**Specification (Measurement)**

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

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Queensland Government

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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, [*type of material*] | $m^3$ |
| 40102P | Excavation and disposal of material not suitable for stabilisation [*type of material*] (Provisional Quantity, if ordered) | $m^3$ |
| 40106P | New material to replace material not suitable for stabilisation [*type of new material*], if ordered (Provisional Quantity, if ordered) | $m^3$ |
| 40110 | Insitu stabilisation using Quicklime or Hydrated Lime [*location*] | $m^2$ |
| 40111 | Supply of stabilising agent [*description, location*] | tonne |
| 40112 | Water curing [*location*] | $m^2$ |



## *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*

### 2.3.1 Stabilising agent

#### 2.3.1.1 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 laboratory mix design testing. The quantity of lime shown in the schedules is based on an Available Lime Index of 90%. The Contractor shall make allowance for variations. Payment for the supply of stabilising agent shall be based on an available lime index of 90%.

#### 2.3.1.2 Quicklime

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

$$M = 0.76 \times A \times S \times \frac{AL_X}{AL_Y} \times \frac{1}{1000}$$

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

#### 2.3.2 Water curing

The area of water curing shall be calculated from the lengths and widths of the lots for which water curing has been specified.

#### 2.3.3 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.

#### 2.3.4 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.

#### 2.3.5 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. |

## *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 of this Specification.

### 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, and

$S_a$ = the actual stabilising agent content (expressed as a percentage) determined in accordance with MRTS07A.

### 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:

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

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 (mm).

### *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.