where the pavement temperature is too low to achieve the necessary viscosity for the particular binder, cutting is required as given in this Clause and the requirements of the Contract.

SAMI seals shall not be cut back unless otherwise specified in Clause 6.5 of Annexure MRTS11.1. Notwithstanding the requirements of Clause 6.5 of Annexure MRTS11.1, SAMI seals shall not be cut by more than the addition of 2.0 parts of cutter by volume.

Assessment of pavement temperatures shall take into account the cooler condition inherent in shaded areas of pavement.

Where the road pavement temperature is such that a temporary reduction in binder viscosity is necessary to enhance initial adhesion between the binder and the cover aggregate, cutter oil shall be added to the binder for seal or reseal work. The amount of cutter oil shall be determined by the Seal Designer's Delegate in accordance with Table 12.7-A and Table 12.7-B, noting that for application rates of polymer modified binder greater than 2 L/m² the cutter oil may be reduced by 2 parts. The amounts of cutter oil in Table 12.7-A and Table 12.7-B shall be adjusted according to the following adjustments which are cumulative –

- consider adding an additional 2 parts cutter oil when pavement temperatures are falling (eg late afternoon) and consider reducing cutter oil by 2 parts when pavement temperatures are rising (eg early morning);
- where it is expected that pavement temperatures will fall below 5°C during the first 24 hours after spraying, consider adding up to 4 parts cutter oil to avoid subsequent aggregate loss;
- when aggregate precoating is inactive or dry, consider adding 2 parts cutter oil, and where the precoated aggregate stockpile is moist with water, consider adding an additional 2 parts cutter oil; and
- consider all other requirements, including early trafficking of the sealed surface, so that the pavement shall be at the relevant temperature for reduced cutting or no cutting before sealing occurs.

If the above cumulative adjustments add 6 parts or more to the base Adjusted Designed Spray Rate, then the Seal Designer's Delegate shall review the binder capacity to adhere to the cover aggregate in accordance with the requirements of the Contract.

Table 12.7-A – Cutting Practice for Class 170, Class 320 and Multigrade Bitumen

Pavement Temperature °C (Note 1)	Traffic Volume (vehicles per lane per day) (Note 2)	Cutter Proportion (Note 3)					
		Aggregate Nominal Size 10 mm or larger			Aggregate Nominal Size 7 mm or less		
		Class 170	Class 320	M500/170	Class 170	M500/170	Class 320
20 to 25	< 100	8	10	8	10	10	12
	100 to 1500	6	8	6	8	8	10
	> 1500	4	6	4	6	6	8
26 to 32	< 100	6	8	6	8	8	10
	100 to 1500	4	6	4	6	6	8
	> 1500	2	4	2	4	4	6
33 to 38	< 100	4	6	4	6	6	8
	100 to 1500	2	4	2	4	4	6
	> 1500	0	2	0	2	2	4
39 to 45	< 100	2	4	2	4	4	6
	100 to 1500	0	2	0	2	2	4
	> 1500	0	2	0	0	0	2
> 45	< 100	0	2	0	2	2	4
	100 to 1500	0	2	0	0	0	2
	> 1500	0	2	0	0	0	2

- Notes: 1 Anticipated pavement temperature at time of aggregate spreading.
 2 Based on AADT.
 3 Parts of cutter oil to 100 parts of bitumen by volume at 15°C.

Incorporation of cutter oil into the binder shall be carried out in accordance with Clause 8.3.3. The cutter oil, without previously being heated, shall be sucked into the hot bitumen in the sprayer. Before spraying, after the addition of the last component, the Contractor shall circulate the full sprayer load of cutback bitumen at a rate of at least 1000 litres per minute for a period until the sprayer contents have been circulated twice.

