Specification (Measurement)

Transport and Main Roads Specifications
MRS09 Plant-Mixed Pavement Foamed Bitumen
Stabilised Pavements

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Translating and interpreting assistance

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1   Introduction

This Specification applies to the construction of stabilised layers in road pavements using a plant-mixed pavement material that comprises a mixture of unbound granular pavement material, foamed bitumen, and a 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 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
Plant-Mixed Pavement Layers Stabilised using Foamed Bitumen		
40501	Mill existing pavement material and dispose of it [*depth, location*]	m²
40502	Mill existing pavement material [*depth, location*], transport to Principal nominated location and stockpile at this location [*stockpiling location*]	m²
40503	Preparation of existing surface before construction of stabilised layer – bound and concrete surfaces and bound pavements [*description, location*]	m²
40504P	New materials to replace material not suitable for stabilisation [*type of new material*] (Provisional Quantity, if ordered)	m³
40508	Plant-mixed foamed bitumen stabilised pavement [*description UM1 / UM2 / UM3, location*]	m³
40511	Water curing [*location*]	m²

2.2   Work Operations

Item 40501   Mill existing pavement material and dispose of it [*depth, location*]

Work Operations incorporated in the above item include:

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

b)   milling of the pavement to the depth(s) and in the area(s) nominated in the contract documents

c)   removing and disposing of all milled materials, and

d)   maintenance of the subgrade and/or pavement courses.

Item 40502   Mill existing pavement material [*depth, location*], transport to Principal nominated location and stockpile at this location [*stockpiling location*]

Work Operations incorporated in the above item include:

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

b) milling of the pavement to the depth(s) and in the area(s) nominated in the contract documents

c) loading of all materials

d) transporting, delivering and stockpiling of all milled materials to the nominated stockpile site(s), and

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

Item 40503   Preparation of existing surface before construction of stabilised layer – bound and concrete surfaces and bound pavements [*description, location*]

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

b) cleaning of pavement including brooming / sweeping on existing surface

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

d) Work Operations as per Clause 8.9.9.2 of MRTS09 *Plant-Mixed Pavement Layers Stabilised using Foamed Bitumen.*

Item 40504P   New materials to replace material not suitable for stabilisation [*type of new 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) supply and delivery of all materials

c) spreading the materials

d) compacting and trimming the materials to facilitate plant-mixed foam bitumen stabilised materials

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

f) associated material and construction compliance testing.

Item 40508   Plant-mixed foamed bitumen stabilised pavement [*description UM1 / UM2 / UM3, location*]

Work Operations incorporated in the above item include:

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

b) supplying, transporting, delivering and storing all materials including the bitumen and secondary stabilising agent and materials to be stabilised

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

d) stockpiling, storing, metering, screening, processing (e.g. pulverising / breaking down particles, sieving of materials as required), blending and mixing of all components of the mixture to produce a uniform, complying material

e) removing and disposing of unsuitable (e.g. oversize) material

f) delivering, placing, compacting and, if necessary, trimming of the stabilised material

g) excavating, removing, disposing and replacing segregated material

h) removing and disposing of trimmed material(s)

i) preparing joints and surfaces including a cutback (if multiple stabilised layers are constructed)

j) proof roll testing

k) maintenance of the stabilised pavement layers, and

l) associated material and construction compliance testing including laboratory foamed bitumen mix design(s) and produced foamed bitumen material by the Contractor's mixing equipment as per Clause 7.4 of MRTS09 *Plant-Mixed Foamed Bitumen Stabilised Pavements*.

Item 40511   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) applying the water such that the stabilised layer is maintained in a damp condition at all time during the curing period, and

d) associated material and construction compliance testing.

2.3   Calculation of quantities

2.3.1   Bitumen

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

$$V_B = Q \times D \times \frac{C}{100} \times 1000 \times \frac{1}{1.04}$$

where: V_B =   volume of bitumen, in litres at 15ºC

   Q   =   quantity of material to be stabilised in the lot, m³

   D   =   maximum dry density of a representative sample of the unbound material to be stabilised (Type UM1, UM2, or UM3), compacted to 100% of standard compaction, in tonnes per m³, and

   C   =   specified content of bitumen, in precent.

2.3.2 Hydrated lime

The mass of hydrated lime shall be calculated using the following formula:

$$M = Q \times D \times \frac{C}{100} \times \frac{AL_X}{AL_Y} \times \frac{1}{1000}$$

where:

M = mass of the hydrated lime, in tonnes

Q = quantity of material to be stabilised in the feed stockpile lot, m³

D = maximum dry density of a representative sample of the unbound material to be stabilised (Type UM1, UM2, or UM3), compacted to 100% of standard compaction, in tonnes per m³, and

C = specified content of hydrated lime, in percent (%)

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 total mass of hydrated lime shall be the sum of the masses of hydrated lime calculated for each lot. The Available Lime Index (ALI) shall be determined for the hydrated lime used in laboratory mix design testing and in construction. Except where stated otherwise in Clause 9 of Annexure MRTS09.1, an ALI of 90% shall be assumed for laboratory mix design testing. The quantity of lime shown in the schedules is based on an ALI of 90%. The Contractor shall make allowance for variations. Payment for the supply of hydrated lime shall be based on an ALI of 90%.

2.3.3 Mill existing pavement material and dispose of it

The quantity of the material to be milled off and disposed of shall be taken as the area over which the existing pavement is to be removed by milling and disposed of.

