

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS07B Insitu Stabilised Pavements using Cement or
Cementitious Blends**

April 2017

Superseded

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1 Introduction

This Technical Specification applies to the stabilisation of in-situ materials by the addition of a cementitious stabilising agent.

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.

1.1 Bituminous coat

Bituminous 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* and other relevant Technical Specifications.

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

2 Definition of terms

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

Table 2 - Definition of terms

Term	Definition	Clause Reference
Actual stabilised layer thickness	Achieved stabilised layer thickness as measured from the bottom of stabilised layer to the top of compacted and trimmed stabilised layer.	8.8.4.1.2
Allowable working time	The time measured from the commencement of incorporation (i.e. mixing) of stabilising agent into the material to completion of compaction and trimming.	8.4 & 8.7.10
Bituminous coat	A sprayed bituminous surfacing with cover aggregate.	1.1
Bulking	Increase in vertical height during incorporating stabilising agent into material using a reclaimer / stabiliser. The increased vertical height of the material is measured from the surface level prior to this incorporation process - refer Figure 8.7.9.	8.7.8.4
Curing materials	Materials applied to the exposed surfaces of the completed stabilised layer for the purpose of curing.	6.4
Design Depth	As specified in the construction drawings and contract documents – refer Figure 8.7.9.	8.7.8.4
Finish surface level	Top level of stabilised layer indicated in the drawings and contract documents – refer to Figure 8.7.9.	8.9.4.2

Term	Definition	Clause Reference
Hydrated Lime	Hydrated lime is a granular form of lime consisting primarily of calcium hydroxide (Ca(OH) ₂).	6.3
Lower reference level	Bottom level of stabilised layer indicated in the drawings and contract documents - refer to Figure 8.7.9.	8.7.8.4
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.	8.7.14
Relative moisture ratio (RMR)	The relative moisture of the treated soil compared to optimum moisture content using standard compaction, express as a percentage.	8.8.2 & 9.7
Stabilising agent	A cement, blended cement, cementitious blend or lime / fly ash blend.	6.3
Target depth	Target depth is the cutting depth required by the reclaimer / stabiliser to achieve the lower reference level and shall consider the bulk height – refer Figure 8.7.9.	8.7.8.4
UCS test	Unconfined Compressive Strength test in accordance with Test Method Q115.	4

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

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
MRTS01	Introduction to Technical Specifications
MRTS05	Unbound Pavements
MRTS11	Sprayed Bituminous Surfacing (Excluding Emulsion)
MRTS12	Sprayed Bituminous Emulsion Surfacing
MRTS20	Cutback Bitumen
MRTS21	Bituminous Emulsion
MRTS22	Supply of Cover Aggregate
MRTS23	Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation
MRTS50	Specific Quality System Requirements

Reference	Title
Department of Transport and Main Roads TN149	Testing of Materials for Cement or Cementitious Blend Stabilisation

4 Standard test methods

The standard test methods listed in Table 4 shall be used in this Technical Specification.

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

Table 4 – Standard test methods

Property to be Tested	Test Method No.
Determination of the relationship between standard and subsidiary test methods	Q010
Selection of sampling and test locations	Q050
Sampling of soils, crushed rock and aggregates	Q060
Spot sampling of soils, crushed rock and aggregates	Q061
Preparation of disturbed samples	Q101
Moisture content	Q102A, Q102B, Q102D
Stabilising agent content	Q134
Working time of stabilised material	Q136
Laboratory reference density	Q142A, Q143, Q144A
Relative compaction	Q140A, Q141A, Q141B
Sulfate content	AS 1289.4.2.1
Road roughness surface evenness	Q708B, Q708C, Q708D
Surface spread rate of stabilising agent	Q719
Plastic limit and plasticity index	Q104A, Q104D, Q105, Q106
Particle size distribution	Q103A
UCS (unconfined compressive strength of stabilised materials)	Q115
Relative Moisture Ratio	Q250

