

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS07C Insitu Stabilised Pavements Using Foamed
Bitumen**

October 2014

Superseded

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1 Introduction

This technical specification applies to the stabilisation of materials insitu by the addition of bitumen, as a foam, and a secondary stabilising agent. It only applies to insitu stabilisation of the uppermost layer/s of an existing pavement to form a single stabilised layer of either base or sub-base.

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.

2 Definition of terms

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

Where indicated in Table 2 of this technical specification a more complete definition is contained in the referenced clause.

Table 2 – Definition of terms

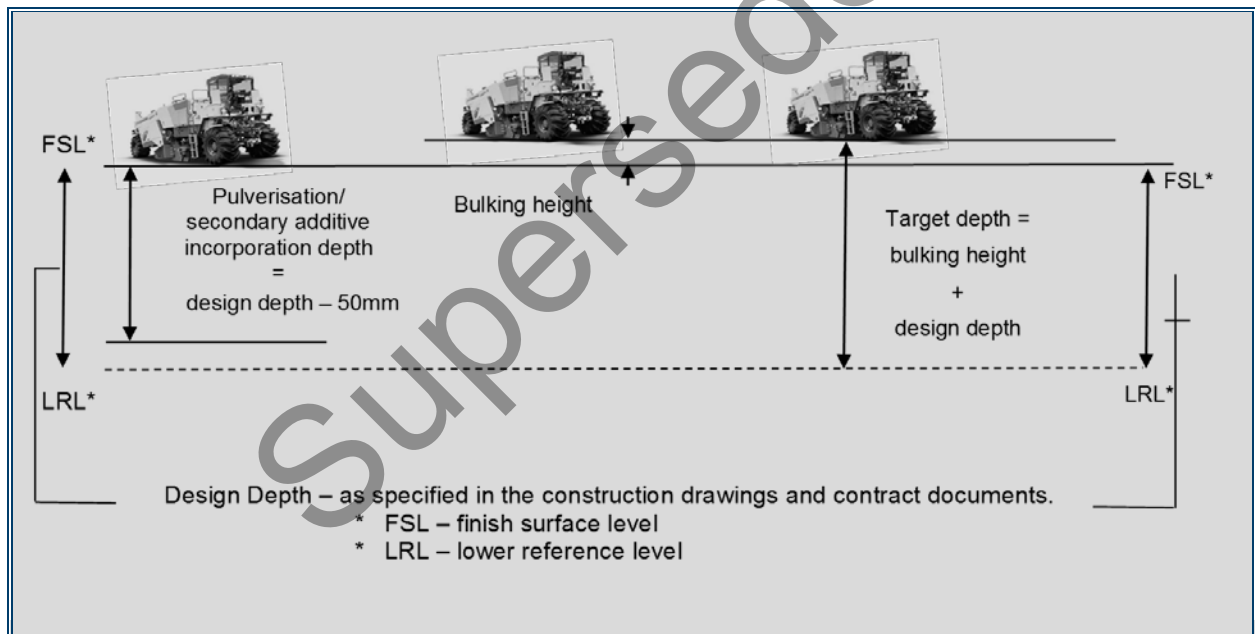
Term	Definition	Clause reference
Actual depth	Achieved layer thickness as measured from the lower reference level to the Finish Surface Level.	8.5.4.2
Allowable working time	The time within which compaction and trimming of the stabilised layer is to be completed, measured from the commencement of incorporation (i.e. mixing) of the secondary stabilising agent into the unstabilised material to completion of compaction and trimming.	8.1.4
Available lime index	The available calcium oxide for quicklime or available calcium hydroxide for hydrated lime in accordance with AS 4489.6.1.	-
Binder	Stabilising agents – see definitions below.	-
Bituminous curing coat	A sprayed bituminous surfacing with cover aggregate.	8.4.19
Bulking	<p>During preliminary pulverisation and/or incorporating secondary and primary agents using a reclaimer/stabiliser of a layer designated for stabilisation, the volume of the material increases as compared to the volume prior to this operation. This increase in volume is called bulking.</p> <p>The amount of bulking height should be determined prior to the final pass incorporating the primary stabilising agent (foam bitumen) through suitable surveying techniques.</p> <p>Once the bulk level is established the bulking is estimated as the difference between the bulk level and the finish surface level.</p> <p>See target depth – refer Figure 1.</p>	8.4.9.2
Curing materials	Materials applied to the exposed surfaces of the completed stabilised layer for the purpose of curing.	6.4

Term	Definition	Clause reference
Design depth	As specified in the construction drawings and contract documents – refer Figure 1.	8.1.2
Equivalent calcium oxide content	Equivalent calcium oxide content is the amount of calcium oxide, expressed as a percentage by mass, which in quicklime produces calcium hydroxide (Ca(OH) ₂) after slaking.	-
Expansion Ratio	A term used to define the expansion properties of the bitumen. It is defined as the ratio of the maximum volume of the bitumen in its foamed state to the volume of bitumen once the foaming has completely subsided.	8.4.11
Foamed bitumen	Class 170 bitumen which is (temporarily) brought into a foamed state by the addition of water and foaming agent(s), if required.	6.3
Foaming agent	A chemical additive added to bitumen to improve its foaming characteristics.	8.4.11
Half life	A term used to define the expansion properties of the bitumen. It is defined as the time taken for the foamed bitumen to settle to one half of the maximum volume of the bitumen in its foamed state. It is measured from the start of bitumen foaming.	-
Height of collimation	Height of collimation is the elevation of the optical axis of the telescope at the time of the setup. The line of collimation is the imaginary line at the elevation.	-
Hydrated lime	Hydrated lime is a granular form of lime consisting primarily of calcium hydroxide (Ca(OH) ₂)	6.3
Lower reference level	Lower reference level is the finish surface level minus the design depth – refer Figure 1.	-
Primary stabilising agent	See foamed bitumen.	6.3
Quicklime	Quicklime is a granular form of lime consisting primarily of calcium oxide (CaO). Quicklime hydrates rapidly in the presence of water.	6.3
Reclaimer/stabiliser	A single-rotor mix-in-place plant of a type (i.e. plant that mixes insitu) specifically designed for the dual task of reclamation and stabilisation work.	-
Relative Moisture Ratio (RMR)	The relative moisture of the treated soil compared to optimum moisture content using standard compaction, expressed as a percentage.	8.5.2
Secondary stabilising agent	Hydrated lime or slaked quicklime included in the stabilisation process used to improve the dispersion of the foamed bitumen and increase the early strength of the stabilised material.	6.3
Stabiliser	A single-rotor mix-in-place plant (i.e. plant that mixes insitu) of a type specifically designed for stabilisation work.	-
Stabilising agent	Primary and secondary stabilising agents – see definitions above.	-

Term	Definition	Clause reference
Target depth	The target depth is the cutting depth required by the reclaimer/stabiliser to achieve the lower reference level. To achieve the lower reference level, the cutting depth (target depth) should take into account the bulk height. This bulk height should be added to the design depth. See definition for bulking. Refer Figure 1.	8.4.9.2

Figure 1 - Target depth sketch

Pulverisation/secondary additive incorporation	Bulking after secondary additive incorporation	Target depth/final foam bitumen pass
Preliminary pulverisation and incorporation of secondary agents is mulched to 50 mm less than the design depth.	After surface compaction and trimming, volume of materials change due to incorporation of the secondary agents. The bulking height above FSL needs to be identified and added to the design depth.	Cutting depth required on the final pass by the reclaimer/stabiliser to reach the LRL will need to account for the additional bulking above the FSL.



3 Referenced documents

Table 3 lists documents referenced in this technical specification.

