

# Main Roads Technical Standard

**MRTS08**

## **Plant-Mixed Stabilised Pavements using Cement**

**June 09**

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**June 09**

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SUPERSEDED

# Plant-mixed Stabilised Pavements

## 1 INTRODUCTION

This Technical Standard applies to the construction of stabilised layers in road pavements using a plant-mixed pavement material which comprises a mixture of unbound granular pavement material and a cement based stabilising agent. In addition it may contain an admixture.

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

This Technical Standard forms part of the Main Roads Specifications and Technical Standards Manual.

## 2 DEFINITION OF TERMS

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

**Table 2 – Definition of Terms**

Term	Definition
Admixture	Chemical admixture to alter the properties of the mix (e.g. either accelerate or decelerate the hydration reaction).
Allowable Working Time	The time within which compaction and trimming of the stabilised layer shall be completed, measured from the commencement of incorporation of stabilising agent (i.e. mixing of the stabilisation agent into the material) to completion of compaction and trimming.
Base Course	A course or courses principally intended to directly support the traffic loads.
Pavement	The portion of the road placed above the subgrade for the support of and to form a running surface for, vehicular traffic.
Pavement Verge	The edge section of the pavement, as defined above, which may consist of material differing from the remainder of the pavement due to different requirements for the edge section.
Subbase Course	A course or courses principally intended to distribute to the subgrade the loads from overlying courses.
Wearing Course	A course which has no structural function but protects the underlying course from wear and the ingress of water. An dense graded asphaltic concrete (with unmodified binder) course less than 50 mm thick and an open graded asphaltic concrete course are both classed as wearing courses.

## 3 REFERENCED DOCUMENTS

Table 3 lists documents referenced in this Technical Standard.

**Table 3 – Referenced Documents**

Reference	Title
AS 1478	Chemical admixtures for concrete, mortar and grout – Admixtures for concrete
AS 3972	Portland and blended cements

### 3.1 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 Bituminous Emulsion Surfacing*, MRTS20 *Cutback Bitumen*, MRTS21 *Bituminous Emulsion*, MRTS22 *Technical Standard for Supply of Cover Aggregate*, as is relevant, and other relevant Department of Technical Standards.

Notwithstanding the above bituminous curing coats shall also comply with this technical standard.

## 4 STANDARD TEST METHODS

The standard test methods listed in Table 4 shall be used in this standard, subject to the method of application(s) stated below.

Further details of test numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Standards*. For compliance testing requirements, refer to Clauses 6 and 9.

**Table 4 – Standard Test Methods**

Property to be Tested	Method No.
California Bearing Ratio (standard compaction)	Q113A
Determination of the relationship between standard and subsidiary test methods	Q010
Density-Moisture Relationship (Rapid Method), including relative dry density	Q110C
Flakiness index	Q201A
Moisture content	Q102A Q102B Q102C Q102D Q102E
Particle Size Distribution	Q103A
Preparation of disturbed samples	Q101
Road Roughness-Surface evenness	Q708
Relative dry density	Q110A Q110F Q110C Q111A Q111C Q112
Selection of sampling or test locations	Q050
Sampling of Soils, Crushed Rock and Aggregates	Q060
Shrinkage of cement treated material	Q128
Spot Sampling of Soils, Crushed Rock and Aggregates	Q061
Stabilising agent content	Q134
Sulphate Content	Q131A
Ten Percent Fines (wet)	Q205B
Unconfined Compressive Strength (UCS)	Q115
Wet/dry strength variation	Q205C

### 4.1 Application of Test Numbers Q110C, Q110F

All sampling and testing undertaken under Test Numbers Q110C and Q110F shall be completed within two hours of the commencement of incorporation of stabilising agent into the unstabilised material. Samples taken for testing under Test Numbers Q110C and Q110F shall be taken:

- a) after mixing of the stabilised material has been completed;
- b) after it has exited the plant; and
- c) prior to the transportation of it commences.

For the purpose of calculating the maximum dry density, testing undertaken to determine the moisture content shall be started as soon as possible, after the commencement of incorporation of stabilising agent into the unstabilised material; the maximum time between incorporation of stabilising agent into unstabilised material and the commencement of this testing shall be 2 hours.