5 Quality system requirements

5.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

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

Table 5.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2.2	1. Approval of construction procedures and construction program		Supply of the construction procedures and construction program for the stabilisation works (21 days)
7.1	2. Compliance of all materials, prior to their incorporation		
8	3. Compaction permitted to proceed		
8.3	4. Survey of services, utilities buildings and drainage		
8.4	5. Determine the allowable working time		
8.6.1	6. Approval of compaction based on a process requirement		
8.6.2		1. Construction of trial section (if process standard specified for compaction)	
8.7.1		2. Removal and disposal of material not suitable for stabilisation	
8.7.2		3. Preliminary pulverisation	
8.7.4		4. Compacting and trimming surface prior to spreading of the stabilising agent	
8.7.6		5. Spreading stabilising agent	
8.7.8.4		6. Nominating the target depth	
8.8.1.1			Ordered spread rate of stabilising agent (14 days)
9.8.2		7. Testing for visible deflection of pavement layer	
9.9	7. Acceptance		

5.2 Construction procedures

5.2.1 General

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 Clause 5.2.2 shall be submitted to the Administrator.

5.2.2 Insitu stabilisation

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

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

- a) Details of all plant associated with the work detailed in this Technical Specification.
- b) Details of how services, utilities, buildings and drainage components shall be located and protected (refer to Clause 8.3).
- c) Details of how services, utilities, buildings, drainage components, plant personnel shall be protected from damage, injury, etc. (refer to Clause 8.3).
- d) The daily calibration procedures of spreader and verification of spread rates in the field (refer to Clause 8.7.6).
- 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
 - v. marking-out the extents of each run
 - vi. details of procedures for working up to, or against, structures, kerb, kerb and channel and road safety barriers, and such as bridges, access chambers, gullies, culverts and concrete medians and any existing pavement cutback point, and
 - vii. curing methodology.
- f) The proposed program of works, and
- g) A testing program which shall include, but not be limited to, the testing methodology that shall be used to assess:
 - i. stabilising agent spread rate
 - ii. stabilisation target depth
 - iii. relative moisture ratio
 - iv. compaction standard
 - v. geometric tolerances
 - vi. actual stabilised layer thickness, and
 - vii. strength gain of the stabilised layer (UCS test) if required.

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

- a) details of the proposed source(s) of the stabilising agent(s)

- b) test results demonstrating compliance of the constituents of the proposed stabilising agent(s) to the required standards
- c) test results demonstrating the compliance of each proposed water source
- d) compliance test results (including Test Method Q136 *Working Time*) 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
- e) where a cementitious blend containing lime or a lime / fly ash blend is specified, the available lime index on proposed lime.

The proposed construction procedure shall be submitted to the Administrator at least 21 days prior to the commencement of stabilisation works. **Milestone**

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 material covered by this Technical Specification are given in Clause 6 to Clause 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 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.

The testing frequencies and lot sizes for construction shall be as stated in Clause 1.2 of Annexure MRTS07B.1.

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

6 Material

6.1 New material(s) 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 of 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 stabilisation shall have a water soluble sulfate content not exceeding 1.9 grams of sulfate (expressed as SO₄) per litre.

6.2 Additional material for shape correction

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

Additional material that is required for shape correction shall be unbound granular material that complies with the requirements stated in Clause 3 of Annexure MRTS07B.1.

Where not so stated in the Annexure, materials shall be either of 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 SO₄) per litre.

6.3 Stabilising agents

The stabilising agent shall comply with the relevant specifications and standards given in Table 6.3.

The type, estimated content and specified spread rate of the stabilising agent to be used at specific locations shall be as stated in Clause 9 of Annexure MRTS07B.1.

Table 6.3 – Stabilising agent requirements

Agents	Relevant Technical Specification or Australian 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
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 3582.2, or • hydrated lime complying with MRTS23 <i>Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation</i>. The minimum Portland cement content of these blends shall be 40%.
Lime / fly ash blend	A blend of: <ul style="list-style-type: none"> • hydrated lime complying with MRTS23 <i>Supply and Delivery of Quicklime and Hydrated Lime for Road Stabilisation</i>, and • “fine grade” fly ash complying with AS 3582.1.

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 the job site. At the time of spreading 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.

6.4 Water

Water used should be potable. Where potable water is not available, the Administrator may consider water from other sources. In all cases, the water used shall contain less than 0.5% sulphates and be free from oil, acids, organic matter and any other matter that could be deleterious to the mixture.

Recycle water shall not be used for any other purpose without the written approval of the Administrator.

The sources(s) of water shall not be changed without the written permission of the Administrator.

