

Specification (Measurement)

**Transport and Main Roads Specifications
MRS07A Insitu Stabilised Subgrades using Quicklime or
Hydrated Lime**

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1 Introduction

This Specification applies to the stabilisation of materials insitu by the addition of quicklime (hydrated and added as a slurry) or hydrated lime.

This Specification shall be read in conjunction with MRS01 *Introduction to Specifications*, MRS50 *Specific Quality System Requirements* and other Specifications as appropriate.

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

2 Measurement of works

2.1 Standard Work Items

In accordance with the provisions of Clause 2.1.3 of MRS01 *Introduction to Specifications*, the Standard Work Items covered by this Specification are listed in Table 2.1.

Table 2.1 – Standard Work Items

Standard Item No.	Description	Unit of Measurement
Insitu Stabilised Pavements using Quicklime or Hydrated Lime		
40101	Excavation and disposal of overlying material, [<i>type of material</i>]	m ³
40102P	Excavation and disposal of material not suitable for stabilisation [<i>type of material</i>] (Provisional Quantity, if ordered)	m ³
40106P	New material to replace material not suitable for stabilisation [<i>type of new material</i>], if ordered (Provisional Quantity, if ordered)	m ³
40110	Insitu stabilisation using quicklime or hydrated lime [<i>location</i>]	m ²
40111	Supply of stabilising agent [<i>description, location</i>]	tonne
40112	Water curing [<i>location</i>]	m ²

2.2 Work Operations

Item 40101 Excavation and disposal of overlying material, [*type of material*]

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) excavating, loading and hauling of overlying material, and
- c) disposal of material.

Item 40102P Excavation and disposal of material not suitable for stabilisation, [*type of material*] (Provisional Quantity, if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) excavating, loading and hauling of material not suitable for stabilisation, and
- c) disposal of material.

Item 40106P New material to replace material not suitable for stabilisation [*type of new material*], if ordered (Provisional Quantity, if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and delivery of all materials
- c) spreading the materials
- d) compacting and trimming the materials to facilitate insitu stabilisation and work operations related to it
- e) maintenance of the subgrade, and
- f) associated material and construction compliance testing.

Item 40110 Insitu stabilisation using quicklime or hydrated lime [*location*]

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) compacting, shaping and trimming of material prior to spreading of the stabilising agent for each pass
- c) uniform spreading of the stabilising agent for each pass
- d) slaking of quicklime to complete hydration
- e) incorporation of the stabilising agent into the material for each spreading pass
- f) compacting, shaping and trimming of material between each incorporation pass
- g) mixing, including the incorporation of water
- h) compaction
- i) trimming
- j) supply, delivery and storage of water
- k) application of water to maintain the stabilised layer in a damp condition at all times during the stabilisation operations
- l) disposal of excess and trimmed material
- m) proof roll testing
- n) maintenance of the stabilised layer, and
- o) associated material and construction compliance testing.

Item 40111 Supply of stabilising agent [*description, location*]

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply, delivery and storage of the stabilising agent, and
- c) associated material and construction compliance testing.

Item 40112 Water curing [location]

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply, transport, delivery and storage of water
- c) application of the water to maintain the stabilised layer in a damp condition at all times during the curing period, and
- d) associated material and construction compliance testing.

2.3 Calculation of quantities

Item 40110 (m²) shall be calculated as per Clause 2.3.1. Where pavement shoulders, verges and/or batters are to be insitu stabilised, this area must be considered in the calculation of quantities.

Item 40111 (tonne) shall be calculated as per Clause 2.3.2.

Item 40112 (m²) shall be calculated as per Clause 2.3.3.

Items 40101, 40102P and 40106P (m³) shall be calculated as per Clauses 2.3.4, 2.3.5 and 2.3.6 respectively.

2.3.1 Insitu stabilisation

The calculated quantity shall be the subgrade surface area that is insitu stabilised (in m²) excluding any overlaps and joints. It shall be calculated using the lengths and widths of the insitu stabilised lots.

2.3.2 Stabilising agent**2.3.2.1 Hydrated lime**

Where hydrated lime is specified, the mass of stabilising agent shall be calculated using the following formula:

$$M = A \times S \times \frac{AL_x}{AL_y} \times \frac{1}{1000}$$

where: M = mass of stabilising agent, in tonnes

A = surface area of subgrade to be insitu stabilised, in m²

S = specified stabilising agent spread rate for hydrated lime, in kg/m²

AL_x = Available Lime Index for hydrated lime used in the laboratory mix design testing (%), and

AL_y = Available Lime Index for hydrated lime used in construction (%).

The mass of stabilising agent for each lot shall be calculated using the above formula.

The Available Lime Index shall be determined for the stabilising agent used in both laboratory design and construction. Except where stated otherwise in Clause 8 of Annexure MRTS07A.1, an Available Lime Index of 90% shall be assumed for the laboratory mix design testing.

The quantity of stabilising agent shown in the schedules shall be based on an Available Lime Index of 90%. The Contractor shall make allowance for variations of the Available Lime Index. Payment for the supply of stabilising agent shall be based on an Available Lime Index of 90%.

2.3.2.2 Quicklime

Where quicklime is specified, the mass of stabilising agent shall be calculated using the following formula:

$$M = A \times 0.76 \times S \times \frac{AL_x}{AL_y} \times \frac{1}{1000}$$

where: M = mass of stabilising agent, in tonnes
 A = surface area of subgrade to be insitu stabilised, in m²
 S = specified stabilising agent spread rate for hydrated lime, in kg/m²
 AL_x = Available Lime Index for hydrated lime used in the laboratory mix design testing (%),
 and
 AL_y = Available Lime Index for quicklime used in construction (%).

