

# Main Roads Technical Standard

## **MRTS07B**

### **Insitu Stabilised Pavements using Cement or Cementitious Blends**

**April 11**

## **TRADEMARKS ACKNOWLEDGEMENT**

Terms mentioned in this document that are known or understood to be trademarks, whether registered or not, have been identified. Where trademarks have been confirmed as registered in Australia, this has been indicated by the addition of the ® symbol, otherwise the ™ symbol is used. While all care has been taken to identify trademarks, users should rely on their own inquiries to determine trademark ownership. Use of a term in this document as a trademark should not be regarded as affecting the validity of any trademark.

## **IMPORTANT INFORMATION**

The requirements of this document represent Technical Policy of the department and contain Technical Standards. Compliance with the department's Technical Standards is mandatory for all applications for the design, construction, maintenance and operation of road transport infrastructure in Queensland by or on behalf of the State of Queensland.

This document will be reviewed from time to time as the need arises and in response to improvement suggestions by users. Please send your comments and suggestions to the feedback email given below.

## **FEEDBACK**

Your feedback is welcomed. Please send to [mr.techdocs@tmr.qld.gov.au](mailto:mr.techdocs@tmr.qld.gov.au).

## **DISCLAIMER**

This publication has been created for use in the design, construction, maintenance and operation of road transport infrastructure in Queensland by or on behalf of the State of Queensland.

Where the publication is used in other than the department's infrastructure projects, the State of Queensland and the department gives no warranties as to the completeness, accuracy or adequacy of the publication or any parts of it and accepts no responsibility or liability upon any basis whatever for anything contained in or omitted from the publication or for the consequences of the use or misuse of the publication or any parts of it.

If the publication or any part of it forms part of a written contract between the State of Queensland and a contractor, this disclaimer applies subject to the express terms of that contract.

## **COPYRIGHT**

Copyright protects this publication. Except for the purposes permitted by and subject to the conditions prescribed under the Copyright Act, reproduction by any means (including electronic, mechanical, photocopying, microcopying or otherwise) is prohibited without the prior written permission of the department. Enquiries regarding such permission should be directed to the Contracts and Technical Capability Branch, Queensland Department of Transport and Main Roads.

© State of Queensland (Department of Transport and Main Roads) 2011



<http://creativecommons.org/licences/by-nc-nd/2.5/au>

## Table of Contents

	Page
1 INTRODUCTION.....	1
1.1 Bituminous curing coat.....	1
2 DEFINITION OF TERMS .....	1
3 REFERENCED DOCUMENTS .....	2
4 STANDARD TEST METHODS .....	2
5 QUALITY SYSTEM REQUIREMENTS.....	3
5.1 Hold Points, Witness Points and Milestones .....	3
5.2 Construction Procedures .....	4
5.3 Conformance requirements .....	5
5.4 Testing Frequencies and Lot Sizes.....	5
6 MATERIAL .....	5
6.1 New Material to Replace Material not Suitable for Stabilisation .....	5
6.2 Additional Material for Shape Correction .....	5
6.3 Stabilising Agent .....	5
6.4 Curing materials.....	6
6.4.1 General .....	6
6.4.2 Water .....	6
6.4.3 Bituminous curing coat .....	6
7 MATERIAL COMPLIANCE TESTING.....	6
7.1 General .....	6
7.2 Stabilising Agent, Water, Curing Materials .....	6
7.3 Unbound Pavement Material .....	7
8 CONSTRUCTION .....	7
8.1 General .....	7
8.1.1 Extent of Stabilising Operation .....	7
8.1.2 Target Depth.....	7
8.1.3 Construction Process.....	7
8.1.4 Allowable Working Time .....	7
8.1.5 Time Between Spreading and Mixing.....	8
8.1.6 Site services, utilities, buildings and drainage .....	8
8.2 Program of works.....	8
8.3 Process Requirements.....	8
8.3.1 Methodology .....	8
8.3.2 Trial Section.....	8
8.4 Construction Requirements .....	8
8.4.1 Removal and Disposal of Material not Suitable for Stabilisation (if required) .....	8
8.4.2 Preliminary Pulverisation .....	9
8.4.3 Additional Material for Shape Correction (if required) .....	9
8.4.4 Compacting and Trimming of the surface Prior to Spreading of the Stabilising Agent .....	9
8.4.5 Stabilising agent equipment.....	9
8.4.6 Spreading of Stabilising Agent.....	9
8.4.7 Incorporation of Stabilising Agent.....	10
8.4.8 Mixing and Incorporation of Water.....	10
8.4.9 Trimming before compaction .....	10
8.4.10 Compaction.....	11
8.4.11 Trimming after compaction .....	11
8.4.12 Period for Compaction and Trimming.....	11
8.4.13 Construction Joints .....	11
8.4.14 Curing .....	11
8.4.15 Minimum Requirements and Numbers of Particular Plant .....	12
8.4.16 Conditions under which stabilisation shall not proceed.....	12
8.5 Product Standards .....	13
8.5.1 Stabilising Agent Content .....	13