#### 4.2 Application of Test Numbers Q111A and Q112

For the purpose of calculating the in situ dry density, a moisture content sample shall be taken within two hours of the commencement of incorporation of stabilising agent into the unstabilised material. The location of this sample shall correspond to the location of the sample to be taken for the determination of the in situ dry density. Testing to determine the water content of this sample shall be started as soon as possible, after the commencement of incorporation of stabilising agent into the unstabilised material; the maximum time between incorporation of stabilising agent into unstabilised material and the commencement of this testing shall be 2 hours.

#### 4.3 Application of Test Number Q111C

The relative dry density shall be calculated based on the ratio of the field density to the maximum dry density using the results from Test Numbers Q110A, Q110F, Q111A and Q112, as modified above.

The relative dry density shall be determined for each stabilised layer, for the entire thickness of each stabilised layer.

#### 4.4 Application of Test Number Q115

UCS samples shall be taken within two hours of the commencement of incorporation of stabilising agent into the unbound pavement material. Compaction of these samples shall be completed within two hours of the commencement of incorporation of stabilising agent into the unbound pavement material.

The UCS tests shall be completed after 7 days of curing.

#### 4.5 Application of Test Number Q134

Calibration shall be undertaken for each combination of stabilising agent, admixture and (representative) material to be stabilised.

### 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 and Milestones applicable to this standard are summarised in Table 5.1. There are no Witness Points given in this technical standard.

**Table 5.1 – Hold Points and Milestones**

Clause	Hold Point	Milestone
7.2		Submission of sample of pavement material for shrinkage testing.
7.3.2	1. Demonstration of material compliance prior to the construction of any stabilised layer.	
8.2.1.1		Submission of sample of pavement material to determine ordered content of stabilising agent, admixture, etc.
9.2.9	2. Covering a pavement layer. 3. Results of compliance testing submitted to Administrator.	

#### 5.2 Construction Procedures

The Contractor shall prepare documented procedures for all construction processes in accordance with the quality system requirements of the Contract.

### 5.3 Conformance Requirements

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

### 5.4 Testing Frequencies and Lot Sizes

The testing frequency and lot size requirements shall be as stated in Clause 1 of Annexure MRTS08.1. If no such requirements are specified for any unbound material to be stabilised then testing frequency and lot size requirements for such material shall comply with the requirements of MRTS05 *Unbound Pavements*.

Where no maximum lot size is specified for construction is specified in Clause 1.2 of Annexure MRTS08.1, 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 work period, provided the material is essentially uniform.

Certification of the compliance of each stabilising agent is required for each source and for each load.

Certification of the compliance of each admixture is required for each type and for each source.

## 6 MATERIALS

### 6.1 Stabilising Agent

The type of stabilising agent shall be as stated in Clause 7 of Annexure MRTS08.1.

The stabilising agent shall comply with the relevant standard in Table 6.1.

All of the components of the stabilising agent shall be completely and homogeneously blended/mixed before they are incorporated into the unstabilised material. Each component of the stabilising agent shall also comply with the relevant Standard at the time of introduction into the plant.

**Table 6.1 – Stabilising Agent Standards**

Agent	Standard
Cement	Type GP or Type LH in accordance with AS 3972.
Blended Cement	Type GB, cement and fly ash blend in accordance with AS 3972.

### 6.2 Admixture(s)

The type of admixture(s) shall be as approved by the Administrator/Administrator. They shall also comply with, and be used in accordance with, AS 1478.

### 6.3 Curing Coat for the Final Layer

The curing coat for the final layer shall be a sprayed bituminous surfacing with cover aggregate constructed using a bitumen emulsion or a cutback bitumen.

The type of bituminous curing coat to be used on this Contract is stated in Clause 8 of Annexure MRTS08.1.

The bituminous curing coat shall comply with the requirements of Clause 3.4 and this standard.

### 6.4 Water

Water shall be free from oil, acids, organic matter and any other matter which could be deleterious to the mixture. It shall also be potable and contain less than 0.05% of sulphates.

