

TRANSPORT FOR NSW (TfNSW)
QA SPECIFICATION R76
INSITU PAVEMENT STABILISATION
USING FOAMED BITUMEN

NOTICE

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REVISION REGISTER

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Ed 1/Rev 0		First issue.	DCS	03.07.18
Ed 1/Rev 1	Global	References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively.	DCS	22.06.20

GUIDE NOTES (Not Part of Contract Document)

Using Specification TfNSW R76

Foamed bitumen stabilisation uses hot bitumen. Contractors must use safe practices detailed in Specification TfNSW G22 Work Health and Safety (Construction and Maintenance Works), Government regulations, and Austroads and industry best practices technical guides. Only competently trained crews are to be used for foamed bitumen stabilisation. TfNSW requires accredited contractors to carry out the work. Refer to the TfNSW website: www.rms.nsw.gov.au for more details.

Refer to TfNSW Technical Direction PTD 2015/001 “Foamed Bitumen Stabilisation” for information about the design and construction of foamed bitumen stabilisation.

TfNSW has developed a form (Foamed Bitumen Stabilisation Record Sheet for Binder Application Rates, TfNSW Form 5113) to determine the Lime and Bitumen Target Application Rates. The Bitumen Target Application Rates are determined by “volume at 15°C” and at field bitumen temperature in L/m². Contractors must complete this form and forward to the Principal at the end of each shift in accordance with Clause 5.1.

In situ foamed bitumen stabilisation uses specialised equipment as the bitumen foaming process and delivery is critical to the stabilised material being fit for purpose. The Contractor is to maintain their equipment, including adhering to the manufacturers guidelines for maintaining and replacing the bitumen jets.



INSITU PAVEMENT STABILISATION USING FOAMED BITUMEN

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VERSION FOR: DATE:

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW R76 Edition 1 Revision 0.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

TfNSW QA SPECIFICATION R76

INSITU PAVEMENT STABILISATION USING FOAMED BITUMEN

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the rehabilitation of existing granular pavements by insitu stabilisation with foamed bitumen to a maximum depth of 400 mm, including pavements with bituminous wearing course of up to 80 mm thick.

It includes requirements for:

- (a) removal of asphalt and previously bound patches and replacement with granular material, or their incorporation into the stabilised material, as specified;
- (b) preliminary pulverisation of existing pavement prior to insitu stabilisation, where specified;
- (c) supply of imported material to improve particle size distribution of the insitu material and to top up the existing pavement, where specified;
- (d) supply and incorporation of lime and foamed bitumen binders into the pavement material;
- (e) compaction and trimming of the stabilised material;
- (f) construction of a trial section of pavement, where specified.

This specification is for use for major rehabilitation works. It is not intended for minor maintenance works, including patching.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Project Specific Requirements

Project specific requirements are shown in Annexure R76/A.

The areas of work and finished surface levels are either shown on the drawings or specified in Annexure R76/A.

1.2.2 Measurement and Payment and Resolution of Nonconformities

The method of measurement and payment is detailed in Annexure R76/B.

Acceptance of materials and work will be in accordance with Annexure R76/B.

1.2.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure R76/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification TfNSW Q for definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure R76/C are **Identified Records** for the purposes of TfNSW Q Annexure Q/E.

1.2.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements shown in Annexure R76/D and must be implemented.

1.2.5 Frequency of Testing

The Inspection and Test Plan must nominate the proposed frequency of testing to verify conformity of the work, which must not be less than the frequency specified in Annexure R76/L. Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of TfNSW Q.

You may propose to the Principal a reduced minimum frequency of testing. The proposal must be supported by a statistical analysis verifying consistent process capability and product characteristics. The Principal may vary or restore the specified minimum frequency of testing, either provisionally or permanently, at any time.

1.2.6 Referenced Documents

Unless otherwise specified, the applicable issue of a referenced document, other than a TfNSW Specification, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure R76/M.

1.3 DEFINITIONS AND ACRONYMS

1.3.1 Definitions

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:

Bound material	A material with significant tensile strength produced from Material To Be Bound mixed with a binder. Bound material is also referred to as stabilised material.
Design Lime Target Spread Rate	The design lime binder application rate expressed in kg/m ² , obtained by converting the binder content stated in the Nominated Mix Design expressed as a percentage of the dry mass of the material to be stabilised.
Expansion ratio	Ratio of the maximum volume of bitumen in its foamed state to the volume of bitumen once the foaming has completely subsidised.
Field Lime Target Spread Rate	The Design Lime Target Spread Rate to which a tolerance has been added.
Fresh joint	A joint between adjacent runs where the stabilised pavement material of each run has been placed and compacted within 2 hours of the first placed run.

Half-life	Time taken for the foamed bitumen to settle to one half of the maximum volume of bitumen in its foamed state.
Joint	A plane formed in the bound pavement course between different materials, or materials constructed by different construction methods, or materials with different batching times, or materials with different placement times.
Material To Be Bound (MTBB)	The unbound material prior to stabilisation with a binder.
Pavement course	A course consisting of uniform material with uniform structural properties. May be applied to subbase, base and wearing courses.
Run	An area of pavement within a Lot that is placed continuously (without stopping the plant). The dimensions of a run are: <ul style="list-style-type: none">• continuous longitudinal length; and• output width from the equipment.
Shift	A continuous operation of spreading, mixing, compacting and trimming. The shift must be completed within 12 hours of mixing the material.
Target moisture content envelope	The range of moisture content (on the dry side of the optimum moisture content), as determined to enable required compaction.

1.3.2 Acronyms

IRI_s	International Roughness Index of a section as defined in Test Method TfNSW T188
NATA	National Association of Testing Authorities, Australia

2 MATERIAL TO BE BOUND

2.1 TYPES

Material To Be Bound (MTBB) in accordance with this Specification includes:

- imported MB20 or MB40 in accordance with Specification TfNSW 3051;
- imported gap graded material complying with TfNSW 3051 except that particle size distribution must comply with Table R76/A.5 or Table R76/E.4 as applicable;
- insitu base and/or subbase material in the existing pavement, which may already have been bound;
- any combination of these materials together with existing bituminous seal, or thin asphalt wearing surface which does not exceed 80 mm thick, and/or patching materials where specified to be incorporated into the pavement course in Annexure R76/A.

2.2 IMPORTED MATERIAL TO BE BOUND

Annexure R76/A will state if imported MTBB is required.

Imported MTBB must comply with the requirements of TfNSW 3051, and any additional requirements stated in Annexure R76/A. Where there is a conflict between these two sets of requirements, the additional requirements in Annexure R76/A take precedence over those in TfNSW 3051.

Frequency of sampling and testing of imported MTBB must comply with TfNSW 3051.

When imported material is combined with insitu material, the combined material particle size distribution must be in accordance with the mix design requirements in Clause 4.1.

HOLD POINT

Process Held:	Supply of imported MTBB.
Submission Details:	Documentation verifying that either: (a) imported MB20 or MB40 complies with TfNSW 3051; or (b) imported gap graded material complies with Table R76/A.5 or R76/E.4 as applicable and with TfNSW 3051 for properties other than particle size distribution.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

2.3 CERTIFIED STOCKPILES

Stockpiles of MTBB that have been tested and shown to conform to the requirements of TfNSW 3051 are designated as Certified Stockpiles.

Prior to the release of MTBB from a Certified Stockpile, provide the Principal with a signed statement certifying that the material from the Certified Stockpile meets the requirements of this Specification and the relevant properties stated in TfNSW 3051. Include NATA endorsed test results with the statement. Indicate clearly in the statement the quantity of material represented by the test results.

HOLD POINT

Process Held:	Deliveries of MTBB from a Certified Stockpile.
Submission Details:	Details of the stockpile, your statement of conformity and documentation specified in TfNSW 3051 regarding conformity.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

Once a stockpile has been certified, do not add any further materials to the stockpile until the additional material has been tested and shown to conform to this Specification. Provide the Principal with test certificates verifying the conformity of all such additional material.

MTBB supplied from Certified Stockpiles will generally not require any further testing.

If subsequent inspection and/or testing of the material at the stockpile or at the point of delivery indicate that the properties of the material have changed since certification, for example, due to segregation, contamination or weathering, the Principal will stop further deliveries of the material, and

require further sampling and testing of the stockpile. The conformity or otherwise of the material will then be reassessed, on the basis of these test results.

Each delivery docket must identify the Certified Stockpile from which the material is supplied.