---

8.5.2	Compaction Standard .....	13
8.5.3	Geometrics, General .....	13
8.5.4	Geometrics, Horizontal Tolerances.....	14
8.5.5	Geometrics, Vertical Tolerances.....	14
9	CONSTRUCTION COMPLIANCE TESTING .....	15
9.1	General.....	15
9.2	Process Requirements .....	15
9.3	Product Standards.....	15
9.4	Geometrics .....	15
9.4.1	General .....	15
9.4.2	Surface Evenness .....	15
9.5	Compaction .....	16
9.6	Stabilising Agent Content .....	16
9.7	Visible Deflection of Pavement Layers.....	17
9.8	Acceptance.....	17
10	SUPPLEMENTARY REQUIREMENTS .....	17

# Insitu Stabilised Pavements using Cement or Cementitious Blends

## 1 INTRODUCTION

This Technical Standard applies to the stabilisation of materials insitu by the addition of a cementitious stabilising agent. This Technical Standard does not apply to lime only stabilisation

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.

### 1.1 Bituminous curing coat

Bituminous curing coats shall be a sprayed bituminous surfacing with cover aggregate and shall comply with MRTS11 *Sprayed Bituminous Surfacing (Excluding Emulsions)*, MRTS12 *Sprayed Bitumen Emulsion Surfacing*, MRTS20 *Cutback Bitumen*, MRTS21 *Bituminous Emulsion*, MRTS22 *Supply of Cover Aggregate* and other relevant Technical Standards.

Notwithstanding the above bituminous curing coats shall also comply with this Technical Standard.

## 2 DEFINITION OF TERMS

The terms used in this Standard shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Standards*. Additional terms used in this Standard shall be as defined in Table 2. Where indicated in Table 2 of this Technical Standard a more complete definition is contained in the referenced clause.

**Table 2 – Definition of Terms**

Term	Definition	Clause reference
Actual depth	Depth achieved measured from the finished surface level.	-
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 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 agent – see definition below.	-
Bituminous curing coat	A sprayed bituminous surfacing with cover aggregate.	1.1
Curing materials	Materials applied to the exposed surfaces of the completed stabilised layer for the purpose of curing.	6.4
Hydrated Lime	Hydrated lime is a granular form of lime consisting primarily of calcium hydroxide (Ca(OH) <sub>2</sub> ).	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.	-
Stabiliser	A single-rotor mix-in-place plant (i.e. plant that mixes insitu) of a type specifically designed for stabilisation work.	-
Stabilising agent	A cement, blended cement, cementitious blend or lime/fly ash blend.	6.3
Target depth	Depth of stabilisation measured from the design surface level of the new insitu stabilised layer.	8.1.2

Term	Definition	Clause reference
Work period	The period from the start of a stabilisation process to the completion of that stabilisation process including compaction and trimming. Note that more than one lot may be completed in a work period.	-

### 3 REFERENCED DOCUMENTS

Table 3 lists the documents referenced in this Technical Standard.