Table 3 – Referenced documents

Reference	Title
AS 4486.1	Test methods for limes and limestones - Lime index - Available lime
AP-G41/02	<i>Austrroads' Bitumen Sealing Safety Guide (2nd Edition)</i>
AP-G41/08	<i>Austrroads' Bituminous Materials Safety Guide</i>
Version A – 14 February 2000	<i>National AustStab Guidelines – Verification of Bitumen Application Rate</i>
MRTS01	Introduction to Technical Specifications
MRTS05	Unbound Pavements
MRTS17	Bitumen
MRTS23	Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation
MRTS50	Specific Quality System Requirements

4 Standard Test Methods

The Standard Test Methods listed in Table 4 shall be used in this specification subject to the additional requirements given in this specification (e.g. see Clause 9).

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 No.
Determination of the relationship between standard and subsidiary test methods	Q010
Selection of sampling and test locations	Q050
Sampling of soils, crushed rock and aggregates	Q060
Spot sampling of soils, crushed rock and aggregates	Q061
Preparation of disturbed samples	Q101
Moisture content	Q102A Q102B Q102D
Laboratory reference density	Q142A Q143 Q144A
Relative compaction (i.e. Relative Dry Density [RDD])	Q140A Q141A Q141B
Sulfate content	AS 1289.4.2.1

Property to be Tested	Test Method No.
Road roughness surface evenness	Q708B Q708C Q708D
Surface spread rate of stabilising agent (for secondary stabilising agent)	Q719
Relative moisture content	Q140A

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 specification are summarised in Table 5.1.

Table 5.1 - Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2	1. Approval of construction procedures and construction program		Supply of the construction procedures and construction program for the stabilisation works (42 days)
7.1	2. Compliance of all materials, prior to their incorporation		
8.1.5	3. Survey of services, utilities, buildings and drainage		
8.3.1	4. Approval of compaction based on a process requirement		
8.3.2		Construction of trial section (if process standard specified for compaction)	
8.4.1		Removal and disposal of material not suitable for stabilisation	
8.4.2		Preliminary pulverisation	
8.4.6		Spreading secondary stabilising agent	
8.4.11	5. Foaming properties of bitumen		
8.5.1.1			Ordered content of stabilising agent (14 days)
8.5.1.2, 9.6		Bitumen tanker dipping	

Clause	Hold Point	Witness Point	Milestone
8	6. Construction permitted to proceed		
9.9.2		Visual deflection of pavement layers	
9.10	7. Acceptance		

5.2 Construction procedures

The Contractor shall prepare documented procedures for all construction processes in accordance with Clause 5 of MRTS50 *Specific Quality System Requirements*. The construction procedure described in this Clause shall be submitted to the Administrator.

A construction procedure detailing all work described in this specification shall be prepared.

The construction procedure shall include, but not be limited to:

- a) details of all plant associated with the work detailed in this specification
- b) details of how services, utilities, buildings and drainage components shall be located (refer to Clause 8.1.5)
- c) details of how services, utilities, buildings, drainage components, plant personnel shall be protected from damage, injury, etc. (refer to Clause 8.1.5)
- d) calibration procedures (for example, for the spreader, for the bitumen spray bar)
- e) a detailed sequence of operations for all aspects of the stabilisation works, including, but not necessarily limited to:
 - i. details of joint locations
 - ii. details of joint overlaps
 - iii. the length of each run
 - iv. the width of each run, and
 - v. details of procedures for working up to, or against, structures, kerb, kerb and channel and road safety barriers, and such as bridges, access chambers, gullies, culverts and concrete medians and any existing pavement cutback point
- f) the proposed program of works
- g) a testing program which shall include, but not be limited to, the testing methodology that shall be used to assess:
 - i. the compaction standard
 - ii. the stabilisation depth, target depth and achieved depth
 - iii. the stabilising agent content, and
 - iv. geometric tolerances
- h) where process requirements are specified in accordance with Clause 8.1.3, a program for the construction of the stabilisation works.

The proposed construction procedure shall be submitted to the Administrator at least 42 days prior to the commencement of stabilisation works. **Milestone**

The following shall also be submitted to the Administrator with the construction procedure:

- a) details of the proposed source of the each stabilising agent
- b) a certificate of test results demonstrating compliance of the constituents of the proposed bituminous and secondary stabilising agents to the required standards, and
- c) compliance test results and a representative sample of the unbound pavement material from each proposed source to be used for shape correction and/or to replace material not suitable for stabilisation.

No stabilisation works shall be commenced until the construction procedure for the stabilisation works is acceptable to, and approved by, the Administrator. **Hold Point 1**

5.3 Conformance requirements

The conformance requirements which apply to lots of stabilised pavement covered by this technical specification are given in Clauses 6 to 9.

5.4 Testing frequencies and lot sizes

Material compliance testing requirements are specified in Clause 7 and construction compliance testing requirements are specified in Clause 9.

The minimum testing frequencies and lot sizes for any additional material required for shape correction and for new material to replace material not suitable for stabilisation shall be as stated in Clause 1.1 of Annexure MRTS07C.1. If no such requirements are specified for any such materials, the testing frequency and lot size requirements for Type 1, Type 2, Type 3 and Type 4 materials shall comply with the requirements of MRTS05 *Unbound Pavements*.

The minimum testing frequencies and lot sizes for construction shall be as stated in Clause 1.2 of Annexure MRTS07C.1. Where no maximum lot size for construction is specified in Clause 1.2 of Annexure MRTS07C.1, the maximum lot size shall be equal to the area (in m²) of production of one completed stabilised layer achieved during one continuous work period, provided the material is, in the opinion of the Administrator, essentially uniform.

Certification of the compliance of each bituminous/primary stabilising agent and each secondary stabilising agent is required for each source and for each load.

6 Material

6.1 New material to replace material not suitable for stabilisation

New material which is required to replace material not suitable for stabilisation shall be unbound granular material that complies with the requirements stated in Clause 2 of Annexure MRTS07C.1.

Where not so stated in the Annexure, materials shall be either Type 1, Type 2, Type 3 or Type 4 unbound pavement material complying with the requirements of MRTS05 *Unbound Pavements*.

Type 1, Type 2, Type 3 or Type 4 unbound granular pavement material shall also comply with the requirements of MRTS05 *Unbound Pavements*.

Stabilised material shall not be used as new material for replacement material.

Additionally, any new material incorporated into the Works shall have a water soluble sulfate content not exceeding 1.9 grams of sulfate (expressed as SO₄) per litre.

6.2 Additional material for shape correction

The shape of the pavement shall be corrected prior to the importation of any overlay material.

Additional material that is required for shape correction shall be unbound granular material that complies with the requirements stated in Clause 3 of Annexure MRTS07C.1.

Where not so stated in the Annexure, materials shall be either Type 1, Type 2, Type 3 or Type 4 unbound pavement material complying with the requirements of MRTS05 *Unbound Pavements*.

Type 1, Type 2, Type 3 or Type 4 unbound granular pavement material shall also comply with the requirements of MRTS05 *Unbound Pavements*.

Stabilised material shall not be used as additional material for shape correction.

Additionally, any new material incorporated into the Works shall have a water soluble sulfate content not exceeding 1.9 grams of sulfate (expressed as SO₄) per litre.

6.3 Stabilising agents

The bituminous and secondary stabilising agents shall comply with the relevant Standard in Table 6.3.

The estimated content and specified application rate for the bituminous stabilising agent are given in Clause 13 of Annexure MRTS07C.1.

The bituminous stabilising agent shall exhibit an Expansion Ratio greater than 10 and a Half Life greater than 20 seconds following incorporation of any foaming agents required to meet these minimum bitumen foaming requirements. The foaming agent content shall not be greater than 2% of the bitumen by mass.