2.4 SITE STOCKPILES

Delivery of MTBB to site stockpiles must comply with the requirements of Clause 2.5. If the material has not been sourced from a Certified Stockpile, the site stockpile must be certified in accordance with Clause 2.3 prior to using the material.

Place the site stockpiles of MTBB only at the locations shown on the Drawings or approved by the Principal.

You are responsible for preparation of the stockpile sites, unless specified otherwise in Annexure R76/A.

When stockpiling MTBB on site, comply with the following:

- (a) Place stockpiles on firm, even, well-drained ground or over a constructed floor.
- (b) Install and maintain around the stockpiles appropriate erosion and sedimentation controls in accordance with Specification TfNSW G38 for the duration of the Contract;
- (c) Construct stockpiles in a manner which does not result in segregation. Place the material in horizontal layers, with each new additional layer fully within the boundary of the underlying layer. Do not push the stockpile into a cone shape. Stockpiles must be of uniform shape with side slopes neither steeper than 1.5 horizontal to 1 vertical, nor flatter than 3 horizontal to 1 vertical.

The total height of any stockpile must not exceed 4 m, unless approved otherwise by the Principal.

- (d) The worked face of any stockpile must be the full face of the stockpile.
- (e) Keep the stockpile material sufficiently damp to avoid loss of fines and to keep dust levels down.
- (f) Keep the stockpiles separated from each other and maintain them to prevent the stockpiled materials from becoming intermixed, or contaminated with foreign material.
- (g) In the context of sampling and testing, the stockpile may be constructed in either one of the following two ways:
 - (i) the stockpile is built up continuously until it is complete, and once complete, no further material is added to the stockpile, with each stockpile constituting a separate Lot;
 - or
 - (ii) the stockpile is built up incrementally, and any further material added to the stockpile previously verified as conforming is considered to be a new Lot, with the new material first tested and verified as conforming before it is added to the stockpile.
- (h) Clearly and uniquely identify each stockpile by signposting, stating the type and quantity of material present in the stockpile. For the purposes of this Specification, the maximum Lot size for Certified Stockpiles is 4,000 tonnes;

- (i) On completion of Works, clear the stockpile locations of all surplus material and re-vegetate the area in accordance with Specification TfNSW R178.

Include in the PROJECT QUALITY PLAN details of the procedures for the construction, operation and restoration of stockpile sites, and measures to be taken to meet the requirements of this Clause.

2.5 DELIVERY OF IMPORTED MATERIAL TO BE BOUND

Transport MTBB in vehicles which are so constructed that loss of material does not occur. The delivery vehicles used must be suitable for the ground conditions at the Site.

The material must be kept suitably damp to prevent segregation or loss of fines during transit and must, at the time of delivery, have a moisture content (uniformly distributed) not greater than the optimum moisture content as determined by either Test Method TfNSW T111 or T162.

MTBB delivered to the Site which is unsuitable for reasons such as segregation or contamination is deemed to be nonconforming and must not be used in the Works.

Include in the PROJECT QUALITY PLAN the methods for preventing segregation and/or loss of fines during transport.

3 OTHER MATERIALS

3.1 BINDERS

3.1.1 General

For the purpose of this specification, the primary and secondary binder are bitumen and lime respectively.

Use only the binder type or class stated in the approved nominated mix design in the Works.

Include in the PROJECT QUALITY PLAN details of all binders proposed for use in the Works, together with supporting test results traceable to the materials supplied.

Sample and test the binder(s) at the frequency stated in Annexure R76/L. Detail in the PROJECT QUALITY PLAN the method of sampling the binder.

3.1.2 Lime

Lime can be either hydrated lime or quicklime, and must comply with the requirements of Specification TfNSW 3211. Where quicklime is used instead of hydrated lime, adjust the target spread rate in accordance with Clause 5.6.3.

Transport lime in watertight containers and protect the lime from moisture until use. Do not use lime that has become caked or lumpy in the Works.

3.1.3 Bitumen

Bitumen must be Class 170 bitumen, or other bitumen approved by the Principal, and must comply with the requirements of Specification TfNSW 3253.

3.2 FOAMING AGENT

3.2.1 General

A foaming agent may be added to the bitumen to improve its foaming properties.

3.2.2 Material Requirements

The foaming agent if in liquid form must, after agitation and when ready for use, remain free from skinning, precipitation or any other form of deterioration.

The foaming agent must be homogeneous.

Provide details of a reproducible laboratory test to determine the concentration of the active component of the material. Specify an average value for the concentration of the active component, and an acceptable minimum value above which the material is considered to be effective.

3.2.3 Delivery

All containers used to deliver the bitumen foaming agent must be in an undamaged condition.

Mark each container clearly and durably with the following information:

- (a) name of manufacturer and/or supplier;
- (b) product name or trade name (if any);
- (c) product reference number or identification number;
- (d) batch number;
- (e) date of manufacture;
- (f) “use by” date.

3.2.4 Conformity

With each delivery, provide a certificate from the manufacturer that the product delivered conform to the design formulation of the product.

3.3 WATER

Water for use in the Works must be free from deleterious amounts of materials such as oils, acids, alkalis, organic matter and any other material which could affect the chemical reactions.

Water that is not taken from a town water supply system must comply with the requirements shown in Table R76.1.

Table R76.1 – Properties of Non-Town Water

Property	Test Method	Upper Limit
Chloride ion (mg/L)	T1004	600
Sulfate ion (mg/L)	T1014	400
Undissolved solids (% by mass)	AS 3550.4	1

Where recycled water is proposed for use, the water must meet the above requirements and those in Specification TfNSW G36, with the maximum concentration of 1,000 thermo-tolerant coliforms per 100 mL when tested in accordance with Test Method TfNSW T1015.

Include in the PROJECT QUALITY PLAN details of the water proposed for use in the Works, including the water source.

3.4 SAFETY

3.4.1 General

The binders and foaming agent must not contain any known component which, when handled in accordance with accepted road making practice, would cause any person to be exposed to any injurious substance above the legal concentration limit.

3.4.2 Safety Data Sheets

Include in the PROJECT QUALITY PLAN the Safety Data Sheets (SDS) for the binders and foaming agent proposed for use in the nominated mix design and procedures for their safe handling.

3.4.3 Hot Bitumen

Provide Safe Work Method Statements (SWMS) for working with hot bitumen.

Refer to the Austroads Bituminous Materials Safety Guide for guidance on safe handling procedures of hot bitumen.

4 MIX DESIGN

4.1 MIX DESIGN REQUIREMENTS

Nominated mix designs must comply with the mix design requirements stated in TfNSW Technical Direction PTD 2015/001 “Foamed Bitumen Stabilisation”.

In particular, the foamed bitumen must have the following characteristics:

- (a) minimum expansion ratio (ER) of 10;
- (b) minimum half-life (HL) of 20 seconds.

4.2 NOMINATED MIX DESIGN

4.2.1 General

Mix designs may be nominated either by the Principal or by the Contractor. The party responsible for nominating the mix design is stated in Annexure R76/A.

4.2.2 Mix Design Nominated by the Principal

Where the mix design is nominated by the Principal, details of the mix design are given in Annexure R76/A.

Where the mix design is nominated by the Principal, the Contractor may propose an alternative mix design for approval.

4.2.3 Mix Design Nominated by the Contractor

Where the Contractor is required to nominate a mix design, as specified in Annexure R76/A, or where the Contractor proposes an alternative mix design, submit to the Principal, at least 10 working days prior to the commencement of Works, the proposed mix design for approval, including the completed Table R76/E.1.

HOLD POINT

Process Held: Use of each Contractor nominated mix design.

Submission Details: At least 10 working days prior to commencement of the trial section of pavement construction (if specified in Annexure R76/A), or commencement of the pavement works, submit to the Principal details of your nominated mix design(s) and test results verifying conformity of the nominated mix design(s).

Release of Hold Point: The Principal will consider the submitted documents prior to approving the Contractor nominated mix design and authorising the release of the Hold Point.

4.3 SUPPLEMENTARY INFORMATION

For each mix design (whether nominated by the Principal or the Contractor), submit to the Principal, at least 10 working days prior to the commencement of work, the following supplementary information:

(a) Imported Material To Be Bound

- (i) Details of imported MB20 or MB40 and test results verifying conformity to TfNSW 3051.
- (ii) Details of imported gap graded material (if applicable) and test results verifying conformity to either Table R76/A.5 or R76/E.4 as applicable, and to TfNSW 3051 for properties other than particle size distribution.