### 6.5 Cover Material for bituminous curing coat

Cover material shall be a material that complies with the requirements of Clause 3.2 and this standard.

### 6.6 Unbound Pavement Material to be stabilised

The unbound pavement material to be stabilised shall comply with the requirements of MRTS05 *Unbound Pavements* and be Type 1, 2 or 3.

The material type/subtype to be used for this Contract is stated in Clause 7 of Annexure MRTS08.1. Within Clause 6 of MRTS05 *Unbound Pavements* there are references to Annexure MRTS05.1 for the purpose of obtaining additional information. This additional information shall be as stated in Annexure MRTS08.1 as follows –



- a) grading envelope – Clause 7 of Annexure MRTS08.1; and
- b) linear shrinkage or plasticity index applicability – Clause 10 of Annexure MRTS08.1.

Type 4 materials shall not be used.

### **6.7 Strength requirements for plant mixed stabilised material**

The strength requirements of the plant mixed stabilised material are given in Clause 7 of Annexure MRTS08.1. The unconfined compressive strength shall be determined as described in Clause 4.

### **6.8 Shrinkage of (GP cement) Stabilised Material**

Shrinkage testing shall be undertaken using the unbound material(s) to be stabilised and Type GP cement, irrespective of what stabilising agent is specified in Clause 8 of Annexure MRTS08.1. A representative sample of each type of unbound pavement material to be stabilised shall be stabilised using GP cement and tested for shrinkage. Unless otherwise approved by the Administrator, the shrinkage of the (GP cement) stabilised pavement material, when mixed with 4.5% by mass of Type GP cement and compacted to 100% RDD (standard compaction), shall not exceed 500 microstrains when measured 20 calendar days after demoulding. The sample shall be tested in accordance with Test Method Q128.

### **6.9 Stockpiling of Materials**

Stockpiles shall be located on clear, even, firm, well-drained ground and in a location where they can be clearly identified.

If a location is stated in Clause 2 of Annexure MRTS08.1, the stockpile shall be so located.

There shall be a separate stockpile for each material of the same standard.

All stockpiles shall be separated from other stockpiles by at least 2 metres.

For the purpose of testing, each individual stockpile lot shall be clearly delineated by one of the alternative methods below –

- a) a separate stockpile shall be formed for each stockpile lot; or
- b) material of the same requirements shall be added to a single stockpile incrementally such that a portion representing a stockpile lot is added, tested and found to be conforming before the next portion, representing the next stockpile lot, is added. Nonconforming stockpile lots shall be removed from the stockpile prior to the addition of further portions.

No stockpile which, in the opinion of the Administrator, is excessively wet shall be used in the stabilisation works.

### **6.10 Acid sulphate content**

No material to be stabilised, nor any material that is within 500 mm of the stabilised layer, shall have a water soluble sulphate content exceeding 1.9 grams of sulphate (expressed as  $\text{SO}_3$ ) per litre.

## **7 MATERIAL COMPLIANCE TESTING**

Testing shall be carried out in accordance with the Test Methods described in Clause 4 and as outlined below.

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.

### **7.1 Stabilising Agent, Admixture, Water, Bituminous Curing Coat and Cover Material**

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

### **7.2 Shrinkage of Stabilised Material**

The shrinkage test shall be carried out on a preliminary sample of each unbound granular material to be stabilised, minimum mass 30 kg, which the Contractor intends to use on the Contract to produce stabilised material. This preliminary sample shall be delivered to the Administrator at least 42 working days before the material is to be used in the pavement. **Milestone**

Testing shall be undertaken in accordance with Clause 6.7.

The material(s) used in the Contract shall be the same as the material(s) supplied for the preliminary sample.

### **7.3 Unbound Pavement Material**

#### **7.3.1 General**

Compliance testing of materials shall be undertaken for each lot. A lot shall include only material of the same subtype.

Unless indicated otherwise in Clause 3 of Annexure MRTS08.1, samples for material compliance testing shall be taken from the stockpile.