The estimated content and specified spread rate for the secondary stabilising agent are also given in Clause 13 of Annexure MRTS07C.1. If a specified application rate for the secondary stabilising agent is not stated in Clause 13 of Annexure MRTS07C.1, the total specified application rate shall be 10 kg/m².

The Contractor shall make allowance for the type of secondary stabilising agent used and the variation of the Available Lime Index of the secondary stabilising agent supplied.

At the time of spreading, the secondary stabilising agent shall not be more than 3 months old, measured from its date of manufacture. The stabilising agent shall have an available lime index of not less than 80%.

Table 6.3 - Stabilising agent requirements

Agent	Standard
Bitumen/primary	Class 170 Bitumen complying with MRTS17 <i>Bitumen</i>
Secondary stabilising agent	Hydrated lime or quicklime complying with MRTS23 <i>Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation</i>

6.4 Curing materials

Only water shall be used for curing. Water shall be free from oil, acids, organic matter and any other matter which could be deleterious to the mixture. Water used for curing shall be potable and contain less than 0.05% of sulfates.

7 Material compliance testing

7.1 General

No material shall be incorporated into the work unless it has been demonstrated to the Administrator's satisfaction that the material(s) to be used in this Contract comply fully with the requirements of this specification. **Hold Point 2**

The Contractor is responsible for carrying out sufficient testing to ensure that the material complies with the standards and requirements of this specification. However, the Contractor's testing program shall be such that the testing frequencies and number of tests are not less than those given in Clause 5.4.

The testing of individual samples shall be carried out in accordance with the Test Methods described in Clause 4.

The costs associated with material compliance testing shall be deemed to be incorporated in the relevant works.

The material(s)/sources used in the Contract shall be the same as those for material(s) supplied as samples or for which certificates of compliance with this specification are provided.

7.2 Stabilising agent, water, curing materials

Sampling and testing shall be carried out in accordance with the relevant standards.

A certificate of test results demonstrating compliance of each of the bituminous and secondary stabilising agents to the relevant standards shall be provided for each load, or part thereof, of each stabilising agent.

7.3 Unbound pavement material

Compliance testing of any new unbound granular material used to replace material not suitable for stabilisation shall be carried out in accordance with the requirements of Clause 4 of Annexure MRTS07C.1.

Compliance testing of any additional material used for shape correction shall be carried out in accordance with the requirements of Clause 5 of Annexure MRTS07C.1.

In all cases Type 1, Type 2, Type 3 and Type 4 material shall also comply with MRTS05 *Unbound Pavements*.

8 Construction

Prior to acceptance (Clause 9.10), construction shall not proceed until the Administrator is satisfied that the requirements covered by Clause 8.1 to Clause 8.5.6.1.3 are satisfied. **Hold Point 6**

8.1 General

The material(s) sources used in the Contract shall be the same as those for material(s) supplied as samples or for which certificates of compliance with this specification are provided.

8.1.1 Extent of stabilising operation

Construction of the stabilised material to the target depth shall be completed as one layer.

Once the secondary stabilising agent has been spread (and fully hydrated via slaking if quicklime is used), foamed bitumen shall be applied and both stabilising agents incorporated and mixed over the entire area of stabilisation within the same work period in which the secondary stabilising agent was spread. The stabilised material shall be fully compacted and trimmed within the allowable working time as per Clause 8.1.4.

8.1.2 Actual depth

The actual depth is the thickness achieved of the completed stabilised layer, measured as stated in Clause 8.5.4.2.

The tolerance of thickness of actual depth at any point of the stabilised layer shall be within - 5 mm and + 15 mm of the specified design depth. The design depth is stated in Clause 13 of Annexure MRTS07C.1.

The datum for measurement of the 'actual depth' shall be as stated in Clause 14 of Annexure MRTS07C.1.

8.1.3 Construction process

8.1.3.1 General

The construction process shall be based either a process requirement or a product standard. The method for this Contract shall be as stated in Clause 13 of Annexure MRTS07C.1.

8.1.3.2 Construction based on process requirements

Construction based on a process requirement shall:

- a) incorporate the methodology and construction of trial sections in accordance with the requirements of Clause 8.3
- b) comply with the construction requirements stated in Clause 8.4, and
- c) comply with the product standards stated in Clause 8.5 except that compaction testing shall not be required on completed works other than trial sections.

8.1.3.3 Construction based on product standards

Construction based on a product standard shall:

- a) comply with the construction requirements stated in Clause 8.4, and
- b) comply with the product standards stated in Clause 8.5.

8.1.4 Allowable working time

The allowable working time, measured from the commencement of incorporating/mixing the first application of secondary additive into the unstabilised pavement materials, to the completion of trimming and compacting (excluding multi tyre rolling) of the stabilised materials, shall be 6.5 hours.

Compaction and trimming of the stabilised layer shall be completed within the allowable working time.

The construction process shall not extend overnight.

Instances where stabilisation cannot be completed within the 6.5 hour period, due to unforeseeable circumstances, the Administrator may consider the following:

- If lime is the secondary stabilising agent and a delay is experienced due to unforeseeable circumstances and if the construction can recommence within 24 hours, the process may continue, provided the material prior to foam bitumen stabilisation meets the requirements in Clause 8.5.2. If the construction delay exceeds 24 hours, treatment within an additional 0.5% lime should be considered. Any extra lime addition (over 0.5%) should be only considered after extensive investigation and testing.
- If cement is the secondary stabilising agent and a delay is experienced due to unforeseeable circumstances the material shall be considered unsuitable for foam bitumen stabilising.

8.1.5 Site services, utilities, buildings and drainage

A survey of the site to determine the location and depth of services, utilities, buildings and drainage components shall be carried out prior to commencement of construction. The survey shall include details of how these and plant and personnel on site shall be protected and how the stabilisation works shall be completed without any detrimental effects to them in the proposed construction procedure.

Stabilising operation shall not commence until the survey has been completed and a copy of the report provided to the Administrator. **Hold Point 3**

8.2 Program of works

The Contractor shall submit the proposed program of the stabilisation works to the Administrator at least 42 days prior to the commencement of stabilisation works, unless otherwise agreed by the Administrator.

Stabilisation works shall not be commenced until the program has been approved by the Administrator. **(Refer to Clause 5.2 and Hold Point 1)**

8.3 Process requirements

8.3.1 Methodology

Each section of the Works with a specific combination of stabilising agent type(s), stabilising agent content(s), material(s) to be stabilised and target depth shall be identified as a separate area for construction.

A trial section shall be constructed for each separate area for construction in accordance with the requirements of Clause 8.3.2.

The compaction of each trial section shall be checked for compaction in accordance with Clause 8.5.3 and tested in accordance with Clause 5.4. If the characteristic value of the RDDs for the trial section is not less than the value specified in Clause 8.5.3, further compaction testing need not be carried out for the balance of the area for construction that is represented by that trial section, provided that the same construction plant, processes and methodology is used to construct the remaining area as that used for the construction of the trial section.

If the characteristic value of the RDDs for the trial section is less than the value specified in Clause 8.5.3, the trial section shall be rectified so that it complies with this standard and an additional trial section shall be constructed and assessed in accordance with this Clause 8.3.

Construction based on a process requirement and a trial shall not be used for the balance of the works without approval of the Administrator. **Hold Point 4**

8.3.2 Trial section

A trial section shall be constructed using the same construction plant, processes and methodology that is proposed to be used for the remainder of the works represented by the trial section.

Witness Point

A trial section shall be at least 200 m long and 3 m wide (so that a longitudinal joint is included).

All operations, testing etc., required by this specification, including compaction testing, shall be used in the construction and testing of each trial section.