(b) Insitu Material To Be Bound

- (i) Optimum moisture content and maximum dry density, including associated test results.
- (ii) Target moisture content envelope, only when the mix design is nominated by the Contractor.

(c) Lime

- (i) Brand(s), grade(s) and source.
- (ii) Compliance certificate, including test results verifying conformity to TfNSW 3211.

(d) Bitumen

- (i) Class and source.
- (ii) Compliance certificate, including test results verifying conformity to TfNSW 3253.

- (iii) Foaming properties of bitumen in accordance with Test Method TfNSW T153 without addition of foaming agent, and after addition of foaming agent (only when the mix design is nominated by the Contractor).

(e) Foaming Agent

- (i) Brand, grade and source.
- (ii) Form, whether solid, liquid or paste.
- (iii) Chemical and physical properties.
- (iv) Recommended dosage rate. The dosage rate quoted must be a percentage of the mass of bitumen at 15°C.
- (v) Recommended method and duration of mixing with bitumen.
- (vi) Effective life once mixed with the bitumen.
- (vii) Recommended shelf life.
- (viii) Compliance certificate, including test results verifying conformity to Clause 3.2.

(f) Water

- (i) Source.
- (ii) Test results verifying conformity to Clause 3.3.

(g) Bound Material (only when mix design is nominated by the Contractor)

- (i) Data including test results verifying that the bound material complies with the mix design requirements (refer Clause 4.1).
- (ii) Mix proportions for lime, bitumen, foaming agent and water, expressed as a percentage by dry mass of MTBB.

Any required testing must be carried out in the 12 months immediately preceding the date of submission of the test results to the Principal. All phases of any particular test must be carried out in the same laboratory.

4.4 VARIATION TO NOMINATED MIX DESIGN

If you vary the source, nature or type of any constituent material, or the proportion of any of the constituent materials, by more than 10% from the nominated quantity in either the Principal nominated mix design or the approved Contractor nominated mix design, submit a new nominated mix design for approval in accordance with Clause 4.2.3.

The Hold Point for Clause 4.2.3 will again apply.

5 CONSTRUCTION

5.1 GENERAL

Carry out insitu pavement stabilisation in a manner which will:

- (a) prevent segregation or loss of material;
- (b) produce a product which is homogenous between joints and edges;

- (c) prevent the development of laminations, lenses, pockets, lumps or granules of incompletely mixed pavement material in the pavement.

The entire process from spreading of lime, incorporation of foamed bitumen, mixing with the insitu material, shaping, compacting and trimming must proceed continuously until completion.

Complete TfNSW Form 5113 and submit to the Principal at the completion of each run.

5.2 EQUIPMENT

5.2.1 General

Include in the PROJECT QUALITY PLAN:

- (a) details of your equipment and methods for preliminary pulverisation of the existing pavement, spreading of lime, injection of foamed bitumen, mixing with the unbound material, compacting and trimming, including treatment of overlaps and irregular shaped Lots;
- (b) details of your method for working adjacent to concrete structures such as bridges, pits, manholes or concrete medians.

5.2.2 Bitumen Tanker

The bitumen tanker supplying hot bitumen to the stabiliser must be able to maintain the bitumen temperature for foaming and be equipped with a calibrated dipstick to determine the volume of bitumen in the tanker when parked on a level surface.

The bitumen temperature at the tanker must be between 170°C and 190°C during the stabilisation process.

5.2.3 Stabiliser

The stabiliser must be purpose built for the insitu mixing of pavement materials, capable of mixing to the depth specified, pulverising the existing unbound pavement and/or patches, mixing the pulverised pavement material and distributing both the binder and moisture uniformly to the full depth and over the total area.

The mixing equipment must include the following:

- (a) fully enclosed mixing chamber;
- (b) minimum engine power capacity of 370 kW for width over 2.0 m, and 300 kW for width up to 2.0 m, to ensure adequate mixing of materials;
- (c) computer controlled calibrated bitumen flow meter to determine binder application rate for process control;
- (d) bitumen injection systems linked to the ground speed to ensure an accurate application throughout the runs, irrespective of the speed of the equipment;
- (e) separate “on” and “off” controls for each jet on the bitumen injection bar, to maintain uniform application transversely for overlapping runs;
- (f) temperature gauges to verify bitumen temperature in the injection system;
- (g) heating system for the bitumen injection bar and supply lines to maintain bitumen temperature;
- (h) self-cleaning bitumen jets;

- (i) fitted with a test jet for sampling, to ensure the flow of bitumen and achievement of the required expansion ratio and half-life of the bitumen;
- (j) capable of applying moisture uniformly during mixing through a series of nozzles on a spray bar located inside the mixing hood.

Each nozzle on the spray bar must be independently controlled to ensure a uniform transverse moisture distribution in overlapping runs.

Replace any spray jets, mixing tools, blades or tynes which are worn out or damaged so as to maintain the mixing efficiency demonstrated during the trial section of pavement (refer Clause 5.13).

5.3 WEATHER CONDITIONS

Do not carry out pavement stabilisation when any of the following apply:

- (a) during wet weather or if wet weather appears imminent;
- (b) when the pavement temperature measured at a depth of 50 mm below the surface of the road is below 15°C;
- (c) during periods of high wind, which may result in the loss of binder or become a nuisance or danger to people and property or the environment.

Include in the PROJECT QUALITY PLAN details of procedures for cessation of operations in the event of adverse weather conditions.

5.4 EXISTING PAVEMENT

5.4.1 Existing Wearing Course

Remove and dispose of existing wearing courses which are thicker than 80 mm in accordance with Specification TfNSW R101 unless specified otherwise in Annexure R76/A. Where the existing wearing course does not have to be removed, it can be incorporated into the pavement course after pulverisation.

Imported MTBB may be required to top up the levels after removal of the existing wearing course.

5.4.2 Existing Patches

Where asphalt and cementitious stabilised patches are specified in Annexure R76/A to be incorporated into the pavement course, include in the PROJECT QUALITY PLAN the procedures for their pulverisation and their uniform mixing with adjacent pavement material.

Otherwise, remove and replace the patches with granular material meeting the requirements of TfNSW 3051. Include in the PROJECT QUALITY PLAN the method of removal of patches and their replacement with imported pavement material(s).

5.4.3 Preliminary Pulverisation

Where pulverisation of the existing pavement prior to stabilisation is specified in Annexure R76/A or directed by the Principal, carry out the preliminary pulverisation to the specified depth. Leave the pulverised material at their original location where practical. You may lightly compact the loose material after pulverisation.

Include in the PROJECT QUALITY PLAN the procedures for the pulverisation of the existing pavement and its uniform mixing with other pavement material.

5.5 PLACING OF IMPORTED MATERIAL TO BE BOUND

5.5.1 Increase in Finished Surface Levels

The finished surface levels are either shown on the Drawings or specified in Annexure R76/A.

Where an increase in surface level over that of the existing pavement is specified, place a layer of imported MTBB over the existing pavement in order to achieve the required finished surface levels.

Describe in the PROJECT QUALITY PLAN the procedure to determine the quantity of imported MTBB required, taking into account any bulking following incorporation of binder, and minimising the amount of bound material that needs to be trimmed after compaction.

5.5.2 Spreading and Mixing Imported MTBB

Spread and mix the imported MTBB into the existing pavement material, with sufficient passes of the mixing equipment to ensure uniform distribution of the imported MTBB, and partially compact the mixed material prior to carrying out stabilisation.

5.6 SPREADING AND MIXING OF SECONDARY BINDER

5.6.1 General

Include in the PROJECT QUALITY PLAN the procedures, and inspection and test plan, for spreading and mixing of lime.

5.6.2 Alternative Construction Method

Any proposed procedure for incorporation of lime by methods other than spreading the lime on the pavement in advance of mixing is termed an Alternative Construction Method.

HOLD POINT

Process Held: Use of an Alternative Construction Method.

Submission Details: Details of the procedures, and inspection and test plan, for spreading and mixing of lime, and documents verifying calibration of the spread rate at a demonstration or during construction of the trial section of pavement.

Release of Hold Point: The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

5.6.3 Design and Field Target Spread Rates of Lime

Determine the Design Target Spread Rate of lime in kg/m² from the approved nominated mix design and the specified (compacted) pavement course thickness using Table R76/E.2.