Samples for compliance testing shall be selected by random sampling from the stockpile lot.

Compliance testing of unbound pavement material shall also meet the requirements of MRS05 *Unbound Pavements* however the requirements of this standard take precedence.

#### **7.3.2 Testing Frequencies and Number of Tests**

The Contractor is responsible for carrying out sufficient testing to ensure that the material complies with 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.

Materials shall not be incorporated into the work unless it has been demonstrated that they comply fully with this standard. **Hold Point 1**

#### **7.3.3 Testing**

##### **7.3.3.1 Ten Percent Fines Value (Wet) and Wet/Dry Strength Variation**

The Ten Percent Fines Value (Wet) and the Wet/Dry Strength Variation tests shall both be carried out on the fraction of the coarse component passing the AS 13.2 mm sieve but retained on the AS 9.5 mm sieve.

However, for material which complies with grading envelopes D or E, if sufficient material for the test cannot be obtained from this sieve range, the tests may be carried out on an alternative fraction approved by the Administrator. This shall normally be the next most coarse fraction which comprises 10% or more of the material and conforms with one of the component sizes listed in Test Method Q205B.

##### **7.3.3.2 Flakiness Index**

The Flakiness Index Test results (Test Method Q201A) shall be reported for the total sample.

##### **7.3.3.3 California Bearing Ratio**

California Bearing Ratio tests shall be undertaken in accordance with Test Method Q113A and the result reported at the maximum dry density and the optimum moisture content as defined by Test Method Q110A.

## **8 CONSTRUCTION**

Construction of a stabilised layer shall not proceed unless the requirements of Clause 9.2.9 are met. **Hold Point 2**

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 Process Requirements**

#### **8.1.1 Equipment**

Equipment capable of efficiently carrying out the following functions shall be continuously available, and in use as required, to the Site –

- a) transporting, transferring and storing mix constituents;
- b) mixing;
- c) delivery of the mixture;
- d) paving;
- e) compaction and trimming;

- f) preparation of the edges and surfaces;
- g) water curing; and
- h) application of the curing coat for the final layer including application of the cover aggregate.

### 8.1.2 Standard of Equipment

#### 8.1.2.1 General

The equipment listed below shall comply with the minimum standards listed in the Clause detailing that piece of equipment.

#### 8.1.2.2 Equipment used to Transport, Transfer and Store Mix Constituents

The stabilising agent and admixture(s) shall be transported and stored using vessels that are both waterproof and watertight. Apparatus used to transfer the stabilising agent and admixture(s) between transport and storage vessels shall also be waterproof during the transfer process. These vessels and apparatus shall be emptied and cleaned prior to the introduction of each type of material to be used in the stabilisation works.

#### 8.1.2.3 Mixing Equipment

Mixing equipment shall comprise at least the following –

- a) a stationary, driven pugmill;
- b) a storage silo for the stabilising agent;
- c) storage facilities for water and the admixture as required;
- d) calibrated and controlled metering systems for the addition of the stabilising agent, admixtures (if required) and water;
- e) a mixture storage bin; and
- f) the necessary conveyors, source of power and controls.

The mixing equipment shall also –

- a) have a control system with a variable feed rate for each mix constituent;
- b) have displays that allow continuous monitoring of each mix constituent;
- c) be capable of producing plant mixed stabilised pavement material complying with this standard;
- d) be capable of uniformly incorporating the stabilising agent, admixture (if required) and water into the unstabilised materials.
- e) be capable of producing a consistent material that is free from segregation;
- f) have a minimum rated continuous production rate that is greater than, or equal to, the greater of 150 tonnes of complying mix per hour or the Contractor's placing rate;
- g) be capable of producing pavement material complying with this standard to continuously meet the Contractor's placing rate;
- h) be capable of producing a mixture in which the stabilising agent content has a maximum standard deviation of 0.3% when derived from at least 10 samples taken from a lot which has a minimum volume of 100 m<sup>3</sup> (loose);
- i) provide for the controlled and metered inclusion of water and admixture (if required) into the mix; and
- j) have a mixture storage bin that is both waterproof and watertight.