8.4 Construction requirements

8.4.1 Removal and disposal of material not suitable for stabilisation (if required)

Material not suitable for stabilisation shall include:

- a) any particle or conglomeration, that exists after preliminary pulverisation, with a dimension greater than 75 mm along any axis
- b) any material(s) deemed unsuitable by the Administrator, which may include:
 - i. cement treated patches, and
 - ii. asphalt patches where the total asphalt thickness is greater than 50 mm unless other methods are approved by the Administrator
- c) any additional requirements stated in Clause 6 of Annexure MRTS07C.1.

At least seven days prior to the date shown in the Contractor's program of works for the removal of material not suitable for stabilisation, the Administrator will mark out patches and/or identify unsuitable materials that are to be replaced.

Where material not suitable for stabilisation is encountered, the volume to be removed shall be agreed with the Administrator prior to removal and replacement operations commencing. **Witness Point**

Existing material that is unsuitable for stabilisation shall be removed and disposed of in accordance with Clause 10 of MRTS01 *Introduction to Technical Specifications* unless other methods are approved by the Administrator.

New material conforming to the requirements stated in Clause 6.1 shall be used to replace the material removed as not suitable for stabilisation. It shall be spread, compacted and trimmed to a shape suitable for stabilisation, compaction and trimming to the alignment, heights and shapes specified in the Contract for the completed work.

8.4.2 Preliminary pulverisation

The material to be stabilised shall be pulverised in accordance with this Clause. One pass of a reclaimer/stabiliser or profiler shall be used to pulverise the material to be stabilised to a depth that is 50 mm less than the target depth of the stabilised layer. **Witness Point**

Preliminary pulverisation shall occur:

- a) after the removal and replacement of material identified as material not suitable for stabilisation
- b) prior to the addition of shape correction material, and
- c) prior to the application or addition of either the bituminous or secondary stabilising agents.

Any additional patches identified during preliminary pulverisation as material not suitable for stabilisation and accepted by the Administrator as being material not suitable for stabilisation, shall be removed and replaced as specified in Clause 8.4.1.

Any particle or conglomeration with a dimension greater than 75 mm along any axis shall be removed from the pulverised material and the voids made good prior to stabilisation. Voids shall be made good either by using either new material in accordance with Clause 6.1 or excess pulverised material that is both adjacent to the void and suitable for stabilisation.

8.4.3 Additional material for shape correction (if required)

The shape of the pavement shall be corrected prior to the importation of any overlay material.

Additional material required for shape correction shall be as specified in Clause 6.2, and shall be added after preliminary pulverisation has been completed. It shall be spread onto the surface of the pavement to a shape suitable for stabilisation, compaction and trimming to the alignment, heights and shapes specified in the Contract.

Compaction of the additional material required for shape correction shall be administrated through either product requirement (Clause 9.3) and/or process requirement (Clause 9.2).

The characteristic value of RDDs shall not be less than 100%. This compaction testing requirement is not applicable if the material thickness less than 75 mm.

8.4.4 Compacting and trimming of the surface prior to spreading of the secondary stabilising agent

Prior to spreading of the secondary stabilising agent, the existing surface shall be shaped, compacted and trimmed to shape to a degree that is sufficient to facilitate stabilisation, compaction and trimming to the alignment, heights and shapes specified in the Contract.

8.4.5 Secondary stabilising agent equipment

Secondary stabilising agent shall be transported, stored and spread using equipment that is both waterproof and watertight. Equipment used to transfer the secondary stabilising agent shall also be waterproof during the transfer process. All such equipment shall be emptied, cleaned and dried prior to the introduction of each type of secondary stabilising agent to be used in the stabilisation works.

Where a stabiliser or reclaimer/stabiliser with a calibrated integrated spreader is used or required (refer to Clause 7 of Annexure MRTS07C.1), the secondary stabilising agent shall be incorporated into the pavement directly using this device. In this case, quicklime shall not be used as the secondary stabilising agent.

Where a stabiliser or reclaimer/stabiliser with a calibrated integrated spreader is used or required (refer to Clause 7 of Annexure MRTS07C.1), the secondary stabilising agent shall be uniformly spread over the insitu material using a purpose-built calibrated spreader at a controlled rate (mass per unit area, kg/m²).

8.4.6 Spreading of secondary stabilising agent

Traffic shall be stopped during spreading of secondary stabilising agent. If wind direction is such that airborne secondary additive are impeding through traffic.

The secondary stabilising agent content shall be determined by testing using the surface spread rate of the secondary stabilising agent (Test Method Number Q719) at the start of each individual run. Additional tests for surface spread rate at other locations for example middle and/or end of run may be conducted at the Administrator's request. **Witness Point**. In this case the maximum amount of stabilising agent to be spread in one pass shall be 10 kg/m² to avoid wastage. Adding more than that is not generally recommended. However, if there is a need to optimise the number of passes and if extreme care is taken, a maximum of 12 kg/m² (with moisture) could be considered. Observation in the field (through a trial) should be carried out and if excessive wastage is seen, a maximum spread rate of 10 kg/m² should be adopted.

The initial spread rate test should be carried out within a distance of 35 m from the start of the run. After the purpose built calibrated spreader has spread over a laid mat or tray/s within the 35 m distance from the start of the run the purpose built spreader should be halted. Spread rate results should be verified that the stabilising agent content is within the allowable tolerance specified in Clause 8.5.1.3. If the spread rate is verified to be within the allowable tolerance (Clause 8.5.1.3) the purpose built spreader shall be allowed to continue the run. If the spread rate is found to be out of tolerance, a further spread rate determination shall be conducted within the next 35 m distance and the spread rate to be determined as per the methodology specified in this Clause 8.4.6. If the spread rate is again out of tolerance, corrective action shall immediately be implemented to limit the extent of the defected area. In addition a proposal to be submitted ensuring achievement of the required spread rate within tolerance.

The results of all surface spread rate tests shall be recorded and included in the quality records and reported to the Administrator (refer to Clause 9.7).

Secondary stabilising agent shall be incorporated as specified in Clauses 8.4.7, 8.4.8, 8.4.9, 8.4.10 and 8.4.11. Further trimming and/or compaction as required (refer to Clauses 8.4.4, 8.4.12, 8.4.13 and 8.4.14) shall be completed before each spreading run.

Once the stabilising agent has been spread, no traffic, other than the construction plant employed for the stabilisation work, shall travel over it.

8.4.7 Quicklime as the secondary stabilising agent

Where quicklime is used as the secondary stabilising agent, it shall be spread (refer to Clause 8.4.6) and fully slaked prior to incorporation into the material(s) to be stabilised. There shall be no residual quicklime after slaking. Quicklime shall be slaked with sufficient potable water to allow complete hydration such that the material remains friable after slaking and no further exothermic reaction occurs when further water is added to the material.

All through traffic shall be stopped during any slaking operation.

The equivalent calcium oxide content of quicklime (lime index) shall not be less than 80%.

8.4.8 Incorporation of secondary stabilising agent

Incorporation of the secondary stabilising agent shall be achieved using a reclaimer/stabiliser before the bituminous stabilising agent.