7 Material compliance testing

7.1 General

No material shall be incorporated into the works unless it has been demonstrated, to the Administrator's satisfaction, that the material(s) to be used complies fully with the requirements of this Technical Specification. **Hold Point 2**

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

The testing of individual samples shall be carried out in accordance with the Test Methods described in Table 4. Testing frequencies and lot sizes shall be as per the requirements of Clause 5.4.

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.

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

7.2 Stabilising agents and water

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

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

A certificate of test results demonstrating the compliance of each proposed water source shall be provided.

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 1.1 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 1.1 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

Prior to acceptance (Clause 9.9), construction shall not proceed until the Administrator is satisfied that the requirements covered from Clause 8.1 to Clause 9.5 have been met. **Hold Point 3**

8.1 General

Construction of the stabilised layer shown in the Drawings or otherwise specified in the Contract, shall be completed as one layer.

The required design depth shall be stated in Clause 9 of Annexure MRTS07B.1.

The datum for measurement of the target depth shall be as stated in Clause 10 of Annexure MRTS07B.1.

Details of measuring the actual thickness of stabilised layer is described in Clause 8.8.4.1.2.

8.2 Program of works

The Contractor shall submit the proposed program of the stabilisation works to the Administrator at least 21 days prior to the commencement of stabilisation works, unless otherwise agreed to by the Administrator.

Stabilisation works shall not be commenced until the program has been approved by the Administrator (refer to Clause 5.2.2 and Hold Point 1).

8.3 Site services, utilities, buildings and drainage

A survey of the site to determine the location and depth of services, utilities, buildings and drainage components shall be carried out prior to commencement of construction. The survey shall include details of how these and plant and personnel on site shall be protected and how the stabilisation works shall be completed without any detrimental effects to them. All such details shall be included in the proposed construction procedure (refer to Clause 5.2.2).

Stabilisation works shall not commence until the survey has been completed and a copy of the report provided to the Administrator. **Hold Point 4**

8.4 Allowable working time

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

The allowable working time is measured from the commencement of dry incorporation of stabilising agent into the insitu material, to the completion of compaction and trimming of the stabilised layer.

The allowable working time shall be determined by the Contractor prior to commencement of stabilisation using Test Method Q136 with Contractor's proposed materials. All test results shall be reported to the Administrator. **Hold Point 5**

8.5 Construction process

8.5.1 General

The construction process shall be based on either a process requirement or a product standard. The method for this Contract shall be as stated in Clause 9 of Annexure MRTS07B.1.

8.5.2 Construction based on process requirements

If a process requirement is specified in Clause 9 of Annexure MRTS07B.1 construction shall:

- a) incorporate the methodology and construction of trial sections in accordance with the requirements of Clause 8.6
- b) comply with the construction requirements stated in Clause 8.7, and

- c) comply with the product standards stated in Clause 8.8 except that compaction testing shall not be required on completed works other than trial sections, provided that the Contractor uses the same construction plant, process and methodology as that used for the trial section.

8.5.3 Construction based on product standards

If a product requirement is specified in Clause 9 of Annexure MRTS07B.1 construction shall:

- a) comply with the construction requirements stated in Clause 8.7, and
- b) comply with the product standards stated in Clause 8.8.

8.6 Process requirements

8.6.1 Methodology

Each section of the Works with a unique combination of stabilising agent type, stabilising agent spread rate, material(s) to be stabilised and depths 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 8.6.2.

The compaction of each trial section shall be checked for compaction in accordance with Clause 8.8.3 and tested in accordance with Clause 5.4. If the characteristic value of the relative compaction results for the trial section is not less than the value specified in Clause 8.8.3, no further compaction testing shall 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 relative compaction results for the trial section is less than the value specified in Clause 8.8.3, the trial section shall be rectified so that it complies with this Technical Specification and an additional trial section shall be constructed and assessed in accordance with this Clause 8.6.

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 6**

8.6.2 Trial section

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

Witness Point 1

A trial section shall be at least 200 metres long and three metres wide and include a longitudinal joint.

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

8.7 Construction requirements

8.7.1 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. concrete
 - ii. cement treated patches, and
 - iii. asphalt patches where the total asphalt thickness is greater than 50 mm, and
- c) Any additional requirements as stated in Clause 4 of Annexure MRTS07B.1.

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

Where material not suitable for stabilisation is encountered, the volume to be removed shall be agreed with the Administrator prior to commencing removal and replacement of the material. **Witness Point 2**

Material that is unsuitable for stabilisation shall be removed and disposed of in accordance with Clause 10 MRTS01 *Introduction to Technical Specifications*.