In addition, the mixing equipment shall be regularly calibrated, including all meters within the plant, in accordance with the manufacturer's/supplier's recommendations. The results of these calibration checks shall be recorded and reported to the Administrator.

#### 8.1.2.4 Delivery Equipment

Vehicles used for the delivery of the mix shall be of the open-body truck type, equipped with adequate covers and capable of transporting and discharging the mixture without segregation. If discharging into the

hopper of a paving machine, the vehicles shall be designed or equipped with the capacity to efficiently discharge into the hopper consistently and without spillage.

Delivery equipment shall be sufficient such that mixture can be continuously delivered at a rate that is at least equal to the Contractor's placing rate.

#### **8.1.2.5 Paving Equipment**

The mixture shall be placed by a self-propelled spreading machine purpose-built for this work. Such machines shall have the capacity to either –

- a) place and spread the mixture on the prepared surface to the required uncompacted layer thickness, width and shape in one pass; or
- b) spread previously placed windrows of the mixture to the required uncompacted layer thickness, width and shape in one pass.

Notwithstanding the above the Administrator may approve other methods of paving in areas where the pavement width is such that the use of such a purpose built machine is impracticable.

Irrespective of what equipment is used, the mix shall be placed and spread such that there is no segregation of it.

#### **8.1.2.6 Equipment for water curing**

The equipment used for water curing shall have the capacity to store at least 6,000 litres of water and also be capable of discharging the water in a fine and even mist over the pavement surface in a manner that avoids slurring of the surface, pavement instability and erosion, and leaching of the stabilising agent.

#### **8.1.2.7 Preparation of the layer edges and surfaces**

The equipment for the preparation of the layer edges shall be capable of cleanly cutting the edges vertically and removing all the cut material from the formation.

The equipment for the preparation of the surface of each layer shall include a machine capable of sweeping the layer and a machine capable of evenly distributing the cement slurry at the required rate on the layer's surface and edges.

#### **8.1.3 Allowable working time: period between mixing and compaction and trimming**

The maximum period between the commencement of mixing and the completion of compaction and trimming shall be as stated in Clause 11 of Annexure MRTS08.1. Where not so stated, the maximum period between the commencement of mixing and the completion of compaction and trimming shall be two hours.

#### **8.1.4 Application of mix constituents**

The application rate of the stabilising agent and admixture(s) shall be monitored via the appropriate meters to ensure that the specified stabilising agent content, within tolerance, is being met.

In addition, application rate checks, measured in kilograms/per tonne of unbound pavement material, shall be recorded and reported for every hour of production, or lot, whichever is the smaller.

#### **8.1.5 Construction Joints**

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 (Clause 8.1.3) of the stabilised material laid first.

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

Where there is more than one layer of stabilised material the longitudinal joints of each layer shall be offset from the underlying layer's longitudinal joint by a minimum distance of 150 mm.

##### **8.1.5.1 Fresh Joints**

Where a fresh joint between adjoining or adjacent runs is to be compacted, the outside 300 mm of material from the first run shall be left uncompacted until the adjacent or adjoining material is ready for compaction. The joint shall be water cured during this period.

When compacting the fresh mix against, the roller shall be partly supported on the previously compacted portion of the layer laid first.

#### 8.1.5.2 Other Joints

Joints that are not fresh shall have the edge of the existing layer cut back to form a neat, clean vertical face. The cutback distance shall be the greater of –

- a) the distance required to cut back into the area of existing material that is compacted to the standard required in this Standard; or
- b) 150 mm.

Immediately before placing an adjoining or adjacent layer, the cut back edge of the existing layer shall have a cement/water slurry applied to it at a rate of 2 kg/m<sup>2</sup>. This slurry shall have water/cement ratio of between 0.6 and 0.7. The cement used in this cement/water slurry shall be the same as that specified for the stabilised material. The adjacent and/or adjoining stabilised layer shall be placed against the cement/water slurry immediately after the slurry has been placed, and before the slurry has set. If the slurry sets before placement of the next stabilised layer, additional slurries shall be placed, at the Contractor's expense, until the requirements of this Clause are met

All cut back material shall be deemed surplus excavated material and shall be disposed of in accordance with Clause 11 of MRTS01 *Introduction to Technical Standards*. No separate payment shall be made for the removal and disposal of cut back material.