Prior to each operation, the Seal Designer's Delegate shall nominate the cutter oil adjustments, which shall be recorded. **Witness Point**

Table 12.7-B – Cutting Practice for PMBs

Pavement Temperature (°C) (Note 3)	Traffic Volume (vehicles per lane per day) (Note 2)	Cutter Proportion (Note 1) for PMB Class					
		S0.25S	S0.7S	S0.3B	S1.8R (Note 4)	S15RF	S18RF
20 to 25	< 1000	7	8	6	10	-	-
	≥ 1000	5 – 7	6 – 8	4	8	-	-
26 to 32	< 1000	5	6	4	8 – 10	10	12
	≥ 1000	3 – 5	4 – 6	2	6 – 8	8	10
33 to 38	< 1000	3 – 4	4 – 5	2	6 – 8	8	10
	≥ 1000	2 – 3	3 – 4	2	6	6	8
39 to 45	< 1000	Minimum 2	Minimum 3	0 – 2	4 – 6	6	8
	≥ 1000	Minimum 2	Minimum 3	0 – 2	4 – 6	4	6
> 45	All traffic	Minimum 2	Minimum 3	0 – 2	Minimum 4	4	6

Notes to Table 12.7-B –

- Parts of cutter oil to 100 parts of bitumen by volume at 15°C.
- Based on AADT.
- Pavement temperatures used to determine the amount of cutter oil shall be based on the worst conditions i.e. shaded areas of pavement.
- Pre-blended crumb rubber (R classes) may contain process oil used in their manufacture. This oil shall most likely reduce the viscosity compared to field blended rubber (RF classes), and may allow a small reduction, i.e. 2 parts, in added cutter oil.

12.8 Spray Rate

The Estimated Spray Rate, Designed Spray Rate, Adjusted Designed Spray Rate and Actual Spray Rate referred to in this technical standard shall be the quantities, at 15°C, of the bituminous material listed in Table 12.8 for the relevant operation.

Table 12.8 – Bituminous Materials for Spray Rate Determination

Operation	Bituminous Materials to be Included in the Spray Rate (at 15°C)
Prime	Cutback bitumen
Primerseal	Cutback bitumen
Seal	Bitumen or polymer modified binder
Reseal	Bitumen or polymer modified binder
Enrichment	Cutback bitumen or cutback bitumen with flux

Operation	Bituminous Materials to be Included in the Spray Rate (at 15°C)
SAMI seals	Bitumen or polymer modified binder

Any spray rates given in Clause 2 of Annexure MRTS11.1 are Estimated Spray Rates.

The Actual Spray Rate shall be within $\pm 5\%$ of the Adjusted Designed Spray Rate defined in the nominated seal design as determined in accordance with Clause 6.

To comply with the above requirements the Contractor shall make adjustments to the operation of the sprayer to account for the following –

- a) the increased volume of the material to be sprayed, where the temperature of the material is higher than 15°C (Refer to Table 15-A); and
- b) the increased volume of the material to be sprayed, where there are other materials in the bituminous material not listed in Table 12.8 for the relevant operation (eg. cutter oil and/or adhesion agent in a sealing operation).

12.9 Quantities Retained in Sprayer Tank

To ensure a uniform spray rate, each sprayer run shall be programmed so that the bituminous material retained in the tank at the completion of the spray run shall be the greater of 250 litres and the manufacturer's recommended minimum limit.

12.10 Tolerances

The sprayed binder edges shall not deviate from the specified edge by more than - 0 mm and + 150 mm.

13 SPREADING PRIME COVER MATERIAL

13.1 General

The Contractor shall spread the prime cover material so as to produce a complete and even distribution. Wet cover material containing free surface water shall not be used.

13.2 Spread Rate

The spread rates stated in Clause 2 of Annexure MRTS11.1 are Estimated Spread Rates.

The Designed Spread Rate shall be that nominated in the seal design determined in accordance with Clause 6. After consultation with the Administrator, the Designed Spread Rate may be adjusted by the Seal Designer's Delegate during the spreading operation to ensure a complete and even distribution. The adjusted rate shall then be the Adjusted Designed Spread Rate.

13.3 Time Limit

To permit penetration of the prime, at least two hours shall elapse between priming and the application of the cover material, unless traffic requirements dictate otherwise.

13.4 Spreading

Bare or insufficiently covered areas shall be re-treated as soon as possible with a further light run or by hand spreading.

The Actual Spread Rate shall not vary outside the range of plus or minus 10% of the Adjusted Designed Spread Rate.

13.5 Removal of Excess Cover Material

Unless otherwise stated in Clause 7.1 of Annexure MRTS11.1, all excess cover material shall be lightly swept and/or vacuumed from the pavement surface with a road broom and/or vacuum truck and completely removed from the road formation. All excess material shall be utilised/disposed of in accordance with the requirements of Clause 11 of MRTS01 *Introduction to Technical Standards*.