Single pass secondary stabilising agent incorporation (refer to Clause 8.1.4):

1. Spread and mix the maximum allowable secondary additive for a single pass as per Clause 8.4.6 with addition of water by means of stabiliser/reclaimer to achieve 55 – 75% RMR. The secondary stabilising agent incorporation depth shall be 50 mm less than design FBS depth and compacted with a smooth drum roller with vibration (refer to the Table 8.4.19) and trimmed prior to FB pass by using a grader (refer to Clause 8.4.9.2).
2. If the secondary stabilising agent is lime, not more than 4 hours after the secondary stabilising agent is incorporated into the payment material, the bituminous stabilising agent shall be mixed into the pavement material with one pass of the reclaimer/stabiliser to the full target depth of stabilisation to achieve lower reference level (refer to Figure 1 and Clause 8.4.9.2).
3. If the secondary stabilising agent is GB cement, not more than two hours after the secondary stabilising agent is incorporated into the pavement material, the bituminous stabilising agent shall be mixed into the pavement material with one pass of the reclaimer/stabiliser to the full target depth of stabilisation to achieve lower reference level (refer to Figure 1 and Clause 8.4.9.2)

Two pass secondary additive incorporation (refer to Clause 8.1.4):

1. Spread and mix the first pass at a rate of up to half the required rate of the secondary stabilising agent without the addition of water. The first incorporation pass shall be to a depth of 50 mm less than design FBS depth and compacted with smooth drum roller with vibration (refer to the Table 8.4.19).
2. Spread and mix remaining balance to the required secondary stabilising agent with the addition of water by means of stabiliser/reclaimer to achieve 55 – 75% RMR. The secondary stabilising agent incorporation depth shall again be 50 mm less than design FBS depth and compacted with a smooth drum roller with vibration (refer to the Table 8.4.19) and trimmed prior to final foam bitumen pass (refer Clause 8.4.9.2).
3. If the secondary stabilising agent is lime, not more than four hours after the secondary stabilising agent is incorporated into the pavement material, the bituminous stabilising agent shall be mixed into the pavement material with one pass of the reclaimer/stabiliser to the full target depth of stabilisation to achieve the lower reference level (refer Figure 1).
4. If the secondary stabilising agent is GB cement, not more than 2 hours after the secondary stabilising agent is incorporated into the pavement material, the bituminous stabilising agent shall be mixed into the pavement material with one pass of the reclaimer/stabiliser to the full target depth of stabilisation to achieve the lower reference level (refer Figure 1).

After each spreading run, and before any other spreading run, secondary stabilising agent shall be incorporated as specified in Clauses 8.4.7, 8.4.8, 8.4.9, 8.4.10 and 8.4.11. Further trimming and/or compaction as required (refer to Clauses 8.4.4, 8.4.12, 8.4.13, and 8.4.14) shall be completed before each spreading run.

8.4.9 Incorporation of moisture

Moisture may be incorporated into the stabilised pavement material using a stabiliser or reclaimer/stabiliser to correct for moisture variations in the existing pavement material at the following stages during the stabilisation process to assist with bitumen dispersion:

- a) during the initial pulverisation of the pavement material
- b) during the incorporation of the secondary stabilising agent into the pavement material
- c) during a separate pass of the reclaimer/stabiliser prior to, or during the, incorporation of the bituminous stabilising agent.

Unless otherwise approved by the Administrator, water shall be added by means of a controlled pressure feed distribution system located inside the mixing chamber of the reclaimer/stabiliser. This system shall be capable of spraying varying rates across its width. The moisture content of the material being stabilised shall be uniform and within the specified range indicated in Clause 8.5.2.

Moisture may also be incorporated into the stabilised pavement material following incorporation of the bituminous stabilising agent for the purposes of achieving compaction.

The stabiliser/reclaimer shall control the moisture content to be incorporated into the stabilised pavement material following incorporation of the bituminous stabilising agent for the purposes of achieving compaction.

8.4.9.1 Compaction of secondary stabilising agent after incorporation

Adequate compaction shall be completed after each application of secondary stabilising agent has been incorporated into the material. This shall be carried out using an appropriate roller that is capable of achieving relatively uniform compaction over the depth of the stabilised layer.

8.4.9.2 Trimming of secondary stabilising agent prior to bituminous stabilising agent incorporation

Surface level heights identified to be higher than that specified in the Contract after the compaction of the secondary stabilising agent and trimming to the specified cross fall shall require the stabilising depth/target depth to be compensated for the difference in height between specified and attained due to effect of bulking to ensure that mixing to the lower reference level is achieved (refer Figure 1).

Alternatively, prior to the incorporation pass of the bituminous stabilising agent, the surface shall be shaped, compacted and trimmed to the alignment, heights and shapes specified in the Contract.

8.4.10 Bituminous stabilising agent equipment

The bituminous stabilising agent shall be transported, stored and transferred using the recommended equipment and procedures described in *Austrroads' Bitumen Sealing Safety Guide (2nd Edition)* and *Austrroads' Bituminous Materials Safety Guide*. Notwithstanding this the bituminous stabilising agent shall also be transported, stored and transferred as specified in MRTS17 *Bitumen*. Further bituminous stabilising agent equipment shall also comply with the requirements given in Clause 8.4.19.

8.4.11 Incorporation of bituminous stabilising agent and mixing

Incorporation of the bituminous stabilising agent and mixing of the stabilised pavement material shall be carried out using a stabiliser/reclaimer with at least the attributes stated in Clause 8.4.19.

Foaming agent should be added to bitumen tanker at last 30 minutes prior to incorporation to enable foaming properties to be achieved as per Clause 6.3.

The bituminous stabilising agent shall be incorporated and mixed into the pavement material during one pass of the reclaimer/stabiliser. Mixing shall be to the full depth of stabilisation. In addition, the distribution of the bituminous stabilising agent, secondary stabilising agent and water shall be uniform throughout the full depth, and over the entire area of the material to be stabilised. The resultant layer shall have no lenses, pockets, lumps or granules of either incompletely mixed material, or incompletely mixed bituminous and secondary stabilising agents. It shall also not be segregated. Mixing uniformity shall be continuously inspected visually and work shall stop if bitumen streaks, blotches or bitumen rich agglomerations form in the mixed material. Corrective action shall immediately be implemented to limit the extent of the defective area.

Where test results or visual inspection by the Administrator or the Administrator's representatives indicate that the mixing requirements stated in this clause have not been met, additional mixing passes shall be carried out to improve the uniformity of the:

- a) materials to be stabilised
- b) distribution of the bituminous and secondary stabilising agents, and
- c) distribution of water.

No additional or separate payment shall be made for any additional passes ordered by the Administrator.

The foamed bitumen shall exhibit a minimum expansion ratio of 10 and a minimum half life of 20 seconds at the time of incorporation. The bitumen shall be incorporated at a temperature between 180°C and 190°C. Bitumen temperature shall not fall below 170°C throughout the bitumen incorporation process. The expansion ratio and half life of every tanker load of bitumen shall be checked using the inspection nozzle on board the stabiliser/reclaimer.

Foaming properties shall be determined within the first 35 m of incorporation of bitumen stabilisation agent while the machine is in motion. Incorporation shall halt until expansion ratio and half life requirement stated in Clause 8.4.11 are satisfied. **Hold Point 5**

The bituminous stabilising agent shall not continue to be incorporated into the pavement material where the foaming properties of the tanker load of bitumen are not in accordance with the requirements stated in this clause.

8.4.12 Initial compaction and trimming after completion of stabilisation but before final compaction

Immediately after stabilisation, the stabilised area shall be initially compacted to eliminate the height differential between the bulked stabilised material, and any wheel ruts left by the stabiliser/reclaimer. This may be achieved with two passes of a vibrating roller.

After initial compaction, and before final compaction commences, the surface shall be trimmed to approximately the alignment, heights and shapes specified in the Contract for the completed work and any depressions shall be filled with additional material stabilised with both stabilising agents that is mixed and placed within its allowable working time. Further final compaction and trimming of all materials shall be completed within the allowable working time of each material.

The stabilised layer shall be compacted to the standard stated in Clause 8.5.3.

Compaction shall be undertaken on the single layer of stabilised material. Compaction shall be achieved for the full thickness of the single stabilised layer. The stabilised layer shall be compacted to the standard stated in Clause 8.5.3.

8.4.13 Trimming after final compaction

Final trimming of the pavement shall be carried out as soon as practicable after rollers have completed compacting the pavement.