#### 8.1.6 Paving

The stabilised mixture shall be laid such that each individual layer is laid in one pass that meets the requirements of this Standard without the addition of extra material except as detailed below.

The material laid ready for compaction shall not have any visible areas of segregation. Any segregated areas are to be removed and replaced with fresh mix prior to the commencement of compaction of the lot. Material removed for this reason shall be disposed of in accordance with Clause 11 of MRTS01 *Introduction to Technical Standards*. No separate payment shall be made for the removal and replacement of segregated material.

#### 8.1.7 Curing

Details of the bituminous curing coat are given in Clause 8 of Annexure MRTS08.1. Curing shall comply with the following requirements.

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

Layers other than the top stabilised layer shall be water cured.

The top stabilised layer shall be cured using a bituminous curing coat with a cover aggregate and as specified in Clauses 8 and 9 of Annexure MRTS08.1.

##### 8.1.7.1 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 stabilised layer or a bituminous curing coat. 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.

##### 8.1.7.2 Bituminous curing coat

The bituminous curing coat shall be a sprayed bituminous surfacing with cover aggregate as specified under the relevant Technical Standards.

The time from completion of compaction to the placement of the bituminous curing coat shall not exceed seven calendar days.

If the bituminous curing coat can not be placed immediately the layer shall be cured using water, in accordance with Clause 8.1.7.1, from immediately after the completion of compaction until the bituminous curing coat is placed. In this case the required water curing shall be deemed to be included in the rate for the bituminous curing coat and no separate payment shall be made for it.

### 8.1.8 Cover Material for Bituminous Curing Coat

Cover material shall be spread before any traffic or equipment is allowed on the bituminous curing coat.

### 8.1.9 Layer Thicknesses

Individual compacted layer thicknesses of the plant-mixed pavement material, chosen to suit the construction process and/or as specified in the documents, shall comply with the requirements of Table 8.1.9.

**Table 8.1.9 – Layer Thickness**

Layer Description	Compacted Thickness Range	
	Maximum (mm)	Minimum (mm)
The first layer on the subgrade	250	100
All other layers	200	100

### 8.1.10 Preparation of the Surface of an Existing Layer Prior to Placing the Next Layer or Prior to Applying the Bituminous Curing Coat

The surface of the existing layer shall be swept clean of any dust and loose particles and, if possible, swept until the larger particles in the surface are slightly exposed without excessive erosion of the surrounding finer material.

Immediately before placing any subsequent stabilised layer, the existing layer shall have a cement/water slurry applied to it at a rate of 2 kg/m<sup>2</sup>. This cement/water slurry shall have a water/cement ratio of between 0.6 and 0.7. The cement used in this cement/water slurry shall be the same as that specified for the stabilised material.

The new overlying stabilised layer shall be placed onto the cement/water slurry immediately after the slurry has been placed, and before the slurry has set. If the slurry sets before placement of the next stabilised layer, additional slurries shall be placed, at the Contractor's expense, until the requirements of this clause are met.

### 8.1.11 Moisture Content of the Mixture

The mixture shall be compacted at a moisture content within  $\pm 1\%$  (absolute) of the optimum moisture content for the compaction equipment and procedure being employed, provided that the compaction equipment and procedure provide a compaction standard which is not less than that required by Clause 8.2.3.

The moisture content shall be determined by Test Method Q102A.

### 8.1.12 Maintenance

The Contractor shall maintain each stabilised layer such that it complies with this Standard until it has been either overlaid with another pavement layer or surfaced with the final wearing course, or until the end of the defect liability period, whichever is the longer.

### 8.1.13 Climate

The entire stabilisation and paving process shall not proceed in any of the following situations –

- a) during rainfall;
- b) when rainfall appears to be imminent;
- c) during conditions that may cause nuisance or danger to people, property, or the environment;
- d) when the stockpile temperature, measured 50 mm below the surface, drops below 100°C; or
- e) when the air temperature, measured in the shade, exceeds 400°C.