2.3.4 Mill existing pavement material, transport to Principal nominated location and stockpile at this location

The quantity of the material to be milled off, transported and stockpiled shall be taken as the area over which the existing pavement is to be removed by milling and so transported and stockpiled.

2.3.5 Preparation of bound and concrete surfaces and bound pavements

The quantity of the existing surface to be prepared before construction of stabilised layer shall be taken as the area of bound surfaces over which the stabilised layer is to be laid.

2.3.6 Water curing

The area of water curing shall be calculated from the lengths and widths of the lots of stabilised pavement constructed.

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(a) 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(a) has deviated by more than the extended limit stated in the second column of Table 3.1(a)

c) the actual value for any property given in Table 3.1(a) or Table 3.1(b) 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(a) or Table 3.1(b) 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(a) – Extended limits

Property	Extended Limit
Blended / combined material to be stabilised	Maximum of † a) defects for any individual sample, or b) a lot average of 3 defects (refer to Clause 3.2).
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 MRS09.1. Where R_m is not so stated, it shall equal $R_s + 0.76$ m/km, where R_s is defined in MRTS09.
Primary stabilising agent content (bituminous)	Minimum content no less than the ordered content (expressed as a percentage) minus 0.5%.
Secondary stabilising agent content	Minimum content no less than the ordered content (expressed as a percentage) minus 0.5%.
Relative moisture ratio feed stockpile (RMR FSP) and foamed bitumen (RMR FB)	Relative moisture ratio no less than the specified minimum RMR minus 10%. Relative moisture ratio no greater than the specified maximum RMR plus 10%.
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.

† A defect is as defined in Table 3.1(b).

Table 3.1(b) – Table of defects

Property	Magnitude of Incremental Departure Outside the Specified Limits or Value which Accumulates One Defect.
Percentage passing the AS 2.36 mm sieve and greater.	For each sieve size, each 2% absolute (or part thereof).
Percentage passing the AS 0.425 mm sieve and the AS 0.075 mm sieve.	For each sieve size, each 1% absolute (or part thereof).
Ratio of the percentage passing the AS 0.075 mm sieve to the percentage passing the AS 0.425 mm sieve.	Up to 0.05 increase or decrease. Each 0.02 (or part thereof) increase or decrease beyond the aforementioned 0.05 increase or decrease.
Liquid Limit	Each 2% absolute (or part thereof) increase
Plasticity Index	Each 0.4% absolute (or part thereof) increase.
Linear Shrinkage.	Each 0.2% absolute (or part thereof) increase.
Weighted Plasticity Index	Each 5 units (or part thereof) increase.
Weighted Linear Shrinkage	Each 2.5 units (or part thereof) increase.

3.2 Defects in blended / combined material to be stabilised

The average number of defects for each lot shall be determined by calculating the defects, if any, for each and every sample taken from the lot and dividing the total number of defects for the lot by the number of samples. The number of defects for each sample shall be determined from Table 3.1(b).

3.3 Determination of the reduced value

3.3.1 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 apply to the scheduled rate for all relevant Work Items covered by Clause 2.1.

3.3.2 Blended / combined material to be stabilised

The percentage reduction shall be determined from the following formula:

Percentage Reduction = N_{av} x 3

where: N_{av} = the average number of defects determined in accordance with Clause 3.2.

3.3.3 Compaction standard

The percentage reduction shall be determined from the following formula:

Percentage Reduction = $(C_s - C_a)$ x 4

where: C_s = the specified value of compaction, and

C_a = the actual minimum characteristic value of compaction.

3.3.4 Road roughness (surface evenness)

The percentage reduction shall be determined from the following formula:

Percentage Reduction = $(R_a – R_s)$ x 26.49

where: R_a = the actual road roughness value, and

R_s = the specified road roughness value defined in MRTS09.

3.3.5 Stabilising agent content

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

Percentage Reduction = $(S – S_a)$ x 10

where:

S = the ordered stabilising agent content (expressed as a percentage) as defined in MRTS09, and

S_a = the actual stabilising agent content (expressed as a percentage) determined in accordance with MRTS09.

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.

3.3.6 Relative moisture ratio feed stockpile (RMR FSP) and foamed bitumen (RMR FB)

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

Percentage Reduction = $(M_a – M_s)$

where: M_a = the actual average relative moisture ratio, and

M_a = the specified maximum or minimum relative moisture ratio value.

3.3.7 Thickness of stabilised layer

If indicated in Clause 2 of Annexure MRS09.1, the percentage reduction shall be determined from the following formula:

Percentage Reduction = $(D_d - D_a)$ x 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 MRTS09 (mm).

3.4 Application of the reduced value payments

The reduced values shall apply to the lot represented by the tests for the total quantity of the (individual) stabilised layer.

The work items listed below are applied of the reduced value:

- Item 40508, 40510 and bitumen costs or Item 40509.

- Item 40510, if used for the affected lot.

- Item 40511.

4 Additional payment for a higher standard of surface evenness

4.1 General

If indicated in Clause 3 of Annexure MRS09.1, an additional payment above the scheduled rate shall be made for the additional benefit of a higher standard of surface evenness on the surface on the final pavement layer as represented by the road roughness count rate.

4.2 Payment

Any additional payment shall be determined from the formula:

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

where: R = scheduled rates for the Work Items covered by Clause 2.2 to construct the final stabilised layer

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

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

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

R_s = specified road roughness value defined in MRTS09, 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 quantity of the (individual) topmost stabilised layer.