The mass of stabilising agent for each lot shall be calculated using the above formula.

The Available Lime Index shall be determined for the stabilising agent used in both laboratory design and construction. Except where stated otherwise in Clause 8 of Annexure MRTS07A.1, an Available Lime Index of 90% shall be assumed for the laboratory mix design testing.

The quantity of lime shown in the schedules shall be based on an Available Lime Index of 90%. The Contractor shall make allowance for variations of the Available Lime Index. Payment for the supply of stabilising agent shall be based on an Available Lime Index of 90%.

2.3.3 Water curing

The surface area (m²) of water curing shall be calculated from the lengths and widths of the insitu stabilised lots for which water curing has been specified.

2.3.4 Removal and disposal of overlying material

The volume of material shall be determined from the three-dimensional shape bounded by the prepared ground surface and the finished shapes and dimensions as shown on the Drawings or otherwise nominated in the Contract.

2.3.5 Removal and disposal of material not suitable for stabilisation

The volume of material not suitable for stabilisation shall be calculated from the loose truck volume of material disposed of from the site. Before commencing this operation, the measured volume of the haulage plant and the loading method shall be deemed suitable by the Administrator. The total volume of material removed and disposed of shall be agreed with the Administrator each day.

2.3.6 New material to replace material not suitable for stabilisation

The volume of replacement material shall be calculated by measuring the volume of the excavation. The volume of the excavation shall be determined from the three-dimensional shape bounded by the bottom of the excavation and the finished shapes and dimensions as shown on the Drawings or otherwise nominated in the Contract. A survey pick-up shall be used, or an alternative method deemed suitable by the Administrator.

3 Utilisation of a rejected lot for a reduced level of service

3.1 Maximum reductions in standards for a reduced level of service

A lot shall not be utilised for a reduced level of service if:

- a) the actual value for any property or requirement not listed in the first column of Table 3.1 has failed to meet the specified limit or requirement for such property or requirement
- b) the actual value for any property or requirement listed in the first column of Table 3.1 has deviated from the extended limit stated in the second column of Table 3.1
- c) the actual value for any property given in Table 3.1 has deviated from the specified limit (not the extended limit) for the same property in the immediately preceding lot, or
- d) the actual value for any property given in Table 3.1 has deviated from the specified limit (not the extended limit) for that property in more than three lots for any preceding work period.

Table 3.1 – Extended limits

Property	Extended Limit
Characteristic value of relative compaction	Minimum characteristic value of relative compaction no less than the specified relative compaction minus 2%.
Stabilising agent content	Minimum content no less than the ordered content (expressed as a percentage) minus 1.0%.
Characteristic value of the stabilised layer thickness	Minimum characteristic value of the stabilised layer thickness no less than the design layer thickness minus 20 mm.
Moisture ratio (MR _u) – lower limit	Moisture ratio (MR _u) no less than the specified minimum minus 10%.

3.2 Determination of the reduced value

3.2.1 General

The reduced value shall be determined from the formula given below for the relevant property. Where there is more than one reduction, the percentage reductions for each property shall be added together to provide a total percentage reduction which shall be applied to the scheduled rate for all Work Items covered by Clause 2.2.

3.2.2 Compaction standard

Where a product standard applies to compaction, the percentage reduction shall be determined from the following formula:

$$\text{Percentage Reduction} = (C_s - C_a) \times 4$$

where: C_s = the specified value of compaction, and

C_a = the actual minimum characteristic value of compaction.

3.2.3 Stabilising agent spread rate

The percentage reduction shall be determined from the following formula:

$$\text{Percentage Reduction} = (S - S_a) \times 3$$

where: S = the ordered stabilising agent content (expressed as a percentage) as defined in *MRTS07A Insitu Stabilised Subgrades using Quicklime or Hydrated Lime*, and
 S_a = the actual stabilising agent content (expressed as a percentage) determined in accordance with *MRTS07A Insitu Stabilised Subgrades using Quicklime or Hydrated Lime*.

3.2.4 Thickness of stabilised layer

If indicated in Clause 1 of Annexure MRS07A.1, the percentage reduction shall be determined from the following formula:

$$\text{Percentage reduction} = ((D_d - 5) - D_a) \times 2$$

where: D_d = the design layer thickness of the stabilised layer (mm), and
 D_a = the actual minimum characteristic value of the stabilised layer thickness measurements determined in accordance with *MRTS07A Insitu Stabilised Subgrades using Quicklime or Hydrated Lime* (mm).

3.2.5 Moisture ratio (MR_u) – lower limit

The percentage reduction for moisture ratio shall be determined from the following formula:

$$\text{Percentage Reduction} = (M_s - 5) - M_a$$

where: M_a = the actual average moisture ratio (%), and
 M_s = the specified minimum moisture ratio value (%).

When the actual average moisture ratio of a lot is less than 95%, but greater than or equal 90%, the Contractor shall raise a suitable Nonconformance report. As per the above formula, a percentage reduction shall not apply for this lot.

When the actual average moisture ratio of a lot is less than 90%, but greater than or equal to 85%, the Contractor shall raise a suitable Nonconformance report. As per the above formula, a percentage reduction shall apply for this lot.

When the actual average moisture ratio of a lot is less than 85%, the Contractor shall raise a suitable Nonconformance report. As per Table 3.1, the Administrator may reject this lot.

3.3 Application of the reduced value payments

The reduced values shall apply to the lot represented by the tests for the total thickness of the (individual) stabilised layer. This shall be applied to the scheduled rate for all Work Items covered by Clause 2.2.