Pad foot marks shall be cut to prevent the marks reflecting to the surface after trafficking. The cutting depth to remove the pad foot marks should not be less than 100 mm.

No marks caused by a pad foot or other roller shall remain on the surface after final trimming and the surface shall be free from loose pockets, holes, bumps and lenses of material.

Localised depression and rises shall be treated as determined jointly by the Administrator and the Contractor.

The trimmed surface shall be free from loose pockets, holes, bumps and lenses of material.

All trimming shall involve cutting to waste. All material cut to waste shall be disposed of in accordance with Clause 10 of MRTS01 *Introduction to Technical Specifications*. No separate or additional payment shall be made for the disposal of material cut to waste. The cost of all activities associated with the disposal of material cut to waste shall be deemed to be incorporated into the relevant works.

8.4.14 Period for compaction and trimming

Compaction and trimming shall be completed within the allowable working time (excluding multi tyre rolling) refer to Clause 8.1.4.

8.4.15 Construction joints

8.4.15.1 General

Joints shall be constructed such that the material at the joints complies with the requirements of this specification.

A construction joint shall be deemed fresh when the material on each side of the joint has been stabilised, placed and compacted within the allowable working time of the stabilised material constructed first.

8.4.15.2 Longitudinal joints

Longitudinal joints shall not be located in the through traffic wheel paths.

Where a fresh longitudinal joint between adjacent runs is to be compacted, the outside 300 mm of material from the first run shall be left uncompacted until the adjacent material is ready for compaction. The joint shall be water cured during this period. When the fresh joint is compacted the roller shall be partially supported on the portion of the first run that has been previously compacted.

The minimum distance for cutting back into previously compacted material shall be the greater of 75 mm or the distance to a point where the stabilised material complies with this specification.

No separate or additional payment shall be made for the disposal of material cut to waste. The cost of all activities associated with the disposal of material cut to waste shall be deemed to be incorporated into the relevant works.

8.4.15.3 Transverse joints

For transverse joints that are not made during the allowable working time, the adjoining section previously stabilised shall be cut back by the greater of 1.5 m and the distance to a point where the stabilised material complies with this specification.

No separate or additional payment shall be made for the disposal of material cut to waste. The cost of all activities associated with the disposal of material cut to waste shall be deemed to be incorporated into the relevant work items.

8.4.16 Water curing

Water curing shall commence immediately after the completion of compaction.

The stabilised layer surface and edges shall be maintained in a continuously damp condition, using the occasional application of a uniformly applied fine mist, until a bituminous surfacing with a cover aggregate is placed as described in Clause 8.4.17 has been applied. Water shall be applied in a manner such that slurring of the surface, pavement instability, pavement erosion flushing and/or leaching of the stabilising agents are all avoided.

8.4.17 Bituminous surfacing

Unless otherwise approved by the Administrator, a bituminous surfacing with a cover aggregate shall be applied within seven calendar days of completion of the stabilised layer.

8.4.18 Maintenance of the stabilised layer

The stabilised layer shall be maintained by the Contractor until a bituminous surfacing with a cover aggregate is applied, until the stabilised layer is covered by another pavement layer or until the end of the defects liability period, whichever is the longer.

No separate or additional payment shall be made for maintenance of the stabilised layer prior to the application of a bituminous curing coat or a bituminous surfacing with a cover aggregate. The cost of all activities associated with maintenance of the stabilised layer prior to the application of a bituminous curing coat or a bituminous surfacing with a cover aggregate shall be deemed to be incorporated into the relevant work items for the stabilised layer.

8.4.19 Minimum requirements and numbers of particular plant

The minimum requirements and numbers of particular plant that shall be on Site at all times during the stabilisation works shall be as stated in Clause 7 of Annexure MRTS07C.1. This shall also be the plant used for the stabilisation.

Where not so stated in the Annexure, the minimum requirements and numbers of particular plant that shall be on Site at all times during the stabilisation works shall be as stated in Table 8.4.19.

Table 8.4.19 – Minimum requirements and numbers of particular plant

Description	Minimum requirement for each piece of plant	Minimum number of units
Reclaimer/stabiliser with foamed bitumen spray bar in mixing chamber or Integrated spreader/reclaimer/stabiliser with foamed bitumen spray bar in mixing chamber	a) Minimum power capacity of 155 kW/m of the drum width b) Capable of mixing to the specified depth c) Purpose built foamed bitumen spray bar located inside the mixing chamber of the stabiliser or stabiliser/reclaimer d) Bitumen injection systems linked to the ground speed to ensure an accurate application of foamed bitumen throughout a run irrespective of the speed of the plant e) Inspection or test jet to ensure uniform flow of bitumen and that the required expansion ratio and half life of the foamed bitumen are being achieved f) Self cleaning bitumen jets g) Bitumen foaming jets can be shut off individually for partial reclaimer width stabilisation h) Bitumen temperature gauges to verify bitumen temperature i) Capable of supplying both water and additive such that incorporation rates can be varied across the full width of the stabilising box and incrementally across the box j) Computer controlled bitumen flow meter for verification of applied additive content, and k) Calibrated and capable of spreading varying widths (if integrated spreader/reclaimer/stabiliser).	1
Purpose-built calibrated spreader	Calibrated with load cells and capable of uniformly spreading stabilising agent to varying widths.	1
Vibrating pad foot roller	18 tonnes for compacted thicknesses up to 200 mm 21 tonnes for compacted thicknesses up to 300 mm	1
Vibrating smooth drum roller	18 tonnes for compacted thicknesses up to 200 mm 21 tonnes for compacted thicknesses up to 300 mm	1
Multi-tyre roller	Minimum 12 tonnes	1
Water truck	Minimum capacity of 6 000 litres	2
Grader	Manned by final trim operator	1

8.4.20 Conditions under which stabilisation shall not proceed

The entire stabilisation process shall not proceed in any of the following situations:

- a) during rainfall
- b) when rainfall appears to be imminent
- c) during periods when the wind is strong enough to cause particles of the secondary stabilising agent to become airborne
- d) during conditions that may result in the work causing nuisance or danger to people, property, or the environment
- e) when the pavement temperature, measured 50 mm below the surface, drops below 10°C, or
- f) when the air temperature, measured in the shade, exceeds 40°C.

8.5 Product standards

Compliance testing of the pavement shall be undertaken for each lot. Where a process standard is specified the compaction requirements in this clause apply to trial sections but not to other sections. Where a product standard is specified the compaction requirements in this clause apply to all sections/lots.

8.5.1 Stabilising agent content

8.5.1.1 Ordered content

At least 14 days prior to the commencement of stabilisation works, the Administrator will confirm or adjust the estimated bituminous stabilising agent content and the estimated secondary stabilising agent content stated in Clause 13 of Annexure MRTS07C.1.

The confirmed or adjusted stabilising agent contents shall be defined as the ordered bituminous stabilising agent content and the ordered secondary stabilising agent content respectively. **Milestone**

8.5.1.2 Actual bituminous stabilising agent content

The actual bituminous stabilising agent content shall be represented either by the average of the measured application rates, measured by the flow meter on board the reclaimer/stabiliser, or the average of the tanker dipping readings measured at the start and end of each stabilising run.

Witness Point The system to be used for this Contract shall be as stated in Clause 13 of Annexure MRTS07C.1.

The actual bituminous stabilising agent content shall be within $\pm 10\%$ of the ordered bituminous stabilising agent content for the lot as defined in Clause 8.5.1.1.

The Principal will only pay for quantity of bitumen and additives required to meet the tolerances given above in this clause. The Contractor shall be liable for the bitumen and additives in excess of the ordered bituminous stabilising agent content plus 10%.

8.5.1.3 Actual secondary stabilising agent content

The actual secondary stabilising agent content(s) shall be represented by the average of the surface spread rates of the secondary stabilising agent(s) for each lot.