Prior to the commencement of the stabilisation work, submit to the Principal the completed Table R76/E.2.

Add a minimum tolerance of 0.2 kg/m² to the Design Target Spread Rate to obtain the Field Target Spread Rate. Where quicklime is used, multiply the Field Target Spread Rate for hydrated lime by a factor of 0.76. These steps are shown in TfNSW Form 5113.

5.6.4 Spreading of Lime

Spread lime at a controlled rate, using vehicles fitted with load cells or other forms of weighing systems capable of providing a recordable output of the rate at which the lime is applied.

Spreading must be visually uniform throughout each spreader run.

Include in the PROJECT QUALITY PLAN the method of continuous monitoring of spread rate and the calibration method.

If quicklime is used, it must be fully slaked prior to mixing by adding water. Include in the PROJECT QUALITY PLAN details of the process of slaking of quicklime and an inspection and test plan for verifying that the quicklime is fully slaked. Adjust the moisture content if required to conform with the target moisture content envelope.

5.6.5 Consistency of Spreading

Initially, verify the consistency of spreading by conducting tray tests in accordance with Test Method TfNSW T136 during construction of the trial section of pavement (refer Clause 5.13), or the first Lot of pavement construction if a trial section of pavement is not required.

Perform one tray test in accordance with TfNSW T136 for every 100 m run of the initial pavement construction, with at least two tests per run, and compare the spread rate determined by TfNSW T136 with that determined using load cells. The first tray test must be undertaken within 30 m of the start of the run.

If the spread rate as determined using load cells is not within $\pm 10\%$ of that determined by TfNSW T136, continue with the tray tests for all subsequent Lots until there is consistency to within $\pm 10\%$ between the spread rate determined using load cells and that determined by TfNSW T136.

5.6.6 Mixing of Lime

Where lime is mixed with the pavement material before the incorporation of foamed bitumen, the spread lime must be mixed into the pavement material to no more than 90% of the stabilised pavement thickness specified in Annexure R76/A.

During the lime mixing process, water may be added to ensure that the moisture content of the pavement material is within the target moisture content envelope (refer to Clause 5.9).

Include in the PROJECT QUALITY PLAN details of the mixing operation, proposed width of passes and nominated depth of mixing to ensure uniform distribution of lime is achieved.

Where visual inspection indicates that the lime is not uniformly mixed with the pavement material and/or the moisture distribution throughout the pavement course is variable, carry out additional passes with the mixing equipment to improve the uniformity of:

- (a) material being stabilised; and/or
- (b) distribution of lime; and/or
- (c) distribution of moisture.

Level and lightly compact the mixed material prior to the addition of foamed bitumen.

5.7 APPLICATION AND MIXING OF PRIMARY BINDER

5.7.1 General

Prior to mixing, all bitumen foaming equipment must be heated to ensure that the mix produced is at a constant temperature from the start to finish of the work.

5.7.2 Design and and Field Target Application Rates of Bitumen

Determine the Design Target Application Rate of bitumen in kg/m^2 from the approved nominated mix design and the specified (compacted) pavement course thickness using Table R76/E.3.

Prior to the commencement of the stabilising work, submit to the Principal the completed Table R76/E.3.

Convert the Design Target Application Rate of bitumen in kg/m^2 to the Application Rate, measured by volume at 15°C , by dividing it by a factor of 1.04. Obtain the Field Target Application Rate, measured by volume at field temperature, by multiplying it with the factor in Table 1 of TfNSW Form 5113. These steps are shown in TfNSW Form 5113.

5.7.3 Mixing of Bitumen

Where a foaming agent is to be used, incorporate the agent into the bitumen in accordance with the manufacturer/supplier's recommendations, prior to determining the expansion ratio and half-life. Include in the PROJECT QUALITY PLAN details of the method and duration of mixing the foaming agent with bitumen.

Before mixing commences, determine the foamed bitumen expansion ratio and half-life (in accordance with TfNSW T153) using the external inspection jet of the stabiliser. Test each bitumen tanker load. If the tanker is held overnight, repeat the tests at the start of tanker discharge. Provide test results immediately to the Principal.

Do not undertake stabilisation when the foaming characteristics do not meet the values specified in Clause 4.1.

Apply the foamed bitumen immediately after the lime spreading and within the same shift as the lime spreading.

Incorporate foamed bitumen to the full pavement depth specified in Annexure R76/A in one mixing pass.

Include in the PROJECT QUALITY PLAN the method of continuous monitoring of application rate, and the calibration method.

Where visual inspection indicates that the foamed bitumen is not uniformly mixed with the pavement material and/or the moisture distribution throughout the pavement course is variable, carry out additional passes with the mixing equipment to improve the uniformity of:

- (a) material being stabilised; and/or
- (b) distribution of foamed bitumen; and/or
- (c) distribution of moisture.

Cease mixing if bitumen streaks or blotches or bitumen rich agglomerations form in the mixed material.

5.8 SPILLAGE OF BINDERS AND FOAMING AGENT

Remove, as soon as possible and not later than 12 hours, any spillage of binder and foaming agent on the Site or at any loading location.

Include in the PROJECT QUALITY PLAN your procedures for dealing with spillage of binder and foaming agent in accordance with TfNSW G36 and the relevant SDS.

Do not incorporate spilled bitumen, foaming agent or lime into the pavement material.

5.9 MOISTURE CONTENT

Where the mix design is nominated by the Principal, the target moisture content envelope will be specified by the Principal in Annexure R76/A.

Where the mix design is nominated by the Contractor, taking into account the bitumen content, develop a work method and target moisture content envelope that will ensure that:

- (a) there is adequate moisture in the pavement material to achieve the specified compaction;
- (b) the pavement is capable of carrying the traffic load without shoving or ravelling on completion of compaction.

Moisture must be uniformly distributed throughout the depth immediately prior to compaction. Adjust the moisture content of the material until it is within the target moisture content envelope.

Include in the PROJECT QUALITY PLAN the procedure to incorporate water in the MTBB and to achieve a uniform distribution of water and within the target moisture content envelope.

5.10 COMPACTION

Commence compaction immediately after mixing of the foamed bitumen into the pavement material. Compaction must be a continuous operation and must be completed within the same shift as the mixing.

Compact the stabilised pavement to its full depth over the entire area, except for the areas adjacent to fresh joints, as stated in Clause 5.11.2.

Include in the PROJECT QUALITY PLAN details of the procedure to be followed to ensure that the specified compaction is achieved.

5.11 JOINTS

5.11.1 General

Include in the PROJECT QUALITY PLAN details of the locations and types of construction joints, treatment of overlaps and irregular shaped Lots, locations of unsupported edges, and compaction rolling pattern.

HOLD POINT

Process Held:	Stabilisation of pavement material.
Submission Details:	Locations and types of construction joints, treatment of overlaps and irregular shaped Lots, locations of unsupported edges and compaction rolling pattern.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

5.11.2 Fresh Joints

A joint is deemed to be fresh when the pavement material adjacent to both sides of the joint has been stabilised within 2 hours.

A fresh joint does not constitute a Lot boundary.

Where a fresh longitudinal joint between adjacent runs is to be compacted, do not compact material mixed in the first run that is within 300 mm of the joint until the adjacent material in the second run is ready for compaction. Keep the joint moist until the start of the second run.

The moisture content in the vicinity of the joint must be within the target moisture content envelope.

5.11.3 Transverse and Longitudinal Construction Joints

Plan and carry out the work in a manner which minimises the number of joints.

The layout of joints must conform to the following requirements:

- (a) Transverse joints must be formed at right angles to the road centreline.
- (b) Longitudinal joints must:
 - (i) not be located at wheel paths;
 - (ii) be formed within ± 100 mm of separation lines of travel lanes;
 - (iii) be located at a minimum distance of 300 mm away from the edge lines and located within the shoulder area.

5.11.4 Stabilisation Adjacent to Joints

Carry out stabilisation in a manner which ensures that there is no unbound material between joints.

Ensure consistent distribution of binder and mixing and compaction at the joint.

Include in the PROJECT QUALITY PLAN details of overlap and/or cutting back of previously stabilised material to ensure a consistent distribution of binder, mixing and compaction at the joint,

5.11.5 Disposal of Cutback Material

Dispose of all cutback material. Do not incorporate cutback material into subsequent pavement courses.

Include in the PROJECT QUALITY PLAN the method of disposal of waste material.