New material conforming to the requirements stated in Clause 6.1 shall be used to replace the material removed. It shall be spread, compacted and trimmed to the alignment, heights and shapes specified in the Drawings or Contract for the completed work.

8.7.2 Preliminary pulverisation

The materials to be stabilised shall be pulverised in accordance with the requirements of 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 design depth (50 mm above the lower reference level). **Witness Point 3**
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 or overlay 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 8.7.1.

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.

8.7.3 Additional material for shape correction (if required)

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

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

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

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

8.7.4 Compacting and trimming of the surface prior to spreading of the stabilising agent

Prior to spreading of the stabilising agent, the surface shall be shaped, compacted and trimmed to a degree that is sufficient to facilitate stabilisation specified in the Contract. **Witness Point 4**

8.7.5 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.

The stabilising agent shall be spread using a purpose-built spreader. The stabilising agent and water shall be incorporated into the material using a reclaimer / stabiliser or stabiliser.

Where a reclaimer / stabiliser with a calibrated integrated spreader is used or required (refer to Clause 5 of Annexure MRTS07B.1), the stabilising agent shall be incorporated directly into the material to be stabilised.

8.7.6 Spreading of stabilising agent

The stabilising agent shall be uniformly spread over the insitu material at a controlled rate (mass per unit area, kg/m²).

The maximum amount of stabilising agent to be spread in one pass shall be 20 kg/m² to avoid wastage. The number of passes shall be calculated to comply with this requirement.

Traffic shall be immediately stopped during spreading of stabilising agent if wind direction is such that airborne cementitious blends are impeding through traffic.

At the start of each individual spreading run, the surface spread rate of the stabilising agent shall be determined using the surface spread rate Test Method (Q719). The surface spread rate test shall be carried out within a distance of 35 m from the start of each individual spreading run. After the purpose built calibrated spreader / integrated spreader has spread over the mat or tray/s, the spreader shall be halted, the actual spread rate measured and this result compared with allowable tolerances specified in Clause 8.8.1.3. If the spread rate result is within the allowable tolerance, the spreader shall be allowed to complete the run. If the spread rate result is outside the allowable tolerance, additional surface spread rate tests shall be repeated in 35 m intervals until the measured surface spread rate result is within the tolerance stated in Clause 8.8.1.3. The Contractor shall undertake corrective action in the area which has nonconforming surface spread rates. **Witness Point 5**

Additional surface spread rate tests at other locations (for example middle and / or end of a run) shall be conducted upon the request of the Administrator.

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

All surface spread rate test results shall be recorded and included in the Contractor's quality records (refer to Clause 9.5).

8.7.7 Time between spreading and mixing

The maximum allowable time between spreading the stabilising agent and incorporation into the insitu material shall be as stated in Clause 9 of Annexure MRTS07B.1. Where no such time is stated in the Annexure, the maximum time between spreading and mixing shall be 30 minutes.

8.7.8 Incorporation of stabilising agent

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

8.7.8.1 Single dry incorporation pass and single moisture incorporation pass

Where a single pass is required to spread the required amount of stabilising agent specified in Clause 9 of Annexure MRTS07B.1, at least two incorporation passes shall be undertaken. The first dry incorporation pass shall be to a depth that is 50 mm less than design depth (50 mm above the lower reference level). Compaction and trimming of surface prior to the moisture incorporation pass shall be undertaken as per Clause 8.7.8.4. The final moisture incorporation pass shall be to a depth specified by the target depth (to ensure mixing to the lower reference level), and moisture content in accordance with Clause 8.7.9.

8.7.8.2 Multiple dry incorporation passes

Where more than one pass is required to spread the required amount of stabilising agent specified in Clause 9 in Annexure MRTS07B.1, the stabilising agent be incorporated into the material after each spreading pass. All dry incorporation of the stabilising agent shall be to a depth that is 50 mm less than design depth (50 mm above the lower reference level).

8.7.8.3 Compaction and trimming of surface between dry incorporation passes

Adequate compaction shall be completed after each application of stabilising agent has been incorporated into the insitu material as stated in Clause 8.7.8.2. This shall be carried out using a roller that is capable of achieving relatively uniform compaction over the depth of the stabilised layer. The compacted surface shall be adequately trimmed to the specified crossfall to allow for subsequent spreading of the stabilising agent.