The actual secondary stabilising agent content shall be within $\pm 10\%$ of the ordered secondary stabilising agent content defined in Clause 8.5.1.1. The actual stabilising agent content shall be based on the use of hydrated lime (Refer to Clause 13 of Annexure MRTS07C Part B).

8.5.2 Relative moisture ratio

The relative moisture ratio (RMR) prior to incorporation of the primary additive shall be as stated in Clause 8 of Annexure MRTS07C.1 or, where not so stated, shall not be less than 55% nor greater than 75% of OMC under standard compaction (refer Clause 9.8).

8.5.3 Compaction standard

The characteristic value of the RDDs shall be as stated in Clause 9 of Annexure MRTS07C.1 or, where not so stated, not less than 102% (standard compaction).

8.5.4 Geometrics, general

The stabilised layer shall be constructed so as not to depart from the alignment, widths, thicknesses, lengths, heights and shapes specified in the Contract by more than the tolerances stated in Clause 8.5.5 and Clause 8.5.6.

8.5.4.1 Geometrics, thickness

At any point of the completed stabilised layer the thickness shall be within – 5 mm and + 15 mm of the specified design depth in Clause 13 of Annexure MRTS07C.1 Part B.

Testing frequency for geometric, thickness refer to Clause 5.4.

8.5.4.2 Measuring actual stabilised layer thickness

As a minimum frequency, the thickness of the stabilised pavement layer is to be assessed at each test location for compaction (refer Clause 9.5).

Following completion of incorporation of the primary stabilisation agent (foamed bitumen) and prior to compaction, levels shall be obtained at the bottom of the stabilised pavement layer to establish the lower reference level.

Following final trim and compaction, levels shall be obtained from the top of the finished stabilised layer, recoverable in the horizontal plane to an accuracy of ± 50 mm of the same location as those from which the lower reference levels were obtained. The difference of this finish surface level and lower reference level is the actual depth of stabilisation. See Clause 8.1.2.

8.5.5 Geometrics, vertical tolerances

8.5.5.1 Primary tolerance

A primary tolerance shall apply to the height of any point on the surface of a layer.

The primary tolerance shall be as stated in Clause 10.1 of Annexure MRTS07C.1 as one of the alternatives in Table 8.5.5.1. If no such indication is given, the primary tolerance shall be thickness only.

In all cases a primary tolerance shall also apply for the thickness of the completed stabilised layer. At any point the thickness of the stabilised layer shall be within – 5 mm and + 15 mm of the specified thickness.

Table 8.5.5.1 – Primary tolerance for stabilised layers

Alternative	Primary tolerance (mm)
A	- 5 to + 10
B	- 5 to + 15
C	Thickness only

In Contracts where by thickness only alternative C has been specified by the Administrator, height of collimation process for recording pavement thickness shall be implemented.

Prior to commencement of stabilising operation a testing program shall be established for measuring the 'actual depth' achieved of the compacted stabilised layer (refer 8.5.4.2). In addition, the thickness of the completed stabilised layer shall be recorded and reported to the Administrator.

The record and report for each thickness determination shall include:

- a) the position, and bottom reading of the lower reference level for each thickness test locations
- b) the position, and top reading of finished surface level for each thickness test location (must be recoverable in the horizontal plane to an accuracy of ± 50 mm)
- c) the thickness obtained from comparing the top finish surface level reading and lower reference level reading for each thickness test location.

8.5.6 Geometrics, horizontal tolerances

The horizontal position of any point on the pavement shall not differ from the corresponding point shown on the drawings or as otherwise specified in the Contract, calculated as described in Clause 8.5.4, by more than ± 50 mm, except where alignment of the pavement with an existing pavement or structure is necessary. In this case, the new work shall be joined neatly to the existing work or structure in a smooth manner as shown on the drawings or as otherwise specified in the Contract. If the drawings or other Contract documents do not show, describe or specify how new work is to join to existing pavement or structures then it shall be done in a manner that is acceptable to the Administrator.

8.5.6.1 Additional tolerances

8.5.6.1.1 General

Where required by Clauses 8.5.6.2.2, 8.5.6.2.3 and 8.5.6.2.4, additional tolerances shall apply to the pavement lots in a stabilised layer.

The Contractor may have to carry out additional work to achieve these additional tolerances. Payment for any such work shall be deemed to be included in the Contractor's scheduled rate for the relevant items.

8.5.6.1.2 Deviation from a straight-edge

Where Clause 10.2.1 of Annexure MRTS07C.1 states a deviation from a straight-edge tolerance applies, the deviation from a 3 m long straight-edge placed anywhere on the surface of a layer shall not exceed the limits stated in Clause 10.2.2 of Annexure MRTS07C.1, due allowance being made for design shape, where relevant. The limit stated in Clause 10.2.2 of Annexure MRTS07C.1 shall be one of the alternatives given in Table 8.5.6.1.2.

Table 8.5.6.1.2 – Tolerance for deviation from a straight edge

Alternative	Primary tolerance (mm)
D	5
E	8
F	15

8.5.6.1.3 Crossfall

Where Clause 10.3 of Annexure MRTS07C.1 states a crossfall tolerance applies, the crossfall shall not depart from the corresponding crossfall shown in the Contract by more than 0.5% absolute.

The crossfall shall be measured:

- a) between any two points more than 2 m apart except where a pavement verge is less than 2 m wide. For pavement verges less than 2 m wide, the measurement shall be made between the extreme edges of the pavement verge on each side of the pavement
- b) transverse to the centre line of the carriageway, and
- c) within the boundaries of a cross-section element which has a constant crossfall.

8.5.6.1.4 Surface evenness

Where Clause 10.4.1 of Annexure MRTS07C.1 states a surface evenness tolerance applies a surface evenness tolerance shall apply to a stabilised layer.

In such a case the surface evenness of a stabilised layer shall be such as to provide a road roughness count rate not exceeding the specified road roughness (R_s) stated in Clause 10.4.2 of Annexure MRTS07C.1 or, where not so stated, not exceeding 50 counts per kilometre.

9 Construction compliance testing

9.1 General

Unless otherwise stated in this specification, the selection of sampling or test locations shall be carried out using random stratified sampling. Exceptions include testing of:

- a) geometrics (Clause 9.4)
- b) the bituminous stabilising agent content (Clause 9.6)
- c) the surface spread rate of the secondary stabilising agent (Clause 9.7), and
- d) visible deflection of pavement layers (Clause 9.9).

The Contractor is responsible for performing sufficient tests to ensure that the pavement complies with the standards and requirements of this specification. However, the Contractor's testing program shall be such that the testing frequencies and number of tests are not less than those specified in Clause 5.4.

9.2 Process requirements

Where construction has been carried out using process requirements, checking for compliance with the specified requirements shall be carried out during and after the construction operation, as relevant. Except for compaction, compliance checking shall be carried out in accordance with Clause 5.4. If a process requirement is specified for compaction the minimum testing frequencies and minimum number of tests for compaction specified in Clause 5.4 apply to trial sections and do not apply to other sections. Notwithstanding this the requirements of Clause 8.3 shall be met and the requirements of Clause 8.4 shall apply.

9.3 Product standards

Where construction has been carried out using product standards, compliance testing of the pavement shall be undertaken for each lot.

If a product standard is specified, the minimum testing frequencies and minimum number of tests for compaction specified in Clause 5.4 apply.

The requirements of Clauses 8.4 and Clause 8.5 shall also apply.

9.4 Geometrics

9.4.1 General

All geometric tolerances, except for surface evenness as specified in Clause 9.4.2, shall be checked at regular intervals not greater than those specified in Clause 5.4.

