Department of Transport and Main Roads

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Specification (Measurement)

Transport and Main Roads Specifications
MRS07C Insitu Stabilised Pavements using Foamed Bitumen

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Government

Contents

1   Introduction

This Specification applies to the stabilisation of materials insitu by the addition of bitumen, as a foam, and secondary stabilising agent.

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 work

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 Foamed Bitumen		
40301P	Excavation and disposal of material not suitable for stabilisation, [*type of material*] (Provisional Quantity, if ordered)	m³
40305P	New material to replace material not suitable for stabilisation [*type of new material*] (Provisional Quantity, if ordered)	m³
40309	Preliminary pulverisation [*location*]	m²
40311	Additional material for shape correction [*type of new material*]	m³
40314	Insitu stabilisation using foamed bitumen [*location*]	m²
40317	Supply of secondary stabilising agent [*description*, *location*]	tonne
40318	Water curing [*location*]	m²

Item 40311 may be nominated as "Provisional Quantity" when the Principal has been unable to accurately determine an estimated quantity.

2.2   Work Operations

Item 40301P   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 40305P   New material to replace material not suitable for stabilisation [*type of new material*] (Provisional Quantity, if ordered)

Work Operations incorporated in the above items 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, shaping and trimming the materials to facilitate insitu stabilisation and work operations related to it

e) maintenance of the subgrade and/or pavement courses, and

f) associated material and construction compliance testing.

Item 40309   Preliminary pulverisation [*location*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) pulverising the material to be stabilised

c) compacting, shaping and trimming the material to facilitate insitu stabilisation, and work operations related to it, and

d) associated material and construction compliance testing.

Item 40311   Additional material for shape correction [*type of new material*]

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, shaping and trimming the materials to facilitate insitu stabilisation and work operations related to it

e) maintenance of the subgrade and/or pavement courses, and

f) associated material and construction compliance testing.

Item 40314   Insitu stabilisation using foamed bitumen [*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 prior to spreading of the secondary stabilising agent for each spreading pass

c) uniform spreading of the secondary stabilising agent after each spreading pass

d) compacting, shaping and trimming of material between each incorporation pass

e) supply, delivery, storage and application of water for slaking of the secondary stabilised agent, if required

f)   supply, delivery, storage, application and incorporation of water into the material to be stabilised

g)   compacting, shaping and trimming prior to incorporation of the foamed bitumen stabilising agent

h)   supply, delivery and storage of Class 170 bitumen

i)   supply, delivery, storage and incorporation of bitumen foaming agent(s)

j)   uniform application / spraying of the foamed bitumen stabilising agent

k)   mixing into the material to be stabilised the foamed bitumen stabilising agent, secondary stabilising agent and, if required, water

l)   compaction

m)   trimming

n)   treatment at construction joints

o)   disposal of excess and trimmed material

p)   proof roll testing

q)   maintenance of the stabilised layer, and

r)   associated material and construction compliance testing.

Item 40317   Supply of secondary 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 secondary stabilising agent, and

c)   associated material and construction compliance testing.

Item 40318   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

Items 40309 and 40314 (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 40317 (tonne) shall be calculated as per Clause 2.3.3.

Item 40318 (m²) shall be calculated as per Clause 2.3.4.

Items 40301P, 40305P and 40311(m³) shall be calculated as per Clauses 2.3.5, 2.3.6 and 2.3.7 respectively.

2.3.1 Preliminary pulverisation and insitu stabilisation

The calculated quantity shall be the pavement 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 Bituminous stabilising agent

The volume of the bituminous stabilising agent, litres at 15ºC, based on the design shall be calculated using the following formula:

$$V = \frac{A \times S}{1.04}$$

where: V = volume of bituminous agent, in litres at 15ºC

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

S = specified primary stabilising agent spread rate, in kg/m² at 15ºC

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

The total mass of stabilising agent shall be the sum of the masses of stabilising agent calculated for each lot.

2.3.3 Secondary stabilising agent

2.3.3.1 Hydrated lime

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

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

where: M = mass of secondary stabilising agent (hydrated lime), in tonnes

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

S_{HL} = 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 hydrated lime for each lot shall be calculated using the above formula. The total mass of hydrated lime shall be the sum of the masses of hydrated lime calculated for each lot.

The available lime index shall be determined for the secondary stabilising agent used in both laboratory design and construction. Except where stated otherwise in Clause 10 of Annexure MRTS07C.1, an available lime index of 90% shall be assumed for the laboratory mix design testing.

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

2.3.3.2 Hydrated lime / fly ash blend

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

$$M = A \times \left[S_{FA} + \left(S_{HL} \times \frac{AL_x}{AL_y} \right) \right] \times \frac{1}{1000}$$

where: M = mass of secondary stabilising agent (hydrated lime / fly ash blend), in tonnes

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

S_{FA} = specified stabilising agent spread rate for the fly ash proportion, in kg/m²

S_{HL} = specified stabilising agent spread rate for the hydrated lime proportion, 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 hydrated lime / fly ash blend for each lot shall be calculated using the above formula. The total mass of hydrated lime / fly ash blend shall be the sum of the masses of hydrated lime / fly ash blend calculated for each lot.