14 SPREADING COVER AGGREGATE

14.1 General

Wet cover aggregate containing free surface water shall not be loaded into the aggregate spreader **Witness Point**.

The Administrator may order that wet aggregate be tested using the Bitumen Stripping Value – Modified Plate test (Q212B). Test results shall be reported to the Administrator.

During spreading and rolling, the Contractor shall ensure that the aggregate effectively adheres to the binder without breaking down or crushing the aggregate particles.

The Contractor shall spread the cover aggregate in a uniform manner which, after rolling and initial trafficking, forms a single layer on the pavement surface with the dense mat of cover aggregate being partly interlocked.

14.2 Spread Rate

The spread rates stated in Clause 2 of Annexure MRTS11.1 are Estimated Spread Rates. The Designed Spread Rate shall be that determined in the seal design in accordance with Clause 6.

In order to achieve the requirements of Clause 14.4, the Seal Designer Delegate may adjust the Designed Spread Rate during the spreading operation. This Adjusted Designed Spread Rate shall be recorded on the spray sheet.

14.3 Time Limit

The spreading of cover aggregate shall commence as soon as possible after the spraying of the binder. Under no circumstances shall any portion of the binder be left without cover aggregate after spraying for longer than the following –

- a) for primerseals: 15 minutes;
- b) for C170, M500/170 and C320 seals: 10 minutes; or
- c) for polymer modified binders, including crumbed rubber binder: 5 minutes.

In the event that cover aggregate is not applied to any one spray run within this time limit, the Contractor shall demonstrate to the Administrator that arrangements have been made to prevent a recurrence of the nonconformance before bitumen spraying may continue. **Nonconformance**

14.4 Spreading

Spreading of cover aggregate shall be carried out with suitable mechanical aggregate spreaders. Minimum requirements for aggregate spreaders shall be as stated in Clause 7.2 of Annexure MRTS11.1.

On each day of spreading, each spreader shall be tested in accordance with the Field Spread Rate of Cover Aggregate test (Q711A) and shall comply with the spread rate tolerance requirements of Clause 14.2. The test frequency shall be one test per spreader per day.

Every attempt shall be made to achieve the required spread pattern on the first spreading pass. Bare or insufficiently covered areas shall be re-treated as soon as possible with a further light spreading run or by hand spreading. Overspreading or underspreading of the aggregate shall be avoided.

If there is an uneven distribution of cover aggregate, it shall be broomed until it is evenly distributed, with minimum dislodgment of any embedded cover aggregate. Areas of under-spread aggregate shall be filled in immediately behind the normal spreading operation and these areas shall require additional rolling.

Any initial underspreading shall be rectified by a further light spreading of aggregate and brooming until it is evenly distributed, with minimum dislodgement of any embedded cover aggregate.

The amount of aggregate spread shall be calculated from either –

- a) the volume used as recorded on the spray sheets; or
- b) by using Test Method Q711A.

The Actual Spread Rate shall not vary outside the range of plus or minus 10% of the Adjusted Designed Spread Rate.

14.5 Rolling

14.5.1 General

Steel-wheeled rollers shall not be used unless approved by the Administrator.

A rubber-coated steel-wheeled roller may be used, subject to the approval of the Administrator [Refer to Hold Point 4].

For double/double coat seals, the rolling shall comply with the requirements of this clause for each coat of seal. Any aggregate not incorporated into the first coat of seal shall be removed in such a manner as to prevent removal of aggregate already embedded in the first coat. Any damage to the first coat shall be repaired by the Contractor, at no cost to the Principal, prior to spraying the binder for the second coat.

14.5.2 Minimum Number of Rollers

The minimum number of rubber-tyred rollers to be available and in use on the Site shall be the greater of –

- a) two; and
- b) the number required to complete the minimum amount of rolling required for the average coverage rate per hour as a continuous operation with successive spray runs in accordance with Clause 14.5.3 and Clause 14.5.4.

Additionally, for polymer modified binders, there shall be enough rollers to cover the full width of the spray run with one pass.