## 8.2 Product Standards

### 8.2.1 Stabilising Agent Content

#### 8.2.1.1 Ordered Content

The stabilising agent content to be used will be ordered by the Administrator after tests have been carried out on a preliminary sample of the unbound pavement material to be used in the Contract. The preliminary sample shall be a minimum quantity of 40 kg and shall be delivered to the Administrator at least 42 days before mixing operations commence. **Milestone**

#### 8.2.1.2 Actual Content

The characteristic value of the stabilising agent content (refer to Clause 9.2.5) shall not be less than the ordered content.

The actual stabilising agent content shall be within  $\pm 10\%$  of the approved content.

### 8.2.2 Admixture Content

The content of any admixtures added shall be strictly controlled to ensure the mix conforms to the ordered mix design. The actual admixture content shall be within  $\pm 10\%$  of the content approved or ordered by the Administrator.

### 8.2.3 Compaction Standard

The characteristic value of the RDDs shall not be less than 100% unless specified otherwise in Clause 4 of Annexure MRTS08.1.

### 8.2.4 Segregation

Segregation is the uneven distribution of particle sizes. The entire construction process, including mixing, transporting and paving, shall minimise segregation so that the particle size distribution of the material in the pavement complies with the particle size distribution requirements specified in MRS05 *Unbound Pavements* for the relevant material, with due allowance being made for the inclusion of the stabilising agent.

The Administrator may arrange for testing of the particle size distributions to evaluate areas of suspected segregation.

### 8.2.5 Geometrics, General

Each stabilised layer shall be constructed so as not to depart from the widths, lengths, heights and shapes specified in the design documentation by more than the tolerances stated in Clauses 8.2.6 and 8.2.7. The widths and heights of the surface of layers other than the final layer shall be calculated using the widths, heights and shapes for the completed pavement as described in the design documentation, and the depth of the surface of the particular layer within the pavement.

### 8.2.6 Geometrics, Horizontal Tolerances

The horizontal location of any point on the pavement shall not differ from the corresponding point shown in the documents, or as specified in Clause 8.2.5, by more than  $\pm 50$  mm except for the following situations –

- a) for pavement edges not adjacent to any other part of the pavement and not adjacent to any structure or adjoining road, the transverse tolerance shall be - 50 mm, + 250 mm (where the + tolerance is in the direction which increases the width of the pavement); and
- b) where alignment of the pavement with an existing pavement or structure is necessary, the new work shall be joined neatly to the existing work or structure in a smooth manner as shown on the Drawings, or, if this is not shown, in a manner approved by the Administrator.

### 8.2.7 Geometrics, Vertical Tolerances

#### 8.2.7.1 Primary Tolerance

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

The primary tolerance for stabilised layers that include Type 1 unbound granular materials shall be  $\pm 15$  mm. The primary tolerance for stabilised layers that include Type 2 and 3 unbound granular materials shall be as stated in Clause 5.1 of Annexure MRTS08.1 as one of the alternatives in Table 8.2.7.1. If no such indication is given, the primary tolerance shall be  $\pm 15$  mm.

**Table 8.2.7.1 – Primary Tolerance for stabilised layers that include Type 2 or 3 unbound granular materials**

Alternative	Primary Tolerance (mm)
A	± 15
B	± 25

### 8.2.7.2 Additional Tolerances

#### 8.2.7.2.1 General

The additional tolerances stated below shall apply to the pavement lots in the final layer of plant-mixed stabilised pavement material and other layers as given in Clause 5.2 of Annexure MRTS08.1. The Contractor may have to carry out additional work to achieve these additional tolerances. No additional payment shall be made by the Principal for achieving such additional tolerances.

#### 8.2.7.2.2 Deviation from a Straight-Edge

The deviation from a 3 metre long straight-edge placed anywhere on the surface of a layer shall not exceed 5mm for stabilised layers that include Type 1 unbound granular material.