5.12 TRIMMING

5.12.1 General

On completion of compaction, carry out trimming to produce a surface which is parallel to the finished wearing surface.

Include in your PROJECT QUALITY PLAN details of your method of trimming and survey control to ensure that the pavement course thickness is not reduced during trimming to the extent that it is nonconforming with respect to thickness as specified in Clause 7.4.

Trimming must be completed within the same shift as mixing and compaction.

Carry out trimming in preparation for a prime, primerseal or seal only when the surface can be cut without causing damage to the pavement surface.

5.12.2 Pavement Surface After Trimming

Include in the PROJECT QUALITY PLAN a procedure which ensures that, after trimming, the finished surface of the pavement is a tightly bound matrix of coarse and fine material without a slurry of fines.

No roller marks must remain on the pavement surface after trimming.

5.12.3 Disposal of Trimmed Material

Dispose of all trimmed material. Do not incorporate trimmed material into subsequent pavement course.

Include in the PROJECT QUALITY PLAN the method of disposal of the trimmed material to waste.

5.13 TRIAL SECTION OF PAVEMENT

5.13.1 General

When so specified in Annexure R76/A, construct a trial section of pavement at a location agreed with the Principal, using the same materials, equipment and methods described in the PROJECT QUALITY PLAN. When an Alternative Construction Method as stated in Clause 5.6.2 is proposed, demonstrate compliance with the requirements of Clause 5.6.2 during the trial.

The trial section of pavement must be between 100 m and 200 m long or any other length approved by the Principal for the proposed Lot width.

Demonstrate that, for the work at the trial section of pavement, the specified compaction, course thickness and levels as well as the specified pavement properties can be achieved.

WITNESS POINT

Process Witnessed: Construction of trial section of bound pavement.

Submission Details: Notification of the construction of the trial section of pavement at least 3 working days prior to commencement.

HOLD POINT

Process Held:	Construction of bound pavement.
Submission Details:	Documentation, including test results, verifying that the trial section of pavement conforms to the specified requirements.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

5.13.2 Nonconformities

If there are nonconformities in the trial section of the pavement, the Principal may require the construction of a further trial section of pavement before releasing the Hold Point. The Principal may also require your proposed disposition to include modifications to the equipment and/or methods of construction.

Treat any nonconforming trial section of pavement in accordance with Clause 7.11.

5.13.3 New Trial Section

The Principal can require a new trial section of pavement to be carried out when you make changes to plant, equipment, method of construction, materials, mix, rate of work or when any material or work does not comply with this Specification.

5.14 PROTECTION OF WORK

5.14.1 Adequate Drainage

Provide adequate drainage of all working areas throughout the period of construction to avoid ponding or scouring.

5.14.2 Trafficking of Newly Placed Pavement

Except for construction plant and vehicles carrying out the construction or testing of a particular section of pavement, do not allow traffic to travel over the spread material prior to completion of mixing.

Do not traffick the stabilised pavement within 3 hours of compaction.

Do not allow the surface to dry up to the extent that excessive dust will be generated by traffic.

5.14.3 Temporary Roadways and Detours

Provide temporary roadways or detours in accordance with Specification TfNSW G10 during construction of the pavement.

Where it is not practicable to provide temporary roadways or detours, the pavement may be constructed in stages; with only part of the width of the pavement being constructed at each stage so that traffic may use the remaining width not under construction.

Include in the PROJECT QUALITY PLAN details of the procedures to comply with this Clause.

5.15 BITUMINOUS SEAL

Spraying of bituminous seal can only commence when the bound pavement surface is sufficiently firm, neatly and tightly bound without a slurry of fines, and ready to receive the sprayed bituminous seal without punching of the sealing aggregates into the bound pavement layer.

Where so specified in Annexure R76/A, assess the surface of the base course by ball penetration test in accordance with Test Method TfNSW T271 prior to applying a bituminous seal.

Where so specified in Annexure R76/A, apply either a prime, primerseal or seal on the bound pavement surface. Application of prime, primerseal or seal must be in accordance with either Specification TfNSW R106 or R107, as specified in Annexure R76/A.

HOLD POINT

Process Held:	Priming, primersealing or sealing of surface of bound pavement course.
Submission Details:	Conformity reports verifying that each Lot conforms with respect to specified level, thickness, surface deviation and compaction, and notification that the bound pavement course is ready for sprayed sealing.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

6 SURVEY

6.1 GENERAL

Carry out survey in accordance with Specification TfNSW G71.

During the progress of the Work, carry out surveys to determine the levels at:

- (a) bottom of the bound pavement course; and
- (b) top of the bound pavement course.

Determine the levels using a survey staff (or reflector) with a flat base of area between 300 mm² and 4,000 mm². Allow for seal thickness in determining the levels. Where the survey is undertaken for a sealed surface, remove any loose foreign matter, including loose aggregates, before the survey and determine the levels by deducting the Average Least Dimension of the cover aggregate of the seal.

6.2 SURVEY OF FINISHED SURFACE LEVELS

6.2.1 Finished Surface Levels Not Shown on Drawings

Where the bound pavement course finished surface levels must be compared with existing surface levels to assess conformity, survey the existing surface levels before the spreading and mixing of binder.

Where an increase in surface level over that of the existing pavement is specified in Annexure R76/A, either:

- (a) obtain by survey the existing surface levels before spreading and mixing of binder and again, after trimming, obtain by survey the bound pavement surface level, to assess conformity; or
- (b) obtain by survey the levels at recoverable points on the existing pavement surface before and after stabilisation.

Survey locations must be along a 100 m line, at a constant offset which is not greater than 4.5 m from the road centreline, and can be on either side of the road centreline. Select and survey the end points of each line so as to be recoverable to an accuracy of ± 100 mm.

Describe the method of selection of the 100 m line in the PROJECT QUALITY PLAN.

Record the levels at 10 equidistant points along the line, both before placing imported MTBB and after trimming of the stabilised material. The average of the increase in level at these 10 points is the increase in surface level at that sampling location.

Obtain the average increase in level at 2 sampling locations per Lot to assess whether the increase in level conforms to the nominated increase in level specified in Annexure R76/A. A Lot must not exceed one day's stabilisation work or a surface area of 5,000 m² and must be surveyed at two sampling locations (100 m lines).

6.2.2 Finished Surface Levels Shown on Drawings

Where finished surface levels are shown on the Drawings, survey the bound pavement course finished surface level to assess conformity.

6.3 SURVEY FOR THICKNESS

On completion of mixing but prior to compaction, measure the levels at the bottom of the bound pavement course at the locations where samples will be taken for compaction assessment (refer Clause 7.3).

Following compaction and trimming to final levels, measure the levels at the top of the bound pavement course at the same corresponding locations (within ± 50 mm in the horizontal plane).

7 CONFORMITY

7.1 GENERAL

Each Lot must comply with the following requirements. Nonconforming Lots must be dealt with in accordance with Clause 7.11.

7.2 BINDER APPLICATION RATE

7.2.1 Lime Spread Rate

Submit the following information to the Principal on completion of each spreader run:

- (a) Chainages and offsets of start and finish locations.
- (b) Width of spread.
- (c) Quantity of lime spread. If monitored by both tray tests and load cells concurrently, provide information for both.

- (d) Calculated actual lime spread rate, expressed as a percentage of the Field Target Spread Rate (measured in kg/m²), initially for each 100 m length (refer Clause 5.6.5) and subsequently for each 200 m length once consistency of spreading has been established.

When measuring at 200 m lengths, combine any length less than 200 m with the length preceding it, and determine the spread rate as an average over the combined length.

The calculated actual average spread rate of a mixing run (assessed by tray test or load cell) must be within $\pm 5\%$ of the Field Target Spread Rate of the nominated mix design, and each individual test result (tray test at every 100 m or load cell assessment at every 200 m) must be within 0% to +10% of the Design Target Spread Rate.

Submit to the Principal at the end of each day the total tonnage of lime used, the area stabilised and the calculated actual spread rate.

7.2.2 Bitumen Application Rate

Submit the following information to the Principal on completion of each spreader run:

- (a) Chainages and offsets of start and finish locations.
- (b) Width of bitumen spray and depth of mixing.
- (c) Dosage of foaming agent used.
- (d) Dip taken from bitumen tanker on level ground, and measured bitumen temperature at start of run.
- (e) Results of checking of nozzles for blockage.
- (f) Dip taken from bitumen tanker on level ground, and measured bitumen temperature at end of run.
- (g) Quantity of bitumen used, determined from dips taken from bitumen tanker.
- (h) Calculated average actual bitumen application rate for each mixing run, expressed as a percentage of Design Bitumen Target Application Rate by mass.