**Table 3 – Referenced Documents**

Reference	Title
AS 3582.1	Supplementary cementitious materials for use with portland and blended cement - Fly ash
AS 3582.2	Supplementary cementitious materials for use with portland and blended cement - Slag - Ground granulated iron blast-furnace
AS 3972	Portland and blended cements
AS 4489.6.1	Test methods for limes and limestones - Lime index - Available lime

### 4 STANDARD TEST METHODS

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

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

**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 Q102C Q102D Q102E
Laboratory reference density	Q141B Q142A Q142C Q143 Q144A
Relative compaction (i.e. Relative Dry Density [RDD])	Q140A Q141A Q141B

Property to be Tested	Test Method No.
Sulfate content	Q131A
Stabilising agent content	Q134
Road Roughness-Surface evenness	Q708A Q708B Q708C Q708D
Surface spread rate of stabilising agent	Q719

## 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. Approval of construction procedure and construction program.		Supply of the construction procedure and construction program for the stabilisation works, including submission of samples (42 days).
7.1	2. Compliance of all materials, prior to their incorporation.		
8.1.6	3. Completion of site survey prior to stabilisation related operations		
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).	
8.4.6		Spreading stabilising agent.	
8.5.1.1			Ordered content of stabilising agent (14 days).
9.7		Testing for visible deflection of pavement layers.	
9.8	5. Covering a pavement layer.		
9.8	6. Construction permitted to proceed.		

## **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 Technical Standard 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 Standard;
- b) details of how services, utilities, buildings and drainage components shall be located (refer to Clause 8.1.6);
- c) details of how services, utilities, buildings, drainage components, plant personnel shall be protected from damage, injury, etc (refer to Clause 8.1.6);
- d) calibration procedures (e.g. for the spreader);
- 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, kerb, kerb and channel and road safety barriers, and structures such as bridges, access chambers, gullies, culverts and concrete medians.
- 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;
  - iii) the stabilising agent content; and
  - iv) geometric tolerances,
- h) where process requirements are specified in accordance with Clause 8.1.4, 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 be submitted to the Administrator with the construction procedure –

- a) details of the proposed source of the stabilising agent;
- b) a certificate of test results demonstrating compliance of the constituents of the proposed stabilising agent(s) to the required Standards;
- 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; and
- d) where a cementitious blend containing lime or a lime/fly ash blend is specified, the available lime index on which it is based (i.e.  $AL_o$  defined in Clause 8.5.1.2).

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 Standard 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 MRTS07B.1. If no such requirements are specified for any such materials, testing frequency and lot size requirements for them 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 MRTS07B.1. Where no maximum lot size for construction is specified in Clause 1.2 of Annexure MRTS07B.1, the maximum lot size shall be equal to the area (in m<sup>2</sup>) 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 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 MRTS07B.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*.

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 SO<sub>3</sub>) per litre.

### 6.2 Additional Material for Shape Correction

Additional material that is required for shape correction shall be unbound granular material that complies with the requirements stated in Clause 3 of Annexure MRTS07B.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*.

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 SO<sub>3</sub>) per litre.

### 6.3 Stabilising Agent

The stabilising agent shall comply with the relevant Specifications and Standards given in Table 6.3. The type(s) of stabilising agent to be used for this Contract, its estimated content and the specified spread rate are given in Clause 11 of Annexure MRTS07B.1. Where the Specified Spread Rate is not so stated in the Annexure, the Specified Spread Rate shall be 20 kg/m<sup>2</sup>.

For cementitious or lime/fly ash blends only the blend ratio shall be as stated in Clause 11 of Annexure MRTS07B.1.

**Table 6.3 – Stabilising Agent Requirements**

Agent	Specification or Standard
Cement	Type GP or Type LH cement that complies with AS 3972.
Blended Cement	Type GB, fly ash blend that complies with AS 3972.

Agent	Specification or Standard
Cementitious blend (excluding GP, LH and GB cements)	Portland cement, that complies with AS 3972, blended with one or more of the following – <ul style="list-style-type: none"> <li>• “fine grade” fly ash complying with AS 3582.1;</li> <li>• Ground granulated blast furnace slag (GGBFS) complying with AS 3582.2; or</li> <li>• hydrated lime complying with MRTS23 <i>Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation</i>.</li> </ul> The minimum Portland cement content of these blends shall be 40%. Further the Portland cement shall comply with AS 3972.
Lime/fly ash blend	A blend of – <ul style="list-style-type: none"> <li>• hydrated lime complying with MRTS23 <i>Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation</i>; and</li> <li>• “fine grade” fly ash complying with AS 3582.1.</li> </ul>

All of the components of the stabilising agent shall be completely, homogeneously and accurately blended/mixed by a dedicated blending plant prior to delivery to Site. At the time of spreading each component of the stabilising agent shall –

- a) comply with the relevant Specification(s), Standard(s) and Technical Standard(s); and
- b) not be more than 3 months old, measured from its date of manufacture to the time of spreading.