8.7.8.4 Compaction and trimming of surface prior to the final moisture incorporation pass

Prior to the final wet incorporation pass, the surface level shall be compacted and shaped to the specified crossfall. Surface level heights higher than specified in the Drawings or Contract after compaction and shaping due to the effects of 'bulking' shall be uniform and shall be identified. In this case, the difference in height between specified in the Drawings or Contract and attained (bulking) shall be added to the design depth to determine the stabilising target depth for the final wet incorporation pass (refer to Figure 8.7.9). **Witness Point 6**

Alternatively, the surface shall be shaped, compacted and trimmed to the alignment, height and crossfall specified in the contract documents prior to the final wet incorporation pass.

8.7.9 Final moisture incorporation pass

The distribution of the stabilising agent and water shall be uniform throughout the entire layer depth for the area stabilisation. The moisture content shall be adjusted as necessary during the wet

incorporation process to achieve the moisture content stated in Clause 8.8.2. The target depth shall ensure mixing to the lower reference level whereby meeting the requirements of Clause 8.8.4.1.

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.

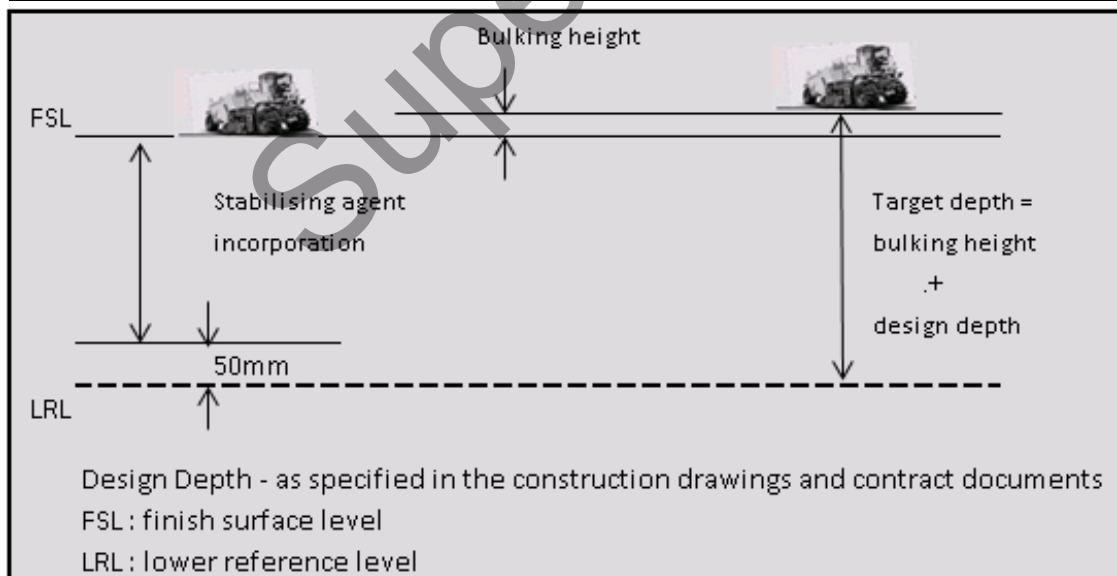
Where test results or visual inspection by the Administrator indicates that any of the requirements stated in this Clause have not been met, additional mixing passes shall be carried out to improve the uniformity of the:

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

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

Figure 8.7.9 - Target depth sketch

Incorporation of stabilising agent	Bulking after stabilising agent	Target depth on the final pass
Incorporation of stabilising agent shall be 50 mm less than the design depth	After surface compaction and trimming, volume of materials change due to incorporation of the stabilising agent. The bulking height above FSL needs to be identified and added to the design depth.	Cutting depth required on the final pass by the reclaimer / stabiliser to reach the LRL will need to account for the additional bulking above the FSL.



8.7.10 Compaction and trimming after final wet incorporation of stabilising agent

Immediately after wet incorporation pass, the stabilised area shall be compacted with adequate rollers (refer to Clause 8.7.14) to achieve the compaction stated in Clause 8.8.3.

Final trimming of the stabilised surface shall be carried out after the stabilised layer has been compacted. Final trimming shall be undertaken on the relatively strengthened stabilised layer within the allowable working time. In this case, Contractor shall ensure that no marks caused by a pad foot or other rollers shall remain on the surface.