The average actual bitumen application rate (kg/m²) of each mixing run must be within 0% to +10% of the Design Bitumen Application Rate.

Submit to the Principal at the end of each day the total tonnage of bitumen used and the area stabilised.

7.3 COMPACTION AND MOISTURE CONTENT

Determine the sampling locations for each Lot in accordance with TfNSW Q. Each Lot must be visually homogenous.

For each sampling location, obtain the insitu density and take samples for determining the field moisture content and the maximum wet density in the laboratory.

7.3.1 Insitu Density

Carry out insitu density tests in accordance with Test Method TfNSW T173 on the stabilised material within 2 hours after completion of compaction.

The depth of testing is as follows:

- (a) **Pavement course ≤ 250 mm thick:**

as close to the bottom of the stabilised pavement course as the probe will allow.

(b) Pavement course > 250 mm:

- (i) at depth “Y”, equal to 150 mm;
- (ii) at depth “X”, which is as close to the bottom of the stabilised pavement course as the probe will allow, or at the maximum extension of the probe (300 mm) where the course thickness exceeds 300 mm.

(Refer to TfNSW T173 showing which part of the layer the dimensions “X” and “Y” refer to.)

Determine the wet density D_z for the lower part of the stabilised pavement course in accordance with TfNSW T173.

Repair nuclear density test holes with freshly mixed material identical to that of the surrounding pavement. Compact the repair material within 2 hours of placing to the same extent as that of the surrounding pavement. Detail in the PROJECT QUALITY PLAN the method of repairing test holes.

7.3.2 Maximum Wet Density

The location of the sample for the determination of maximum wet density must be the same as that for the determination of insitu density.

Determine the maximum wet density in accordance with TfNSW T162 on a sample taken prior to compaction. Compact the sample within 3 hours of sampling.

Record and report the time of commencement of mixing of the material at the sampling location and the time of sampling.

7.3.3 Relative Compaction

Calculate the relative compaction in accordance with Test Method TfNSW T166.

Determine the characteristic value of relative compaction in accordance with TfNSW Q and report to one decimal place.

For pavement course ≤ 250 mm thick, the characteristic value of relative compaction, based on the wet density measured as close to the bottom of the course as the probe will allow, must be $\geq 106\%$.

For pavement course > 250 mm thick:

- (a) the characteristic value of relative compaction, based on the wet density measured as close to the bottom of the stabilised course as the probe will allow, or at the maximum extension of the probe (300 mm), where the course thickness exceeds 300 mm, must be $\geq 104\%$; and
- (b) the individual value of relative compaction, based on the calculated wet density D_z for the lower part of the stabilised pavement course, must be $\geq 99\%$.

Record and report the following:

- (i) test locations;
- (ii) relative compaction result(s) for the pavement depth at each location; and
- (iii) characteristic value of relative compaction of each Lot.

7.3.4 Field Moisture Content

At each test location where an insitu density test is to be performed, take a sample for the determination of field moisture content. Take samples immediately after the mixing of foamed bitumen but prior to compaction.

Determine the moisture content in accordance with Test Method TfNSW T120, T121 or T180.

The field moisture content must be within the target moisture content envelope as specified in Clause 5.9.

7.4 THICKNESS

After final trimming, the bound pavement course thickness at any point as determined in accordance with Clause 6.3 must be 10 mm to 30 mm above the thickness shown on the Drawings or specified in Annexure R76/A.

7.5 SURFACE LEVELS

After final trimming, the pavement surface must be parallel to the design finished surface.

The surface levels after final trimming must be between 0 and 10 mm above the finished surface levels shown on the Drawings or specified in Annexure R76/A.

7.6 SURFACE DEVIATION

After final trimming, test the surface with a 3 m straight edge laid in any direction.

Include in the PROJECT QUALITY PLAN details of the planned locations for taking straight edge measurements.

The surface of the bound pavement course must not deviate from a 3 m straight edge laid in any direction by more than 5 mm. Additionally, there must be no abrupt change of levels in the transition from the pavement to fixed structures such as a bridge deck, or adverse changes that will affect surface pavement drainage.

7.7 RIDE QUALITY

Where so specified in Annexure R76/A, measure the ride quality of the finished pavement surface within 2 weeks after the prime, primerseal or seal has been applied and swept, with either:

- (a) a calibrated NAASRA Roughness Meter in accordance with Test Method TfNSW T182; or
- (b) a laser profilometer in accordance with TfNSW T188.

Include in the PROJECT QUALITY PLAN details of the equipment to be used for measuring the ride quality of the finished pavement surface, and associated calibration data.

Where the NAASRA Roughness value over a 100 m survey interval is less than 65 counts/km (equivalent to IRI_s value of 2.5 m/km), incentives or deductions in accordance with Annexure R76/B will apply.

Where the NAASRA Roughness value over a 100 m survey interval is equal to or exceeds 65 counts/km (equivalent to IRI_s value of 2.5 m/km), the pavement course constructed for that length

must be either reworked, or removed and replaced.

7.8 WIDTH

Measure the width of bound pavement between the outside edges of the bound pavement course.

The width of bound pavement must not be less than the width shown on the Drawings or specified in Annexure R76/A.

7.9 BASE SURFACE ASSESSMENT

Where so specified in Annexure R76/A, at each location where an insitu density test is performed, determine the average ball penetration value, *Pen*, at the surface of the base course in accordance with TfNSW T271.

The test location for the ball penetration test must be within 0.5 m of the density test location, and each of the 5 test points required by TfNSW T271 for a test location must be on surfaces undisturbed by the density test sampling and subsequent repair.

Calculate the characteristic value of *Pen* for a Lot in accordance with TfNSW Q Clause L3.2.

Conformity of a Lot for base surface assessment is achieved where:

- (a) the value of *Pen* at each test location is less than 3.0 mm; and
- (b) the characteristic value of *Pen* for a Lot as calculated above is less than 2.5 mm.

7.10 CERTIFICATE OF CONFORMITY

Unless approved otherwise by the Principal, submit weekly to the Principal a signed certificate verifying conformity with the requirements of Clause 7.

Where appropriate, submit with the certificate a summary of test results from a laboratory accredited by NATA. Additionally, submit daily to the Principal the moisture content and relative density test results.

Highlight any nonconforming Lots.

7.11 TREATMENT OF NONCONFORMING LOTS

7.11.1 General

Where a Lot is nonconforming, submit to the Principal a Nonconformity Report and your proposed disposition for the Lot.

Lots that are nonconforming with respect to compaction or ride quality may be accepted with a deduction in accordance with Annexure R76/B. Nonconforming Lots not accepted with a deduction must be either rectified or replaced.

HOLD POINT

Process Held:	Rectification or replacement of a nonconforming Lot.
Submission Details:	Nonconformity Report and details of your proposal to rectify or replace the Lot.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

7.11.2 Rectification

Where rectification by re-stabilisation is proposed, in conjunction with an appropriate NATA registered laboratory, prepare and submit to the Principal a re-stabilisation proposal which takes into account the effects of the binder already incorporated in the rejected Lot.

Where rectification by an alternative to re-stabilisation is proposed, submit to the Principal:

- (a) your proposed alternative, supported by pavement design calculations;
- (b) NATA endorsed test certificates and a report of the investigations carried out; and
- (c) proposed method of carrying out the work.

7.11.3 Removal and Replacement

Removal and replacement of pavement course must comply with the requirements of this Specification.

7.11.4 Cost of Rectification

The costs of rectifying, or removal and replacement, of nonconforming Lots, including any restoration work to any underlying or adjacent surface or structure which becomes necessary as a result of such rectification or replacement, will be borne by you.

ANNEXURE R76/A – PROJECT SPECIFIC REQUIREMENTS**A1 AREAS OF WORK AND FINISHED SURFACE LEVELS**

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R76/A)

Complete the tables below by deleting whichever option is not applicable and filling in the required details. If “areas of work” are shown on the Drawings, delete Table R76/A.2 in its entirety.

In Table R76/A.2 below, “Road Reference” can be the road name, control line designation or RoadLoc reference. “From” and “To” can be the road intersection name, chainage or RoadLoc reference.