The available lime index shall be determined for the secondary stabilising agent used in both laboratory design and construction. Except where stated otherwise in Clause 10 of Annexure MRTS07C.1, an available lime index of 90% shall be assumed for the laboratory mix design testing.

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

2.3.3.3 Quicklime

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

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

where: M = mass of secondary stabilising agent (quicklime) in tonnes

A = surface area of the pavement to be insitu stabilised in m²

S_{HL} = 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 quicklime for each lot shall be calculated using the above formula. The total mass of quicklime shall be the sum of the masses of quicklime calculated for each lot.

The available lime index shall be determined for the secondary stabilising agent used in both laboratory design and construction. Except where stated otherwise in Clause 10 of Annexure MRTS07C.1, an available lime index of 90% shall be assumed for the laboratory mix design testing.

The quantity of secondary 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 secondary stabilising agent shall be based on an available lime index of 90%.

2.3.4 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.

2.3.5 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.

2.3.7 Additional material for shape correction

The volume of material shall be determined from the three-dimensional shape bounded by the lines, dimensions and shapes shown on the Drawings or otherwise nominated in the Contract.

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 the actual value for:

a) 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) 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) 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) 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.

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%.
Road roughness (surface evenness)	Maximum road roughness value of R_m as stated in Clause 1 of Annexure MRS07C.1 or, where R_m is not so stated, it shall equal R_s + 0.76 m/km, where R_s is defined in MRTS07C *Insitu Stabilised Pavements using Foamed Bitumen*.
Primary stabilising agent content (bituminous)	Minimum content no less than the ordered content (expressed as a percentage) minus 0.3%.
Secondary stabilising agent content	Minimum content no less than the ordered content (expressed as a percentage) minus 0.5%.
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%.
Moisture ratio (MR_u) – upper limit	Moisture ratio (MR_u) no greater than the specified maximum plus 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 reduction 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:

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

where: C_s = the specified value of compaction, and

C_a = the actual minimum characteristic value of compaction.

3.2.3 Road roughness (surface evenness)

The percentage reduction shall be determined from the following formula:

$$Percentage\ Reduction = (R_a - R_s) \times 26.49$$

where: R_a = the actual road roughness value, and

R_s = the specified road roughness value as defined in MRTS07C.

3.2.4 Stabilising agent content

The percentage reduction for both the bituminous and secondary stabilising agents shall be determined from the following formula:

$$Percentage\ Reduction = (S - S_a) \times 10$$

where: S = the ordered stabilising agent content (expressed as a percentage) as defined in MRTS07C *Insitu Stabilised Pavements using Foamed Bitumen*, and

S_a = the actual stabilising agent content (expressed as a percentage) determined in accordance with MRTS07C *Insitu Stabilised Pavements using Foamed Bitumen*.

The calculation shall be made for each stabilising agent that is outside the specified limit.

Where the stabilising agent content of more than one stabilising agent is outside the specified limit, a percentage reduction shall be calculated for each stabilising agent and summed to get the total reduction related to stabilising agent content.

3.2.5 Thickness of stabilised layer

If indicated in Clause 2 of Annexure MRS07C.1, the percentage reduction shall be determined from the following formula:

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

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 MRTS07C *Insitu Stabilised Pavements using Foamed Bitumen* (mm).

3.2.6   Moisture ratio (MR_u) – lower limit

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

$$Percentage\ reduction = (M_s - 5) - M_a$$

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 55%, but greater than or equal 50%, 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 50%, but greater than or equal to 45%, 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 45%, the Contractor shall raise a suitable Nonconformance report. As per Table 3.1, the Administrator may reject this lot.

3.2.7   Moisture ratio (MR_u) – upper limit

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

$$Percentage\ reduction = M_a - (M_s + 5)$$

where: M_a = the actual average moisture ratio (%), and

M_s = the specified maximum moisture ratio value (%).

> When the actual average moisture ratio of a lot is greater than 75%, but less than or equal 80%, 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 greater than 80%, but less 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 greater 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.

4 Additional payment for a higher standard of surface evenness

4.1 General

If indicated in Clause 3 of Annexure MRS07C.1, an additional payment above the scheduled rate shall be made for the additional benefit of a higher standard of surface evenness on the surface of the final pavement layer as represented by the road roughness value.

This shall be applied to the scheduled rate for all Work Items covered by Clause 2.2.

4.2 Payment

Any additional payment shall be determined from the formula:

$$Additional\ Payment = R \times Q \times P$$

where: R = scheduled rate for the Work Item for the top stabilised layer

Q = compacted quantity in the lot (as modified by Clause 4.3), and

P = $\frac{(R_s - R_a)}{9.4} - 0.02$

where: P = the additional payment factor due to the achievement of a higher standard of surface evenness

R_s = specified road roughness value defined in MRTS07C *Insitu Stabilised Pavements using Foamed Bitumen*, and

R_a = measured road roughness value.

Notwithstanding the above the maximum value of P shall be 0.04.

4.3 Quantity of pavement to which the additional payment applies

The additional pavement shall apply to the lot represented by the higher standard of surface evenness for the total thickness of the (individual) stabilised layer.