Compaction and final trimming shall be completed within the allowable working time as specified in Clause 8.4.

The trimmed surface shall be free from loose pockets, holes, bumps and lenses of materials. The identified depressions shall be filled with additional stabilised material that is mixed and placed within its allowable working time as specified in Clause 8.4.

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

8.7.11 Construction joints

8.7.11.1 General

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

A construction joint (longitudinal or transverse) 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.

8.7.11.2 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.

To ensure complete stabilisation across the full width of the pavement, the minimum distance for cutting back / overlapping into previously stabilised material shall be the greater of 100 mm or the distance to a point where the stabilised material complies with this Technical Specification. The overlap at a change of crossfall or crown will need to be carefully considered to comply with the longitudinal joint requirements of this clause and Clause 8.8.4.

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

8.7.11.3 Transverse joints

For transverse joints that are not made during the allowable working time of the material stabilised, 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 Technical Specification. The cutback material shall be removed, disposed of and replaced in accordance with this Technical Specification. After this material has been replaced with material that complies with the requirements of Clause 6.1, the material shall then be included in the stabilisation process of the adjoining section to be stabilised.

Alternatively, with approval by the Administrator, the adjoining stabilised section shall be remixed using a stabiliser / reclaimer by the greater of 1.5 m or the length ordered by the Administrator.

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.

8.7.12 Curing

A curing operation shall commence immediately after the completion of compaction. Curing operation shall be carried out with extreme care to avoid any damage to the stabilised layer.

The stabilised layer shall be cured using water by maintaining the layer surface and edges in a continuously damp condition, using a uniformly applied fine mist, until the stabilised layer is covered by an overlying 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 are all avoided. During the water curing process, no heavy construction equipment shall be allowed on the stabilised layer.

8.7.13 Protection

The surface of the compacted layer shall be kept moist, in good order, in good condition and free from contamination until an overlying pavement layer or a sprayed bituminous surfacing with cover aggregate is placed, or until the Administrator accepts and takes responsibility for that area. Construction or other traffic shall not use a compacted layer where damage to the surface may occur.

8.7.14 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 5 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 8.7.14.

Table 8.7.14 – Minimum requirements and numbers of particular plant

Description	Minimum requirement for each piece of plant	Minimum number of units
Reclaimer / stabiliser or Integrated spreader / reclaimer / stabiliser	a) Minimum power capacity of 155 kW/m of the drum width. b) Capable of mixing to the specified depth. c) Capable of supplying water such that incorporation rates can be varied across the full width of the stabilising box and incrementally across the box. d) Calibrated and capable of uniformly spreading stabilising agent to varying widths (if integrated spreader / reclaimer / stabiliser).	1
Purpose built calibrated spreader	Calibrated with load cells and capable of uniformly spreading stabilising agent using a fixed bulk bin feeding a mechanical or hydraulic driven spreading rotor to varying widths.	1
Vibrating pad foot roller	21 tonnes for compacted thicknesses greater than 200 mm.	1

Description	Minimum requirement for each piece of plant	Minimum number of units
Vibrating smooth drum roller	18 tonnes for compacted thicknesses up to 200 mm.	1
Multi-tyre roller	Minimum 12 tonnes.	1
Water truck	Capacity of 6000 litres.	2
Grader	Manned by Final Trim Operator.	1

8.7.15 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, the environment, or live stock
- 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.

8.8 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.

8.8.1 Stabilising agent spread rate

8.8.1.1 Ordered spread rate

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 ratio stated in Clause 9 of Annexure MRTS07B.1.

The confirmed or adjusted stabilising agent spread rate shall be the ordered spread rate of stabilising agent. **Milestone**

8.8.1.2 Corrected content

Notwithstanding the ordered content of stabilising agent given in Clause 8.8.1.1, 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 8.8.1.1
 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

8.8.1.3 Actual spread rate

The actual spread rate shall be represented either by the characteristic value of the stabilising agent content or by the average of the actual surface spread rates of the stabilising agent for each lot.

The actual stabilising agent spread rate shall be within $\pm 10\%$ of the ordered spread rate as defined in Clause 8.8.1.1.

8.8.2 Relative moisture ratio

The Relative Moisture Ratio (RMR) during the wet incorporation of the stabilising agent shall be determined as per Clause 9.7 and shall be between 90% to 105% of OMC (Optimum Moisture Content).