9.4.2 Surface evenness

The surface evenness of a stabilised pavement layer shall be measured by road roughness as per Test Method Q708B, Q708C, Q708D.

The minimum length of a lot for this test shall be 100 m and the maximum length of a lot for this test shall be 500 m.

9.5 Compaction

Where construction has been carried out using product standards, the compaction standard for each lot shall be represented by the characteristic value of RDD.

The characteristic value shall be calculated as stated in Clause 12 of MRTS01 *Introduction to Technical Specifications* using the individual RDDs determined from testing of each lot.

The locations of all samples taken for the determination of reference density, insitu dry density and relative compaction shall be at the same offset and positioned one metre longitudinally in a direction opposite to the travel of the stabiliser or stabiliser/reclaimer from the location of samples taken to determine the corresponding laboratory reference density.

Sampling of stabilised materials to determine the laboratory reference density as detailed in Test Method Q142A shall take place after the final mixing run, but prior to the commencement of compaction of the stabilised material.

The relative compaction of the stabilised material as detailed in Test Method Q140A shall be determined using the ratio of the compacted dry density to the maximum dry density. The relative compaction shall be determined for the entire thickness of the stabilised layer.

9.5.1 Reference density laboratory compaction time

Following sampling, reference density testing shall be completed to a stage where laboratory compaction has been completed within three hours of the commencement of bituminous stabilisation for the corresponding lot. Additionally, following sampling, oven drying of any specimens used to determine the moisture content shall commence within three hours of the commencement of bituminous stabilisation for the corresponding lot. Refer to Clause 12 of Annexure MRTS07C.1.

For calibration for Test Method Q141A, compacted density testing as detailed in Test Methods Q141B and Q143, shall be completed to a stage where the mass of wet sample has been determined and the oven drying of any moisture sub-sample is completed within the following time constraints:

- a) where rolling is completed before 4 pm – same day, or
- b) where rolling is completed 4 pm or later – same day or before 10 am on the following day.

9.6 Bituminous stabilising agent content

The bituminous stabilising agent content shall be determined by either the average of the measured application rate, measured by the flow meter onboard the stabiliser or reclaimer/stabiliser, or by the average of the tanker dipping readings measured at the start and end of each run as specified in

Clause 13 of Annexure MRTS07C.1. Dip readings shall be undertaken in accordance with the procedure outlined in *Verification of Bitumen Application Rate (AustStab 2000)*.

In all cases the bituminous stabilising agent content shall be within the allowable tolerance specified in Clause 8.5.1.2. Further the results of all dipping tests **Witness Point** recorded and included in the quality records and reported to the Administrator. This shall be done irrespective of the method used to determine the bituminous stabilising agent content.

The results of all dipping tests shall be recorded and included in the quality records and reported to the Administrator. The record and report for each application rate test shall include:

- a) the position, date and time
- b) all values and calculations, including assumptions, used to calculate the application rate, and
- c) the calculated application rate of bitumen.

The testing program shall be established prior to commencement of stabilising operation (**refer Hold Point 2**).

In addition, the quantity of bituminous stabilising agent incorporated during each stabilising run shall be recorded and included in the quality records and reported to the Administrator. The record and report for each run shall include:

- a) the start position, date and time
- b) the end position, date and time
- c) the length of the run
- d) the width of the run
- e) the quantity of bitumen in the tanker at the start of the run
- f) the quantity of bitumen in the tanker at the midpoint of the run (if the length of the run exceeds 500 m)
- g) the quantity of bitumen in the tanker at the end of the run
- h) the quantity of bitumen incorporated into the pavement between each dip reading (if the length of the run exceeds 500 m)
- i) the quantity of bitumen incorporated into the pavement for the entire run
- j) the temperature of the bitumen in the tanker during stabilisation
- k) the average bitumen application rate, and
- l) expansion ratio and half life.

All records shall be such that the actual bitumen application rate for each stabilisation run shall be calculated at 15°C prior to the next stabilising 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 Tables 9.6-A and 9.6-B.

Table 9.6-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	80	1.042	145	1.0861
20	1.003	85	1.0453	150	1.0897
25	1.0062	90	1.0487	155	1.0932
30	1.0094	95	1.052	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	1.062	175	1.1074
50	1.0223	115	1.0655	180	1.1109
55	1.0256	120	1.0689	185	1.1145
60	1.0288	125	1.0723	190	1.118
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 9.6-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	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	0.906
45	0.9813	110	0.9416	175	0.9031
50	0.9782	115	0.9385	180	0.9002
55	0.9751	120	0.9355	185	0.8973
60	0.972	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	0.886

9.7 Secondary stabilising agent content

The secondary stabilising agent content shall be determined by testing using the surface spread rate of the secondary stabilising agent (Test Method Number Q719).

The secondary stabilising agent content shall be within the allowable tolerance specified in Clause 8.5.1.3.

The results of all surface spread rate tests shall be recorded and included in the quality records and reported to the Administrator. The record and report for each surface spread rate test shall include:

- a) the position/s, date and time
- b) all values and calculations, including assumptions, used to calculate the surface spread rate, and
- c) the calculated surface spread rate.

The testing program for determination of the secondary stabilising agent content shall be discussed and agreed with the Administrator prior to commencement of stabilising operation (**refer Hold Point 1**)

In addition, the tonnage of stabilising agent placed during each spreading run shall be recorded in the quality records and reported to the Administrator. The record and report for each run shall include:

- a) the start position, date and time
- b) the end position, date and time
- c) the length of the run
- d) the width of the run
- e) the tonnage of stabilising agent in the spreader at the start of the run
- f) the tonnage of stabilising agent at in the spreader 500 m intervals (if the length of the run exceeds 500 m)
- g) the tonnage of stabilising agent in the spreader at the end of the run
- h) the tonnage of stabilising agent spread for each 500 m interval (if the length of the run exceeds 500 m), and
- i) the tonnage of stabilising agent spread for the entire run.

9.8 Relative moisture content

The moisture content of the stabilised material shall be determined in accordance with Q102A. The moisture sample locations shall be identical to the sample locations for compaction testing. The moisture samples shall be extracted immediately following the bitumen stabilisation run of the stabiliser or reclaimer/stabiliser and prior to the addition of any additional moisture for the purposes of compaction and trimming. The value shall be calculated using the individual moisture content to the optimum moisture content for each corresponding location (refer Clause 8.5.2).

9.9 Visible deflection

9.9.1 Visual deflection prior to early trafficking

No trafficking shall be allowed until the requirement of Clause 9.9 is carried out until no visual deflection is observed. Additional curing time may be required prior to traffic.

9.9.2 Visual deflection pavement layers

The objective visible deflection test specified in this clause shall apply to a stabilised layer, unless stated otherwise in Clause 11 of Annexure MRTS07C.1.

Where the surface of any section of a stabilised layer displays visible deflection, as a result of the movement of a vehicle with an 8 tonne gross axle load, **Witness Point** the Administrator may require

the Contractor to carry out additional compliance testing to ensure that the affected section of the pavement layer complies with Clauses 9.5, 9.6, 9.7 and 9.8. No additional payment shall be made by the Principal for such additional testing.

9.10 Acceptance

Construction shall not proceed until the Administrator has received the results of all compliance testing for all lots constructed in the preceding two work periods, except where less than two work periods have passed since the commencement of stabilisation works. **Hold Point 7**. The Contractor shall allow at least one working day for a response from the Administrator.

No layer of a pavement shall be covered by a subsequent layer of pavement, or by surfacing, until all testing has been completed and the layer has been presented to the Administrator for permission to proceed.

10 Supplementary requirements

The requirements of MRTS07C *Insitu Stabilised Pavements Using Foamed Bitumen* are varied by the supplementary requirements given in Clause 15 of Annexure MRTS07C.1.

Superseded

Superseded