14.5.3 Rolling Speed

The initial passes shall be done at a low speed (5 – 10 km/h) to achieve the aim of pressing the aggregate into the binder. After that, the rolling speed shall be increased to between 15 – 25 km/h to move and reorientate the aggregate particles to their correct position.

14.5.4 Roller Coverage

For bitumen and multigrade binders, Table 14.5.4 specifies the maximum sprayed area (m²) that can be effectively rolled, taking into account the effect of traffic and aggregate size.

Table 14.5.4 – Area that can be effectively rolled per hour with each self propelled multi-wheeled roller for bitumen and multigrade binders

Aggregate size (mm)	Traffic Volume (vehicles per lane per day)		
	< 300	300-1200	> 1200
	Area – m ² per roller hour (Note 1)		
7 or smaller	4000 – 4500	5000 – 5500	6000 – 6500
10	3000 – 3500	3500 – 4000	4500 – 5000
14	2500 – 3000	3000 - 3500	3500 - 4000

Table Note 1 – 'roller hours' is defined as the product of the number of specified rollers by hours of application

Examples of the use of Table 14.5 can be found in Austroads/AAPA Pavement Work Tip No. 24.

14.5.5 Number of Roller Passes

After satisfactory spreading, the cover aggregate shall be rolled with a sufficient number of roller passes to ensure adhesion of the cover aggregate, and where the minimum number of roller passes shall be as stated in Clause 7.3 of Annexure MRTS11.1, or if not so stated –

- a) For bitumen and multigrade binders, the greater of –
 - i) six passes; and
 - ii) the number of passes required to achieve the minimum amount of rolling that satisfies the requirements of Table 14.5.4 as a continuous operation with successive spray runs.

- b) For polymer modified binders that are not SAMI seals, the greater of –
 - i) nine passes; and
 - ii) the number of passes plus 50% more than are required for the minimum amount of rolling that satisfies the requirements of Table 14.5.4 as a continuous operation with successive spray runs.
- c) For polymer modified binders that are SAMI seals, the greater of –
 - i) twelve passes; and
 - ii) the minimum number of passes plus 100% more than are required for the minimum amount of rolling that satisfies the requirements of Table 14.5.4 as a continuous operation with successive spray runs.

14.6 Removal of Loose Aggregate after Rolling

Loose cover aggregate shall be lightly swept and/or vacuumed from the pavement surface without dislodgment of the embedded aggregate. A rotary broom is permitted to remove loose aggregate from the trafficked areas. Loose aggregate shall not be removed until the aggregate is properly embedded into the binder by either trafficking or additional rolling.

Areas of aggregate that have been overspread (generally at joins, turnouts and overlaps) shall be broomed off on the same day with hand brooms or mechanical sweepers.

For aggregates of size greater than or equal to 10 mm, after sweeping and prior to the work being opened to traffic at the pre-existing signposted speed, the number of loose aggregate particles (per m²), not including aggregate particles from any scatter coat, shall –

- a) be determined in accordance with Austroads test method AGPT/T452 Measurement of Loose Aggregate on Sprayed Seals;
- b) be tested at locations that are representative of each homogeneous section and as agreed by the Administrator; and
- c) not exceed the values shown in Clause 7.4 of Annexure MRTS11.1. If values are not specified in Clause 7.4 of Annexure MRTS11.1, the values shown in Table 14.6 apply.

Table 14.6 – Maximum Allowable Loose Aggregate Particles by Area Prior to Opening to Traffic

Location	Maximum Allowable Loose Aggregate Particles
Urban Area	20 particles/m ²
Other medium to high traffic (greater than or equal to 250 vehicles/lane/day)	30 particles/m ²
Low traffic (less than 250 vehicles/lane/day)	40 particles/m ²

The loose aggregate requirements of Table 14.6 shall apply to the road formation.

Loose aggregate in excess of the limits of Table 14.6 shall be removed within 24 hours from concrete channels, traffic islands, open drains, footpaths, nature strips or verges. All other excess loose aggregate shall be removed and transported from the job site within 5 days. Loose aggregate shall be utilised/disposed of in accordance with the requirements of Clause 11 of MRTS01 *Introduction to Technical Standards*.

Any damage to the seal resulting from removal of loose aggregate shall be repaired by the Contractor at no cost to the Principal.