8.8.3 Compaction standard

The characteristic value of the relative compaction results for the full thickness of the stabilised layer shall not be less than 100% (standard compaction).

8.8.4 Geometrics

The stabilised layer shall be constructed so as not to depart from the alignment, widths, thicknesses, lengths, heights and shapes specified in the Drawings or Contract by more than the tolerances stated in Clause 8.8.4.1 to Clause 8.8.4.4.

8.8.4.1 Geometrics, thickness

8.8.4.1.1 General

At any point of the completed stabilised layer, the measured actual stabilised layer thickness shall be within tolerance given in Clause 8.8.4.2.1 of the design depth specified in Clause 9 of Annexure MRTS07B.1 Part B.

8.8.4.1.2 Measuring actual stabilised layer thickness

During each final wet incorporation pass and prior to compaction, depth checks shall be undertaken to determine the lower reference level at the bottom of the stabilised layer. The frequency of the depth checks shall be stated in Clause 1.2 of Annexure MRTS07B.1.

Where not so stated in the Annexure, the depth checks shall be measured as per the following minimum frequency:

- a) 1 per 5 m within the first 20 m of each final wet incorporation pass, and
- b) 1 per 20 m for the remaining length of each final wet incorporation pass.

The following reduced level of testing may be accepted by the Administrator:

- a) 1 per 5 m within the first 20 m of each final wet incorporation pass, and
- b) 1 per 50 m for the remaining length of each final wet incorporation pass.

Following compaction and final trim, levels shall be obtained from the top of the finished stabilised layer. They shall be recovered in the horizontal plane to an accuracy of ± 50 mm of the same location as those from which the lower reference levels were obtained. The difference between the finished surface level and lower reference level shall be recorded as the actual stabilised layer thickness.

The actual stabilised layer thickness shall be recorded by the Contractor and reported to the Administrator. The record for each thickness determination shall include:

- a) the position and measurement of the lower reference level for each test location
- b) the position and measurement of the finished surface level for each test location (shall be recoverable in the horizontal plane to an accuracy of ± 50 mm)
- c) the actual stabilised layer thickness record obtained by subtracting the finish surface level measurement from the lower reference level measurement for each test location.

8.8.4.2 Geometrics, vertical tolerances

8.8.4.2.1 Primary tolerance

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

This shall be as specified in Clause 6.1 of Annexure MRTS07B.1 as one of the alternatives in Table 8.8.4.2.1. If no such indication is given, the primary tolerance shall be thickness only.

Table 8.8.4.2.1 – Primary tolerance for the height of any point on the surface of the stabilised layer

Alternative	Primary Tolerance
A	-5 and + 10 mm
B	-5 and + 15 mm
C	Thickness only

In all cases a primary tolerance shall also apply for the thickness of the completed stabilised layer (refer to Clause 8.8.4.1.1).

Alternative A primary tolerance (-5 to +10 mm) is recommended for the insitu stabilised layer when the subsequent overlying layer is asphalt.

Where 'thickness only' Alternative C has been specified in Clause 6.1 of Annexure MRTS07B.1, the following shall apply:

- a) height of collimation shall be used to determine the actual stabilised layer thickness
- b) minimum testing frequency for determining the actual stabilised layer thickness shall be at each compaction test location (refer Clause 9.6), and
- c) at any point of the completed stabilised layer the measured thickness shall be within -5 mm and +15 mm of the design depth stated in Clause 9 of Annexure MRTS07B.1 Part B.

8.8.4.3 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, by not 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 demonstrate, 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.

8.8.4.4 Additional tolerances

8.8.4.4.1 General

Where required by Clauses 8.8.4.4.2, 8.8.4.4.3 and 8.8.4.4.4, additional tolerances shall apply to the stabilised layer.

Additional work shall be carried out by the Contractor where necessary 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 work items.

8.8.4.4.2 Deviation from a straight-edge

Where Clause 6.2.1 of Annexure MRTS07B.1 states a deviation from a straight-edge tolerance applies the deviation from a three metre long straight-edge placed anywhere on the surface of a layer shall not exceed the limits stated in Clause 6.2.2 of Annexure MRTS07B.1, due allowance being made for design shape, where relevant.

The limit stated in Clause 6.2.2 of Annexure MRTS07B.1 shall be one of the alternatives given in Table 8.8.4.4.2.

