

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS08 Plant-Mixed Stabilised Pavements using
Cement or Cementitious Blends**

July 2017

Superseded

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1 Introduction

This Technical Specification 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 or cementitious based stabilising agent. In addition it may contain an admixture.

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

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

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. 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
Binder	A cement, blended cement or cementitious blend
Bituminous curing coat	A sprayed bituminous surfacing with cover aggregate
Curing materials	Materials applied to the exposed surfaces of the completed stabilised layer for the purpose of curing

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
AS 1478	<i>Chemical admixtures for concrete, mortar and grout – Admixtures for concrete</i>
AS 3582.1	<i>Supplementary cementitious materials for use with portland and blended cement - Fly ash</i>
AS 3582.2	<i>Supplementary cementitious materials for use with portland and blended cement - Slag - Ground granulated iron blast-furnace</i>
AS 3972	<i>Portland and blended cements</i>
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS05	<i>Unbound Pavements</i>
MRTS08	<i>Plant-Mixed Stabilised Pavements using Cement or Cementitious Blends</i>
MRTS11	<i>Sprayed Bituminous Surfacing (Excluding Emulsion)</i>

Reference	Title
MRTS12	<i>Sprayed Bituminous Emulsion Surfacing</i>
MRTS20	<i>Cutback Bitumen</i>
MRTS21	<i>Bituminous Emulsion</i>
MRTS22	<i>Supply of Cover Aggregate</i>
MRTS50	<i>Specific Quality System Requirements</i>

4 Standard test methods

The standard test methods listed in Table 4 shall be used in this Technical Specification, 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 Specifications*. For compliance testing requirements, refer to Clauses 7 and 9.

Table 4 – Standard test methods

Property to be Tested	Method No.
California Bearing Ratio (Standard Compactive Effort)	Q113A
Determination of the relationship between standard and subsidiary test methods	Q010
Flakiness index	Q201
Moisture content	Q102A Q102B Q102D
Particle Size Distribution	Q103A
Preparation of disturbed samples	Q101
Relative dry density	Q142A Q144A Q141B Q140A Q141A
Road Roughness-Surface evenness	Q708B Q708C Q708D
Sampling of Soils, Crushed Rock and Aggregates	Q060
Selection of sampling or test locations	Q050
Spot Sampling of Soils, Crushed Rock and Aggregates	Q061
Stabilising agent content	Q134
Sulfate Content	AS 1289.4.2.1
Ten Percent Fines (wet)	Q205B
Unconfined Compressive Strength (UCS)	Q115
Wet / dry strength variation	Q205C

4.1 Application of Test Number Q140A

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 Q142A, Q144A, Q141B and Q141A, as modified above.

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

4.2 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 seven days of curing.

4.3 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 Specifications*.

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

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
7	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, and so on
8.2.1.2			Proposed mixing equipment controls and so on
9.2.8		1. Testing for visible deflection of pavement layers	
8 & 9.2.9	2. Covering a pavement layer		
9.2.9	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 Technical Specification are given in Clauses 6 to 10.

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 in Clause 1.2 of Annexure MRTS08.1, the maximum lot size shall be equal to the area (m²) of production of one completed stabilised layer achieved during one 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.

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 and, where relevant, the blend ratio and the estimated stabilising agent content 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 homogeneously and accurately blended / mixed by a dedicated blending plant prior to incorporation into the unbound material. Each component of the stabilising agent shall also comply with the relevant Standard at the time of introduction into the plant.

At the time of incorporation each component of the stabilising agent shall:

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

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
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"> • “fine grade” fly ash complying with AS 3582.1 • Ground granulated blast furnace slag (GGBFS) complying with AS 3852.2. The minimum Portland cement content of these blends shall be 40%. The Portland cement shall comply with AS 3972.

6.2 Admixture(s)

The type of admixture(s) shall be as approved by the 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 that complies with Clause 6.4.

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

6.4 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 *Supply of Cover Aggregate*, as is relevant, and other relevant Technical Specifications.

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

Refer to Clauses 8 and 9 of Annexure MRTS08.1.

6.5 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 sulfates.

6.6 Cover material for bituminous curing coat

Cover material shall be a material that complies with Clause 6.4 and shall be as stated in Clause 9 of Annexure MRTS08.1.

6.7 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 7 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.

6.8 Strength requirements for plant-mixed stabilised material

The Unconfined Compressive Strength (UCS) 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.

6.9 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 two 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 Water soluble sulfate content

No material to be stabilised, shall have a water soluble sulfate content exceeding 1.9 grams of sulfate (expressed as SO₄) per litre.

7 Material compliance testing

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 Technical Specification. **Hold Point 1**

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 Technical Specification 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 Technical Specifications.

A certificate of test results demonstrating compliance for each of the constituents of the proposed stabilising agent to the relevant Technical Specifications shall be provided for each Lot, or part thereof, of stabilising agent.

7.2 Unbound pavement material

7.2.1 General

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

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 MRTS05 *Unbound Pavements* however the requirements of this Technical Specification take precedence.

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 Technical Specification 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 Technical Specifications 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 m³ (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 paving 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 6000 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 Technical Specification.

A construction joint shall be deemed fresh when the material on each side of the joint has been stabilised, placed and compacted within the allowable working time (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 Technical Specification, 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/m². 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 10 of MRTS01 *Introduction to Technical Specifications*. 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 Technical Specification 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 10 of MRTS01 *Introduction to Technical Specifications*. No separate payment shall be made for the removal and replacement of segregated material.