During the Defects Liability Period up to the issue of the Final Certificate, where the Contractor is the nominated Seal Designer in accordance with Clause 1 of Annexure MRTS11.1, the Contractor is required, at no cost to the Principal, to ensure that the requirements of Table 14.6 are met.

14.7 Protection of Fresh Seals from Traffic

The Contractor shall take precautions to protect the work from damage until such time as the prime or seal (including primerseals, new seals, reseals and SAMI seals) has developed sufficient strength to carry normal traffic without dislodgement of the cover aggregate or cover material, as applicable.

Special attention is required at intersections.

14.8 Early Trafficking Minimum Requirements

Unless otherwise stated in Clause 8 of Annexure MRTS11.1, the Contractor shall complete the following early trafficking minimum requirements in order to address both loose stone considerations in accordance with Clause 14.6 and the protection of the fresh seal from traffic in accordance with the requirements of Clause 14.7 –

- a) In areas where the posted speed limit is equal to or less than 60 km/h and which are opened to traffic prior to final sweeping, the Contractor shall install temporary 'loose stones' and 'slippery' warning signs and temporary 40 km/h speed signs until the maximum allowable loose aggregate requirements of Clause 14.6 are met;
- b) In areas where the posted speed limit exceeds 60 km/h and which are opened to traffic prior to final sweeping, the Contractor shall install temporary 'loose stones' and 'slippery' warning signs and temporary 60 km/h speed signs until the maximum allowable loose aggregate requirements of Clause 14.6 are met; and
- c) For a period of between 24 hours and 48 hours after the maximum allowable loose aggregate requirements of Clause 14.6 have been met, the temporary speed limit shall be not greater than 80 km/h and the posted speed limit, and the Contractor shall install signs accordingly.

For primes, neither construction traffic nor public traffic shall be permitted on the surface where the traffic exceeds 50v/l/d. Where the traffic is less than 50v/l/d, neither construction traffic nor public traffic shall be permitted on the surface –

- a) within 24 hours of spraying or until the prime has dried sufficiently so as not to be damaged by vehicles; and
- b) until prime cover material is applied.

All signage shall comply with the requirements of MRTS02 *Provision for Traffic*.

The requirements of Clause 14.8 are **Hold Point 7** and the road shall not be opened to traffic until the release of this Hold Point by the Administrator.

15 MEASUREMENT AND RECORDING

The volume of bituminous material sprayed of each run shall be determined by dipping the tank after each run and recording the volume of bituminous material in the tank to the nearest 50 L. The sprayer shall be dipped whilst parked on level ground. Sprayers with electronic process control and data recording may, with the approval of the Administrator, be exempted from this requirement.

For each spray run, the Contractor shall record all details of the sealing operations on an appropriate spray sheet, which shall include details of at least the following –

- a) Job Number;
- b) The Queensland Sprayer Certificate number and its expiry date;
- c) Date and start time of the spray run;
- d) Description of the weather throughout the spray run;
- e) Name and signature of the Spray Seal Designer's Delegate determining the Adjusted Designed Spray Rate and Adjusted Designed Spread Rate;
- f) Pavement temperature at the start and end of the spray run, and when there is significant change in temperature (record time/ temperature degrees Celsius);
- g) Gazettal chainages for start and finish of the spray run;
- h) Area of the spray run (in m²);
- i) Hot volume of binder prior to addition of cutter and additives (in L);
- j) Binder type/s used on the spray run;
- k) Additive (including adhesion agent and cutter) types used, if any;
- l) Design cutter oil proportions (parts per 100 parts of binder) used, if any (refer Clause 12.7);
- m) Actual cutter oil proportions (parts per 100 parts of binder) used, if any;
- n) Quantity of adhesion agent (parts per 100 parts of binder) used, if any;
- o) Temperature of mixture at start of the spray run;

- p) Adjusted Designed Spray Rate/s and Actual Spray Rate/s for each run (at 15°C);
- q) Nominal aggregate size used for the spray run;
- r) Quantity of aggregate spread for the spray run;
- s) Adjusted Designed Spread Rate/s and Actual Spread Rate/s);
- t) Number of and type of rollers used;
- u) A statement of whether the spray rate complied with the tolerance requirements detailed in Clause 12.8, and whether the aggregate spread rate complied with the tolerance requirements detailed in Clause 13.4 and Clause 14.4;
- v) A statement confirming conformance in accordance with Clause 5.3.