Table R76/A.1 – Areas of Work and Finished Surface Levels

Clause	Description	Requirement
1.2.1	Areas of work shown on	Drawings / Table R76/A.2
6.2	Finished surface levels are	shown on Drawings / to match existing surface levels / to be mm above existing surface levels

Table R76/A.2 – Specified Areas of Work

Road Reference	Location		Stabilised Pavement	
	From	To	Width (m)	Thickness (mm)

A2 OTHER PROJECT SPECIFIC REQUIREMENTS

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R76/A)

Complete the table below by deleting whichever option is not applicable and filling in the required details.

Notes:

1. Item relating to Clause 5.4.1: existing wearing course thicker than 80 mm must be removed unless the pavement design has catered for incorporation of wearing courses thicker than 80 mm into the pavement.
2. Item relating to Clause 5.9: specify the target moisture content envelope only where the mix design is to be nominated by the Principal. In this case, the default value is “60 – 70%”. Otherwise, insert the words “By Contractor”.

Table R76/A.3 – Other Project Specific Requirements

Clause	Description	Requirement
2.2	Imported MB20 or MB40 required	Yes / No
2.2	Imported gap graded material required	Yes / No
2.4	Preparation of stockpile site by Contractor	Yes / No
4.2.1	Mix design nominated by	Principal / Contractor
5.4.1	Removal and disposal of existing wearing course thicker than 80 mm required ⁽¹⁾	Yes / No
5.4.2	Incorporation of patches into pavement course after pulverisation required	Yes / No
5.4.3	Preliminary pulverisation of entire area required	Yes / No
	If yes, depth of pulverisation required (mm)	
5.9	Target moisture content envelope (% of OMC of MTBB) ⁽²⁾	
5.13.1	Trial section of pavement required	Yes / No
5.15	Application of the following bituminous sealing layer required:	
	Prime	Yes / No
	Primerseal	Yes / No
	Seal	Yes / No
5.15	Application of prime, primerseal or seal to be in accordance with	R106 / R107
7.7	Measurement of ride quality required	Yes / No
	Ride quality incentives/deductions in Table R76/B.2 applicable	Yes / No
5.15, 7.9	Base surface assessment by ball penetration test required	Yes / No

Note:

- ⁽¹⁾ If removal and disposal of existing wearing course thicker than 80 mm is not required, or if existing wearing course is not thicker than 80 mm, then wearing course may be incorporated into pavement course after pulverisation.

- ⁽²⁾ Target moisture content envelope specified above only where mix design is nominated by the Principal. Otherwise, the Contractor is to nominate the target moisture content envelope in accordance with Clause 5.9.

A3 ADDITIONAL REQUIREMENTS FOR IMPORTED MATERIAL TO BE BOUND

Refer Clause 2.2.

Insert here any additional requirements for imported MTBB.

A4 PRINCIPAL NOMINATED MIX DESIGN

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R76/A)

Provide in Table R76/A.4 below details of the mix design where the mix design is to be nominated by the Principal. If mix design is to be nominated by the Contractor instead of the Principal, delete the entire contents of this Clause and replace the heading title with “Not Used”.

Complete Table R76/A.5 below if relevant; otherwise delete table entirely.

Refer Clause 4.2.2.

Table R76/A.4 – Principal Nominated Mix Design Details

Nominated Dry Density of MTBB (t/m³)	Design Lime Application Rate (% by Mass ⁽¹⁾)	Design Bitumen Application Rate (% by Mass ⁽¹⁾)

Note:

- ⁽¹⁾ Percent by dry mass of MTBB.

Table R76/A.5 – Particle Size Distribution of Gap Graded Material

Sieve Size (mm)	Percentage Passing
26.5	
19.5	
9.5	
4.75	
2.36	
1.18	
0.6	
0.425	
0.3	
0.15	
0.075	

ANNEXURE R76/B – MEASUREMENT AND PAYMENT AND DISPOSITION OF NONCONFORMITIES

B1 MEASUREMENT AND PAYMENT

Payment will be made for all costs associated with completing the work detailed in this Specification, excluding removal and disposal of existing wearing surface and placement of new bituminous seal, in accordance with the following Pay Items.

If applicable, removal and disposal of existing wearing surfaces thicker than 80 mm and asphalt patches will be paid for under TfNSW R101; placement of new bituminous seal will be paid for under the pay items in the specification nominated in Annexure R76/A (either TfNSW R106 or R107).

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

Unless specified otherwise, a lump sum price for any of these items will not be accepted.

Pay Item R76P1 - Insitu Stabilisation Using Foamed Bitumen

The unit of measurement is the “square metre”.

The quantity is determined by multiplying the stabilised pavement width specified in Annexure R76/A by the length of stabilised pavement, including any additional areas such as parking areas, slip lanes, etc directed to be stabilised. No account will be taken of the course thickness tolerances or any over-spread of lime or over-application of bitumen or at areas outside of the area specified for treatment.

This Pay Item must cover all costs associated with insitu stabilisation in accordance with the requirements of this Specification.

Pay Item R76P2 – Preliminary Pulverisation of Existing Pavement

The unit of measurement is the “square metre”.

The quantity is determined by multiplying the width specified in Annexure R76/A by the length of the existing pavement to be pulverised, including any additional areas such as parking areas, slip lanes, etc directed to be pulverised.

This Pay Item must cover all costs associated with preliminary pulverisation in accordance with the requirements of this Specification.

Pay Item R76P3 – Supply and Spreading of Imported Material To Be Bound

Unless approved otherwise by the Principal, the unit of measurement is the “tonnes” of imported Material To Be Bound, as determined by registered weighbridge dockets or other approved method.

Where the Principal approves payment based on conversion to tonnes from the volume in cubic metres of loose material, the quantity must be confirmed by haulage records that show the following:

- (a) truck driver;
- (b) truck owner;
- (c) truck registration;

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- (d) truck tare mass;
- (e) volume capacity (m³);
- (f) date of loading and delivery;
- (g) time of loading and delivery;
- (h) tallyperson's signature.

This Pay Item covers all costs associated with the supply, stockpiling and haulage of imported Material To Be Bound, spreading of the material on existing pavement, trimming and partial compaction of the material immediately before stabilisation. The costs of moisture content control and stabilisation of the material are included in Pay Item R76P1.

B2 DEDUCTIONS FOR NONCONFORMITIES AND INCENTIVES

Lots that are nonconforming with respect to compaction or ride quality may be accepted with a deductions to the rate for Pay Item R76P1, as specified hereunder.

The deduction is applied to the quantity of material in the Lot(s) represented by the test results.

(a) Compaction (refer to Clause 7.3.3)

Where the characteristic value of relative compaction of a Lot is nonconforming, deductions in accordance with Table R76/B.1 will apply.

Table R76/B.1 – Deductions for Relative Compaction

Pavement Course Thickness ≤ 250 mm		Pavement Course Thickness > 250 mm	
Relative Compaction ⁽¹⁾	Deduction ⁽²⁾	Relative Compaction ⁽¹⁾	Deduction ⁽²⁾
≥ 105 to < 106%	10%	≥ 102 to < 104%	10%
≥ 104 to < 105%	30%	≥ 99 to < 102%	30%
< 104%	Reject ⁽³⁾	< 99%	Reject ⁽³⁾

Notes:

- ⁽¹⁾ Characteristic value of relative compaction.
- ⁽²⁾ Applied as % deduction to rate for Pay Item R76P1 for quantity represented by test results.
- ⁽³⁾ Rectify, or remove and replace, quantity represented by test results.

In addition, where the course thickness exceeds 250 mm, and the relative compaction calculated for the lower layer is less than 99% at one or more points, the Lot may be accepted but with a deduction of 20% to the rate for pay item R76P1 for the Lot. This deduction is in addition to the deductions specified in Table R76/B.1.

(b) Ride Quality (refer to Clause 7.7)

Where the NAASRA Roughness value over a 100 m survey interval is less than 65 counts/km, incentives or deductions to the rate for Pay Item R76P1 in accordance with Table R76/B.2 will apply.

Where the NAASRA Roughness value over a 100 m survey interval is equal to or exceeds 65 counts/km (equivalent to IRI_s value of 2.5 m/km), the pavement course constructed for that length must be either reworked, or removed and replaced.