The stabilising agent as a whole shall also comply with the relevant Specification(s), Standard(s) and Technical Standard(s).

## **6.4 Curing materials**

### **6.4.1 General**

The method of curing shall be as stated in Clause 12 of Annexure MRTS07B.1. Curing materials shall comply with the requirements in Clauses 6.4.2 or 6.4.3.

### **6.4.2 Water**

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.

### **6.4.3 Bituminous curing coat**

Bituminous curing coats shall comply with Clause 1.1.

## **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 Standard. **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 Standard. 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 and as described in Clause 7.

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 Standard 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 constituents of the proposed stabilising agent to the relevant Standards shall be provided for each load, or part thereof, of stabilising agent.

### **7.3 Unbound Pavement Material**

Compliance testing of any new unbound pavement material used to replace material not suitable for stabilisation shall be carried out in accordance with the requirements of Clause 4 of Annexure MRTS07B.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 MRTS07B.1.

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

## **8 CONSTRUCTION**

Construction of a stabilised layer shall not proceed unless the requirements of Clause 9.8 are met [refer to **Hold Points 5 and 6**].

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 Standard are provided.

### **8.1 General**

#### **8.1.1 Extent of Stabilising Operation**

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

Once stabilising agent has been spread it shall be incorporated and mixed over the entire area of spread within the same work period in which it was spread. The stabilised material shall be fully compacted and trimmed within the allowable working time.

#### **8.1.2 Target Depth**

The target depth is stated in Clause 11 of Annexure MRTS07B.1.

The datum for measurement of the target depth shall be as stated in Clause 13 of Annexure MRTS07B.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 11 of Annexure MRTS07B.1.

##### **8.1.3.2 Construction Based on Process Requirements**

If a process requirement is specified in Clause 11 of Annexure MRTS07B.1 construction 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**

If a process requirement is specified in Clause 11 of Annexure MRTS07B.1 construction 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**

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

The allowable working time, measured from the commencement of incorporation (i.e. mixing) of stabilising agent into the unstabilised material to the completion of compaction and trimming of the stabilised material, shall be as stated in Clause 11 of Annexure MRTS07B.1.

### 8.1.5 Time Between Spreading and Mixing

The maximum time between spreading of the stabilising agent and mixing of it into the unstabilised material shall be as stated in Clause 11 of Annexure MRTS07B.1. Where no such time is stated in the Annexure, the maximum time between spreading of the stabilising agent and mixing of the stabilising agent into the unstabilised material shall be 30 minutes.

### 8.1.6 Site services, utilities, buildings and drainage

The Contractor shall undertake a survey of the site to determine the location and depth of services, utilities, buildings and drainage components prior to the commencement of construction. The Contractor 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.

All such details shall be included in the proposed construction procedure (Clause 5.2).

Stabilisation related operations 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, stabilising agent content, 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 8.5.2 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 8.5.2, 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 8.5.2, 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 metres long and 3 metres wide (so that a longitudinal joint is included).

All operations, testing, etc required by this Standard, including compaction testing, shall be used in the construction and testing of a 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,
- c) any additional requirements as stated in Clause 6 of Annexure MRTS07B.1.

At least 7 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.

Existing material that is unsuitable for stabilisation shall be removed and disposed of in accordance with Clause 11 of MRTS01 *Introduction to Technical Standards*.

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 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.

Preliminary pulverisation shall occur –

- a) after the removal and replacement of material deemed by the Administrator as material not suitable for stabilisation;
- b) prior to the addition of shape correction material; and
- c) prior to the addition of the stabilising agent.

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)**

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.

#### **8.4.4 Compacting and Trimming of the surface Prior to Spreading of the Stabilising Agent**

Prior to spreading of the 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 Stabilising agent equipment**

Stabilising agent shall be transported, stored and spread using equipment that is both waterproof and watertight. Equipment used to transfer the 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 stabilising agent to be used in the stabilisation works.

#### **8.4.6 Spreading of Stabilising Agent**

The maximum amount of stabilising agent to be spread in one pass shall be 20 kg/m<sup>2</sup>. The number of passes shall be calculated to comply with this requirement.

The stabilising agent shall be uniformly spread over the insitu material at a controlled rate (mass per unit area, kg/m<sup>2</sup>). **Witness Point**

The total rate of spread shall be such that the stabilising agent content of the compacted material is within the specified tolerances.