8.1.7 Curing

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 in accordance with Clause 8.1.7.2 using a bituminous curing coat with a cover aggregate, and as specified in Clause 6.4, and 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 and shall comply with Clauses 6.3, 6.4, 6.6 and 8.1.7.

Details of the bituminous curing coat are given in Clause 8 of Annexure MRTS08.1.

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 cannot 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.

8.1.7.2.1 Cover material for bituminous curing coat

Details of the cover material for the bituminous curing coat are given in Clause 9 of Annexure MRTS08.1.

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

8.1.8 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

8.1.9 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/m². 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.

8.1.10 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.

8.1.11 Maintenance

The Contractor shall maintain each stabilised layer such that it complies with this Technical Specification 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.

8.1.12 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 10°C, or
- e) when the air temperature, measured in the shade, exceeds 40°C.

8.2 Product standards

8.2.1 Stabilising agent content

8.2.1.1 Ordered content

Testing for Stabilising Agent Content in accordance with this Clause shall be carried out by the contractor unless otherwise indicated in Clause 3 of Annexure MRTS08.1.

The Contractor shall undertake an adequate number of Unconfined Compressive Strength (UCS) testing in arriving at the Ordered Additive Content based on the minimum UCS requirements as stated in Clause 7 of Annexure MRTS08.1. UCS testing will be carried out as per the following:

- in accordance with Transport and Main Roads Test Method Q115
- a seven day UCS test is to be used
- samples are air cured at 23°C + or – 2°C and at least 95% relative humidity
- samples are prepared at 100% standard compaction, and
- samples are prepared at optimum moisture content.

The Ordered Additive Content is arrived at based on the UCS testing stated above. At least three sets of tests shall be carried out. In each set, a range of stabilising agent content shall be tested to determine the stabilising agent content required to meet the minimum UCS specified in Clause 7 of Annexure MRTS08.1. The Characteristic Value is then calculated statistically, based on the number of sets of tests and the stabilising agent content value from each set of test as per Clause 12 of MRTS01 *Introduction to Technical Specifications*. The Administrator will review all test data and order the stabilisation content to be used. This herein after will be called the Ordered Content.

If Clause 3 of Annexure MRTS08.1 requires the testing for Stabilising Agent Content to be carried out by the Administrator, a minimum quantity of 40 kg of the representative sample of the unbound pavement material to be used in the contract shall be delivered to the Administrator at least 42 days before mixing operations commence. **Milestone** The stabilisation Agent content to be used will be ordered by the Administrator after tests have been carried out on the representative sample supplied.

8.2.1.2 Actual Additive Content Variability

The Ordered Content of stabilising agent and associated production tolerances shall be determined by considering the Actual Additive Content Variability. The Actual Additive Content Variability is an estimation of the likely variability in stabilising agent content that can be expected during production using the actual mixing plant to be used in the Works. It is considered to be normally distributed and it is defined by a Target Additive Content (TAC) and σ the standard deviation of historic production results for the Actual Additive Content for the actual mixing plant to be used in the Works, expressed as % by dry mass of mixture.

The Ordered Additive Content \geq Target Additive Content $- \sigma Z$ (Where z is 1.64 for a 90% confidence interval (for normally distributed data).

In other words the Contractor will be selecting a Target Additive Content, knowing the control on the variability (σ) in order to satisfy the above requirement for the Ordered Additive Content.

Where there are no historic production test results available for the mixing plant to be adopted in the Works, the Contractor may adopt an interim σZ value of 0.5% for the first 30 production tests for the additive content. Following this, the Contractor shall nominate a revised value based on these results.

At least 14 days before mixing operations commence **Milestone** the Contractor shall provide the Administrator with:

- a) the contractor's proposed Target Additive Content and σ for the mixing plant to be used in the Works (in order to achieve the Ordered Additive Content with 90% confidence limits as stated above)
- b) details of the proposed mixing equipment and controls to be adopted
- c) historic production test results summarised in a table with the following columns: Test ID, Test Date, Stabilising Agent Type, Actual Content of Stabilising Agent (Production Mix), Ordered Content of Stabilising Agent, Target Additive Content and the Difference between Actual Content and Ordered Content
- d) all test certificates for the historic production test results
- e) a statistical analysis of the difference between the Actual Content and Ordered Contents for the historic production test results, and
- f) other relevant supporting information.

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 MRTS05 *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 ± 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 Standard 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 and the thickness of the layer.

The primary tolerance for stabilised layers that include Type 1 unbound granular materials shall be ± 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 ± 15 mm.

In all cases a primary tolerance shall also apply for the thickness of each completed stabilised layer. At any point the thickness of each stabilised layers shall be within minus 5 mm and plus 10 mm of the specified thickness.

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 m long straight-edge placed anywhere on the surface of a layer shall not exceed 5 mm for stabilised layers.

For other materials the deviation from a 3 m 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:

- a) between any two points more than 2 m apart except where a pavement verge is less than 2 m wide. For pavement verges less than 2 m wide, the measurement shall be made between the extreme edges of the pavement verge on each side of the pavement
- b) transverse to the centre line, and
- c) 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 (R_s) 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 12 of MRTS01 *Introduction to Technical Specifications* using the individual RDD determined from each lot.

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

The insitu dry density shall be determined by Test Methods Q141A or Q141B and the maximum dry density of the reference sample shall be determined by Test Methods Q142A or Q144A.

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 12 of MRTS01 *Introduction to Technical Specifications* 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.

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 a stabilised pavement layer shall be measured by road roughness as per Test Methods Q708B, Q708C and Q708D.

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, **Witness Point 1** 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** 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 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** The Contractor shall allow at least one working day for a response from the Administrator.

10 Supplementary requirements

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

Superseded