The bituminous materials spraying record sheet shall be made available to the Administrator for verification, within one day of the sealing operations applicable to the run.

All records shall be such that the actual spray rate for each spray run shall be calculated at 15°C prior to the next spray run.

All volume conversions, in relation to changes in temperature of bituminous materials, shall be carried out in accordance with the relevant factors listed in Table 15-A and Table 15-B.

Table 15-A – Equivalent Volumes at Higher Temperatures of 1 Litre of Bituminous Material Measured at 15°C

Temp (°C)	Factor	Temp (°C)	Factor	Temp (°C)	Factor
15	1.0000	80	1.0420	145	1.0861
20	1.0030	85	1.0453	150	1.0897
25	1.0062	90	1.0487	155	1.0932
30	1.0094	95	1.0520	160	1.0967
35	1.0126	100	1.0553	165	1.1003
40	1.0158	105	1.0587	170	1.1038
45	1.0191	110	1.0620	175	1.1074
50	1.0223	115	1.0655	180	1.1109
55	1.0256	120	1.0689	185	1.1145
60	1.0280	125	1.0723	190	1.1180
65	1.0321	130	1.0757	195	1.1216
70	1.0354	135	1.0792	200	1.1252
75	1.0387	140	1.0827	205	1.1287

Table 15-B – Equivalent Volumes at 15°C of 1 Litre of Bituminous Material Measured at Higher Temperatures

Temp (°C)	Factor	Temp (°C)	Factor	Temp (°C)	Factor
15	1.0000	80	0.9597	145	0.9207
20	0.9969	85	0.9566	150	0.9177
25	0.9938	90	0.9536	155	0.9148
30	0.9907	95	0.9506	160	0.9118
35	0.9876	100	0.9476	165	0.9089
40	0.9844	105	0.9446	170	0.9060
45	0.9813	110	0.9416	175	0.9031

Temp (°C)	Factor	Temp (°C)	Factor	Temp (°C)	Factor
50	0.9782	115	0.9385	180	0.9002
55	0.9751	120	0.9355	185	0.8973
60	0.9720	125	0.9326	190	0.8945
65	0.9689	130	0.9296	195	0.8916
70	0.9658	135	0.9266	200	0.8888
75	0.9627	140	0.9236	205	0.8860

16 CONSTRUCTION COMPLIANCE

16.1 General

Material compliance shall be tested and checked in accordance with the requirements of Clause 7.1.

The process requirements shall be checked for compliance with the specified requirements during and after construction for each lot.

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

The Contractor and Administrator shall jointly investigate and provide the Principal with a written report on the causes where any of the following occurs on more than 10% of any wheel path length of any run at any time to the end of the Defects Liability Period –

- a) Stripping, which is defined as areas where more than 10% cover aggregate has been lost from the seal's aggregate matrix;
- b) Flushing, which is defined as where surface texture depth is < 0.5 mm when tested by AGPT/T250; and/ or
- c) Debonding, which is defined as separation of the seal from the underlying layer.

16.2 Surface Texture

Except for SAMI seals, where the seal is the final surfacing or shall be opened to public traffic, surface texture shall be tested, recorded and reported to the Administrator as follows –

- a) Surface texture shall be assessed by the Modified Surface Texture Depth (Pestle Method);
- b) Testing shall be carried out –
 - i) At sections of through pavement that have a homogeneous visual appearance; and
 - ii) At each of the following locations –
 - pedestrian crossings, railway level crossings, roundabouts, and intersections (including the maximum 50 m approaches and departures to all of these);
 - curves with radius ≤ 250 m;
 - gradients $\geq 5\%$ and ≥ 50 m long;
 - on/off ramps, including merge and diverge areas; and/or
 - merge and diverge areas of overtaking lanes and intersections.
- c) Testing shall be completed after the loose aggregate requirements of Clause 14.6 are met.

All surface texture depths shall achieve the requirements stated in Clause 9 of Annexure MRTS11.1.

17 SUPPLEMENTARY REQUIREMENTS

The requirements of MRTS11 *Sprayed Bituminous Surfacing (Excluding Emulsion)* are varied by the supplementary requirements given in Clause 10 of Annexure MRTS11.1.