After each spreading run, and before any other spreading run, stabilising agent shall be incorporated as specified in Clause 8.4.7. Further trimming and/or compaction as required (refer 8.4.4 and 8.4.10) 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 Incorporation of Stabilising Agent**

### **8.4.7.1 General**

Incorporation of the stabilising agent shall be achieved using a reclaimer/stabiliser or stabiliser.

Water shall only be added during mixing as described in Clause 8.4.8.

### **8.4.7.2 Single Pass**

Where a single pass is required to spread the required amount of stabilising agent in accordance with Clause 8.4.6, there shall be at least one pass to incorporate the stabilising agent. At least one more (mixing) pass is required in accordance with Clause 8.4.8.

### **8.4.7.3 Multiple Passes**

Where more than one pass is required to spread the required amount of stabilising agent in accordance with Clause 8.4.6, the stabilising agent shall be uniformly incorporated into the material after each spreading pass, except that, after the last spreading pass, the balance of the stabilising agent and water shall be uniformly incorporated into the material during mixing as described in Clause 8.4.8.

All passes made to incorporate the stabilising agent shall be to the full depth of stabilisation.

## **8.4.8 Mixing and Incorporation of Water**

Mixing and incorporation of water shall be achieved using a reclaimer/stabiliser or stabiliser.

There shall be at least one pass to incorporate the stabilising agent (i.e. one incorporation pass) and at least one more pass to mix the constituents.

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 or stabiliser. This system shall be capable of spraying varying rates across its width.

Mixing shall be to the specified full depth of stabilisation. In addition, the distribution of the 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 stabilising agent, nor shall it be segregated.

Where test results or visual inspection by the Administrator indicate that the above requirements 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 stabilising agent; and
- c) distribution of water.

## **8.4.9 Trimming before compaction**

After completion of stabilisation and before compaction commences, the surface shall be trimmed to approximately the alignment, heights and shapes specified for the completed work, and any depressions shall be filled with excess, complying, mixed (stabilised) material that is placed and compacted within its allowable working time.

#### 8.4.10 Compaction

Light compaction shall be completed after each application of 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.

Final compaction shall be completed within the allowable working time (refer to Clause 8.1.4). The stabilised layer shall be compacted to the standard stated in Clause 8.5.2.

Compaction shall be undertaken on the single layer of stabilised material. Compaction shall be achieved for the full thickness of the single stabilised layer.

#### 8.4.11 Trimming after compaction

No marks caused by a pad foot or other roller shall remain on the surface after final trimming.

All trimming shall involve cutting to waste. All material cut to waste shall be disposed of in accordance with Clause 11 of MRTS01 *Introduction to Technical Standards*. No separate 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.

#### 8.4.12 Period for Compaction and Trimming

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

#### 8.4.13 Construction Joints

##### 8.4.13.1 General

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

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.

##### 8.4.13.2 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 Standard. The cutback material shall be removed, disposed of and replaced in accordance with this Standard.

No separate 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.

##### 8.4.13.3 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 Standard. The cutback material shall be removed, disposed of and replaced in accordance with this Standard. After this material has been replaced with material that complies with the requirements of Clause 6.1, stabilising agent shall be spread over the cutback length. This material shall then be included in the stabilisation process of the adjoining section to be stabilised.

No separate 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 Curing

##### 8.4.14.1 General

A curing operation shall commence immediately after the completion of compaction.

The curing method to be used for the stabilised layer shall be as specified in Clause 12 of Annexure MRTS07B.1.

Irrespective of the curing method specified a sprayed bituminous surfacing with cover aggregate shall be applied within 7 calendar days of completion of the stabilised layer. This sprayed bituminous surfacing with cover aggregate shall comply with MRTS11 *Sprayed Bituminous Surfacing (Excluding Emulsions)*, MRTS12 *Sprayed Bitumen Emulsion Surfacing*, MRTS20 *Cutback Bitumen*, MRTS21 *Bituminous Emulsion*, MRTS22 *Supply of Cover Aggregate* and other relevant Department of Technical Standards.