Table 8.8.4.4.2 – Tolerance for deviation from a straight edge

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

8.8.4.4.3 Crossfall

Where Clause 6.3 of Annexure MRTS07B.1 specifies a crossfall tolerance applies, the crossfall shall not depart from the corresponding crossfall shown in the Drawings or Contract by more than 0.5% absolute.

The crossfall shall be measured:

- a) Between any two points more than two metres apart except where a pavement verge is less than two metres wide. For pavement verges less than two 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 that has a constant crossfall.

8.8.4.4.4 Surface evenness

Where Clause 6.4.1 of Annexure MRTS07B.1 states a surface evenness tolerance applies, a surface evenness tolerance shall apply to the 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 6.4.2 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 Technical Specification, the selection of sampling or test locations shall be carried out using random stratified sampling. Exceptions include testing of:

- a) geometrics (Clause 9.4)
- b) the stabilising agent content (Clause 9.5)
- c) visible deflection of pavement layers (Clause 9.8), and

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

9.2 Process requirements

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

Notwithstanding this, the requirements of Clauses 8.6 and 8.7 shall apply.

9.3 Product standards

Where construction has been carried out using product standards, compliance testing of the stabilised layer 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.

Notwithstanding this, the requirements of Clauses 8.7 and 8.8 shall apply.

9.4 Geometrics

9.4.1 General

All geometric tolerances, except for surface evenness, shall be checked at regular intervals not greater than the frequency 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 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 Stabilising agent spread rate

The stabilising agent content shall be determined by Test Method Q719. The stabilising agent spread rate shall be within the allowable tolerance specified in Clause 8.8.1.3 in all cases.

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 ordered spread rate and assumptions, used to calculate the surface spread rate, and
- c) the calculated surface spread rate.

The testing program shall be discussed and agreed with the Administrator prior to commencement of stabilising operations (refer to Clause 5.2.2 Hold Point 1).

In addition, the tonnage of stabilising agent placed during each spreading run shall be recorded 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 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.

9.6 Compaction

Where a product standard is specified, the compaction standard for each lot shall be represented by the characteristic value of relative compaction results.

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

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

Sampling of stabilised materials to determine the laboratory reference density as detailed in Test Method Q142A shall take place immediately after the wet incorporation pass, and prior to the commencement of compaction of the stabilised material.

The relative compaction of the stabilised material as detailed in Test Method Q140A is stated in Clause 8 of Annexure MRTS07B.1. If it is not stated, it shall be determined using the ratio of the compacted dry density to the maximum dry density. The relative compaction shall be determined for the entire thickness of the stabilised layer.

9.6.1 Reference density laboratory compaction time

Following sampling, reference density testing shall be completed to a stage where laboratory compaction has been completed within the two hours or the allowable working time, whichever is shorter, 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.

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 any moisture sub-sample is being oven dried within the following time constraints:

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

9.7 Relative moisture ratio

The relative moisture ratio of the stabilised material shall be determined in accordance with Q250. The moisture sample locations shall be identical to the reference density testing locations for compaction testing. The moisture samples shall be extracted immediately following the final wet incorporation of stabilising agent by the stabiliser or reclaimer / stabiliser and prior to the addition of any additional moisture for the purposes of compaction and trimming. The relative moisture ratio shall be calculated using the individual moisture content compared to the optimum moisture content for each corresponding location (refer Clause 9.6). As a minimum frequency, the relative moisture ratio of stabilised materials shall be assessed at each test location for compaction. The results shall be reported to the Administrator as soon as it is available.

9.8 Visible deflection of pavement layers

9.8.1 Visual deflection prior to early trafficking

No trafficking shall be allowed until the requirements of Clause 9.8 is carried out and no visual deflection is observed. Additional curing time may be required prior to trafficking.

9.8.2 Visual deflection pavement layers

The objective visible deflection test specified in this Clause shall apply to a stabilised layer, unless stated otherwise in Clause 7 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 7 the Administrator may require the Contractor to undertake additional compliance testing to ensure that the affected section of the pavement layer complies with Clauses 8.8.1, 8.8.2 and 8.8.3. This shall be at the Contractor's expense unless the Administrator agrees otherwise.

9.9 Acceptance

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

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

10 Supplementary requirements

The supplementary requirements given in Clause 11 of Annexure MRTS07B.1 shall apply.

Superseded

Superseded