For other materials the deviation from a 3 metre long straight-edge placed anywhere on the surface of a layer shall not exceed the limit given in Clause 5.3 of Annexure MRTS08.1, due allowance being made for design shape, where relevant. The limit given in Clause 5.3 of Annexure MRTS08 shall be one of the alternatives given in Table 8.2.7.2.2. If no such indication is given, the deviation limit shall be 5 mm.

**Table 8.2.7.2.2 – Deviation from a Straight-Edge for stabilised layers that include Type 2 or 3 unbound granular materials**

Alternative	Maximum deviation (mm)
C	5
D	8

#### 8.2.7.2.3 Crossfall

The crossfall shall not depart from the corresponding crossfall shown in the documents by more than 0.5% absolute.

The crossfall shall be measured –

- 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;
- transverse to the centre line; and
- within the boundaries of a cross-section element which has a constant crossfall.

#### 8.2.7.2.4 Surface Evenness

The surface evenness of the top pavement layer shall be such as to provide a road roughness count rate not exceeding the specified road roughness (Rs) stated in Clause 5.4 of Annexure MRTS08.1 or where not so stated, not exceeding 60 counts per kilometre.

## 9 CONSTRUCTION COMPLIANCE TESTING

### 9.1 Process Requirements

#### 9.1.1 General

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

Compliance checking shall be carried out in accordance with minimum testing frequencies and minimum test numbers specified in Clause 5.4.



### 9.1.2 Unbound Granular Pavement Material

Each lot of constructed pavement shall be cross-referenced to the lot in the stockpile from which the unbound granular pavement material was obtained.

## 9.2 Product Standards

### 9.2.1 General

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

### 9.2.2 Testing Frequencies and Number of Tests

The Contractor is responsible for performing sufficient tests to ensure that the pavement complies with 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.

### 9.2.3 Geometrics

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

### 9.2.4 Compaction

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 RDD determined from each lot.

The location of each in situ dry density test shall be chosen by a method of random stratified sampling.

The in situ dry density shall be determined by Test Methods Q111A or Q112 and the maximum dry density of the reference sample shall be determined by Test Method Q110A or Q110F.

### 9.2.5 Stabilising Agent Content

The stabilising agent content for each pavement lot shall be represented by the characteristic value of the stabilising agent content. The characteristic value shall be calculated as shown in Clause 13 of MRTS01 *Introduction to Technical Standards* using the individual values of stabilising agent content determined from each lot. Samples for testing shall be randomly selected from the plant-mixed pavement material to be used in each lot. Each sample shall be tested in accordance with the test methods described in Clause 4.

Where the content is represented by an average value, the average value shall be the arithmetic mean of the values of stabilising agent content calculated, at random times, by comparing the rate of addition of the stabilising agent to the pugmill to the rate of addition of the unbound granular pavement material to the pugmill.

### 9.2.6 Admixture Content

At random times, the quantity of admixture added to the water which is to be incorporated into the mix shall be recorded and reported.

### 9.2.7 Surface Evenness

The surface evenness of the top stabilised pavement layer shall be measured by Test Method Q708.

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

### 9.2.8 Visible Deflection of Pavement Layers

The objective visible deflection test specified in this clause shall apply to lots in the top stabilised pavement layer only, unless stated otherwise in Clause 6 of Annexure MRTS08.1.

Where the surface of any section of the pavement layer displays visible deflection as a result of the movement across the surface of a vehicle with 8 tonne (gross) axle load on a single axle with dual tyres, 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 9.2.4 and 9.2.5. No additional payment shall be made by the Principal for such additional testing.

### 9.2.9 Acceptance

No layer of a pavement shall be covered by a subsequent layer of pavement or by a surfacing until all testing has been completed and the layer has been presented to the Administrator for permission to proceed. **Hold Point 2**

Construction shall not proceed until the Administrator has received the results of 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 3**

## 10 SUPPLEMENTARY REQUIREMENTS

The requirements of MRTS08 *Plant-Mixed Stabilised Pavements using Cement* are varied by the supplementary requirements given in Clause 12 of Annexure MRTS08.1.

SUPERSEDED