#### **8.4.14.2 Water Curing**

Where water curing is required, the stabilised material shall be cured via a uniformly applied fine mist of water. Further the top surface and edges shall be maintained in a continuously damp condition during curing. Curing shall continue until the stabilised material is covered by another pavement layer or a sprayed bituminous surfacing with cover aggregate. Water shall be applied in a manner such that slurring of the surface, pavement instability and erosion and/or leaching of the stabilising agent(s) are all avoided.

#### **8.4.14.3 Bituminous curing coat**

Where a bituminous curing coat is specified, the stabilised layer shall be cured with a sprayed bituminous surfacing with cover aggregate in accordance with Clause 1.1. If the bituminous curing coat can not be placed immediately, the layer shall be cured using water, in accordance with Clause 8.4.14.2, until the bituminous curing coat is placed.

No payment shall be made for water curing where a bituminous curing coat is specified. Any water curing required where a bituminous curing coat is specified shall be deemed to be included in the relevant works for the bituminous curing coat.

Where bituminous curing coat is specified, cover aggregate shall be spread over the sprayed bituminous surfacing before any traffic is allowed onto the sprayed bituminous surfacing.

#### **8.4.15 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 MRTS07B.1. 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 8.4.15.

**Table 8.4.15 – Minimum Requirements and Numbers of Particular Plant**

<b>Description</b>	<b>Minimum requirement for each piece of plant</b>	<b>Minimum number of Units</b>
Reclaimer / stabiliser or calibrated and integrated spreader / reclaimer / stabiliser	375 kilowatts. Calibrated and capable of spreading varying widths (if integrated spreader / reclaimer / stabiliser).	1
Purpose built spreader	Calibrated with load cells and capable of spreading 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	–	1
Water truck	Capacity of 6 000 litres.	2
Grader	Manned by Final Trim Operator.	1

#### **8.4.16 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 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 stabilising agent content and any blend ratios stated in Clause 11 of Annexure MRTS07B.1. The confirmed or adjusted stabilising agent content shall be the ordered content,  $C_o$ . **Milestone**

#### 8.5.1.2 Corrected Content

Notwithstanding the ordered content of stabilising agent given in Clause 8.5.1.1, the content to be used for the stabilisation works shall be the corrected content,  $CC_o$ , as calculated below.

Where the stabilising agent does not contain lime,  $CC_o = C_o$ .

Where a cementitious blend containing (hydrated) lime or a (hydrated) lime/fly ash blend is specified for the stabilising agent -

$$CC_o = C_o \left[ \left( \frac{P_{NL}}{100} \right) + \left( \frac{P_L}{100} \times \frac{AL_o}{AL_A} \right) \right]$$

where –

$CC_o$  = Corrected content of stabilising agent in percent (%);

$C_o$  = Ordered content of stabilising agent in percent (%) as defined in Clause 8.5.1.1;

$P_{NL}$  = Proportion of the blend in percent (%) that is not hydrated lime;

$P_L$  = Proportion of the blend in percent (%) that is hydrated lime;

$AL_o$  = Available lime index in percent (%) on which  $C_o$  is based; and

$AL_A$  = Actual available lime index in percent (%) for the (hydrated) lime to be used in the Contract.

#### 8.5.1.3 Actual Content

The actual content shall be represented either by the characteristic value of the stabilising agent content or by the average of the surface spread rates of the stabilising agent for each lot. The method to be used for this Contract shall be as stated in Clause 11 of Annexure MRTS07B.1.

The actual stabilising agent content shall be within  $\pm 10\%$  of the corrected content as defined in Clause 8.5.1.2.

### 8.5.2 Compaction Standard

The characteristic value of the RDDs for the full thickness of the stabilised layer shall not be less than 100% Standard compaction.

### 8.5.3 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 Clauses 8.5.4 and 8.5.5.

**8.5.4 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 8.4.3, 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.

**8.5.5 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 8.1 of Annexure MRTS08.1 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 + 10 mm of the specified thickness.

**Table 8.5.5.1 – Primary Tolerance for Stabilised Layers**

Alternative	Primary Tolerance (mm)
A	± 10
B	± 15
C	Thickness only

**8.5.5.2 Additional Tolerances**

**8.5.5.2.1 General**

Where required by Clauses 8.5.5.2.2, 8.5.5.2.3 and 8.5.5.2.4, 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.

**8.5.5.2.2 Deviation from a Straight-Edge**

Where Clause 8.2.1 of Annexure MRTS07B.1 states a deviation from a straight-edge tolerance applies the deviation from a 3 metre long straight-edge placed anywhere on the surface of a layer shall not exceed the limits stated in Clause 8.2.2 of Annexure MRTS07B.1, due allowance being made for design shape, where relevant. The limit stated in Clause 8.2.2 of Annexure MRTS07B.1 shall be one of the alternatives given in Table 8.5.5.2.2.

**Table 8.5.5.2.2 – Tolerance for Deviation from a Straight Edge**

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

**8.5.5.2.3 Crossfall**

Where Clause 8.3 of Annexure MRTS07B.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 metres apart except where a pavement verge is less than 2 metres wide. For pavement verges less than 2 metres 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.

#### **8.5.5.2.4 Surface Evenness**

Where Clause 8.4.1 of Annexure MRTS07B.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 8.4.2 of Annexure MRTS07B.1 or, where not so stated, not exceeding 50 counts per kilometre.

## **9 CONSTRUCTION COMPLIANCE TESTING**

### **9.1 General**

Unless otherwise stated in this Standard, 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 surface spread rate (Clause 9.6); and
- c) Visible deflection of pavement layers (Clause 9.7).

The Contractor is responsible for performing sufficient tests to ensure that the pavement complies with the standards and requirements of this Standard. 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 Methods Q708A, Q708B, Q708C and Q708D.

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

## **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 13 of MRTS01 *Introduction to Technical Standards* 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 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. Following sampling, reference density testing shall be completed to a stage where laboratory compaction has been completed within the Allowable Working Time of the corresponding lot. Additionally, following sampling, oven drying of any specimens used to determine the moisture content shall commence within the Allowable Working Time of the corresponding lot.

The relative compaction of the stabilised material as detailed in Test Method Q140A shall be determined using the ratio nominated in Clause 10 of Annexure MRTS07B.1. Where a ratio is not so stated the relative compaction of the stabilised material as detailed in Test Method Q140A shall be determined using the ratio nominated by the Administrator which shall be the ratio of either –

- a) the compacted dry density to the maximum dry density;
- b) the compacted dry density to the maximum converted dry density; or
- c) the compacted wet density to the maximum converted wet density.

For Test Method Q140A the use of the ratio of compacted wet density to the maximum converted wet density shall only be used where the insitu moisture content is within the range of - 4% to + 2% of the moisture content corresponding to the maximum converted wet density. The relative compaction shall be determined for the entire thickness of the stabilised layer.

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

## **9.6 Stabilising Agent Content**

Where the method of testing of stabilising agent content is stated as characteristic value in Clause 11 of Annexure MRTS07B.1, the stabilising agent content shall be determined by Test Method Q134. In this case the characteristic value shall be calculated as specified in Clause 13 of MRTS01 *Introduction to Technical Standards* using the individual stabilising agent contents determined from testing of each lot. Further the calibration for Test Method Q134 shall be undertaken for each combination of stabilising agent and representative material to be stabilised.

Where the method of testing of stabilising agent content is stated as the surface spread rate in Clause 11 of Annexure MRTS07B.1, the stabilising agent content shall be determined by Test Method Q719. In this case the testing program shall be discussed and agreed with the Administrator prior to commencement of stabilising operation (refer Hold Point 2).

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

Irrespective of which method is used to determine the stabilising agent content, 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, date and time;
- b) All values and calculations, including assumptions, used to calculate the surface spread rate; and
- c) The calculated surface spread rate.

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 spreading 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 in the spreader at 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.

### **9.7 Visible Deflection of Pavement Layers**

The objective visible deflection test specified in this clause shall apply to a stabilised layer, unless stated otherwise in Clause 9 of Annexure MRTS07B.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 on a single axle with dual tyres, **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 and 9.6. No additional payment shall be made by the Principal for such additional testing.

### **9.8 Acceptance**

No layer of a pavement shall be covered by a subsequent layer of pavement or a surfacing until all testing has been completed and the layer has been presented to the Administrator for permission to proceed. **Hold Point 5** The Contractor shall allow at least one working day for a response from the Administrator.

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 6** The Contractor shall allow at least one working day for a response from the Administrator.

## **10 SUPPLEMENTARY REQUIREMENTS**

The requirements of MRTS07B *Insitu Stabilised Pavements using Cement or Cementitious Blends* are varied by the supplementary requirements given in Clause 14 of Annexure MRTS07B.1.