Table R76/B.2 – Incentives and Deductions for Ride Quality

NAASRA Roughness (counts/km) over 100 metre length	Equivalent IRI_s (m/km) over 100 metre length	Incentives/Deductions ⁽¹⁾
< 20	< 0.80	+ 3%
20 – 24	0.80 – 0.95	+ 2%
25 – 34	0.96 – 1.35	+ 1%
35 – 39	1.36 – 1.55	Nil
40 – 49	1.56 – 1.95	– 2%
50 – 54	1.96 – 2.10	– 4%
55 – 59	2.11 – 2.30	– 8%
60 – 64	2.31 – 2.50	– 16%
≥ 65	> 2.50	Reject ⁽²⁾

Notes:

⁽¹⁾ Applied as % incentive or deduction to rate for Pay Item R76P1 for quantity represented by test results.

⁽²⁾ Rectify, or remove and replace, quantity represented by test results.

ANNEXURE R76/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Clause	Type	Description
2.2	Hold	Verification of imported MTBB
2.3	Hold	Certification of stockpiles
4.2.3	Hold	Submission of Contractor nominated mix design
5.6.2	Hold	Submission of details of proposed Alternative Construction Method
5.11.1	Hold	Locations and types of construction joints, treatment of overlaps and irregular shaped Lots, locations of unsupported edges and compaction rolling pattern
5.13.1	Witness	Construction of trial section of pavement
5.13.1	Hold	Submission of documentation verifying conformity of trial section of pavement
5.15	Hold	Submission of reports verifying conformity of level, thickness, surface deviation and compaction prior to placing bituminous seal
7.11.1	Hold	Submission of Nonconformity Report and rectification proposal

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW Q Annexure Q/E.

Clause	Description of Identified Record
2.2	Documentation verifying conformity of imported MTBB
2.3	Certification of stockpiles
3.1.2	Certificates of lime
3.1.3	Certificates of bitumen
3.2	Certificates of foaming agent
3.3	Certificates of water
4.2.3	Approved Contractor nominated mix design details
4.3	Supplementary Information and test results
4.4	Variation to approved Contractor nominated or Principal nominated mix design
5.6.2	Details of Alternative Construction Method
5.6.3	Completed Table R76/E.2 and calculations
5.7.2	Completed Table R76/E.3 and calculations
5.9	Target moisture content envelope

Clause	Description of Identified Record
5.11.1	Locations and types of joints, treatment of overlaps and irregular shaped Lots, locations of unsupported edges and compaction rolling pattern
5.13.1	Conformity documentation for trial section of pavement
7.4	Thickness of bound pavement course
7.10	Certificate of conformity

ANNEXURE R76/D – PLANNING DOCUMENTS

Refer to Clause 1.2.4.

The following documents are a summary of documents that must be included in the PROJECT QUALITY PLAN. The requirements of this Specification and others included in the Contract must be reviewed to determine additional documentation requirements.

Clause	Description
2.4	Procedures for construction, operation and restoration of stockpile sites
2.5	Methods to prevent segregation and/or loss of fines during delivery of imported MTBB
3.1.1	Details of binders
3.1.1	Method of sampling the delivered binder
3.3	Details of source of water
3.4.2	Safety Data Sheets and procedures for safe handling of materials
5.2.1	Details of proposed equipment and methods for preliminary pulverisation of the existing pavement, spreading of lime, injection of foamed bitumen, mixing with the unbound material, compacting and trimming. Method of work adjacent to concrete structures
5.4.2	Method of treatment or removal of existing patches
5.4.3	Procedures for pulverisation of the existing pavement and its uniform mixing with other pavement material
5.3	Procedures for cessation of operations in the event of adverse weather conditions
5.5.1	Procedure for spreading imported MTBB
5.6.1	Procedures for spreading and mixing of lime
5.6.4	Method of monitoring of lime spread rate and calibration
5.6.4	Method of slaking of quicklime
5.6.6	Details of mixing, width of passes and nominated depth
5.7.3	Details of mixing of foaming agent with bitumen
5.7.3	Method of monitoring of bitumen application rate and calibration
5.8	Procedures for dealing with spillage of binder and foaming agent
5.9	Procedure for incorporation of water and achievement of uniform distribution of water
5.10	Procedures for compaction
5.11.1	Locations and types of construction joints, treatment of overlaps and irregular shaped Lots, locations of unsupported edges and compaction rolling pattern
5.11.4	Details of overlap of joints and/or cutting back of previously stabilised material
5.11.5	Method of disposal of cutback material
5.12.1	Method of trimming and survey control to produce required pavement thickness
5.12.2	Procedure to produce required pavement surface after trimming
5.12.3	Method of trimming and disposal of trimmed waste material
5.14	Procedures for protection of work

Clause	Description
5.15	Procedure to ensure that the finished surface is ready to receive sprayed bituminous seal
6	Method of surveying levels
7.3.1	Method of repairing test holes
7.6	Locations of straight edge measurements
7.7	Details of equipment for measuring ride quality and calibration data

ANNEXURE R76/E – DETAILS TO BE PROVIDED BY THE CONTRACTOR

E1 CONTRACTOR NOMINATED MIX DESIGN

Applicable only when mix design is nominated by the Contractor (refer Clause 4.2.3).

Table R76/E.1 – Contractor Nominated Mix Design Details

Nominated Dry Density of MTBB (t/m ³)	Design Lime Application Rate (% by mass ⁽¹⁾)	Design Bitumen Application Rate (% by mass ⁽¹⁾)

Note:

⁽¹⁾ Percent by dry mass of MTBB.

E2 BINDER APPLICATION DETAILS

Table R76/E.2 – Lime Spreading Details

Pavement Section	Column A	Column B	Column C	(A × B × C) / 100
	Nominated Dry Density of MTBB (t/m ³) ⁽¹⁾	Stabilised Pavement Thickness (mm) ⁽²⁾	Design Target Application Rate ⁽³⁾ (% by mass ⁽⁴⁾)	Design Target Spread Rate ⁽³⁾ (kg/m ²)

Notes:

⁽¹⁾ From either Table R76/A.4 or Table R76/E.1.

⁽²⁾ From Table R76/A.2.

⁽³⁾ Design target application/spread rate are based on use of hydrated lime. If quicklime is used, the target spread rate must be adjusted for the lime type by multiplying by a factor as shown in TfNSW Form 5113.

⁽⁴⁾ Percent by dry mass of MTBB.

⁽⁵⁾ A tolerance of 0.2 kg/m² is added to the design target spread rate in kg/m² to give the field target spread rate in accordance with Clause 5.6.3 and as shown in TfNSW Form 5113.

Table R76/E.3 – Bitumen Application Details

Pavement Section	Column A	Column B	Column C	$(A \times B \times C) / 100$
	Nominated Dry Density of MTBB (t/m^3) ⁽¹⁾	Stabilised Pavement Thickness (mm) ⁽²⁾	Design Target Application Rate (% by mass) ⁽³⁾	Design Target Application Rate (kg/m^2)

Notes:

- (1) From either Table R76/A.4 or Table R76/E.1.
- (2) From Table R76/A.2.
- (3) Percent by dry mass of MTBB.
- (4) The field target application rate by mass is first converted to that by volume at 15°C. The application rate is then converted to that at the bitumen temperature at the time of foaming in accordance with Clause 5.7.2 and as shown in TfNSW Form 5113.

Table R76/E.4 – Particle Size Distribution of Imported MB20 or MB40 or Gap Graded Material
(delete or complete as appropriate)

Sieve Size (mm)	Percentage Passing
26.5	
19.5	
9.5	
4.75	
2.36	
1.18	
0.6	
0.425	
0.3	
0.15	
0.075	

ANNEXURES R76/F TO R76/K – (NOT USED)

ANNEXURE R76/L – MINIMUM FREQUENCY OF TESTING

Clause	Characteristic Tested	Test Method	Minimum Frequency of Testing
2.2	Properties of imported MTBB	TfNSW 3051	As per TfNSW 3051
3.1.2	Quality of hydrated lime or quicklime	TfNSW 3211	As per TfNSW 3211
3.1.3	Quality of C170 bitumen	TfNSW 3253	As per TfNSW 3253
3.2	Quality of foaming agent (if required)	As per Clause 3.2	1 per contract per source
3.2	Quality of water:		1 per contract per source
	Chloride ion concentration	TfNSW T1004	
	Sulphate ion concentration	TfNSW T1014	
	Undissolved solids	AS 3550.4	
	Concentration of thermo-tolerant coliforms	TfNSW T1015	
5.7.3	Expansion ratio and half-life	TfNSW T153	1 per day (at the commencement of incorporation of bitumen binder) and 1 per change of bitumen tanker
7.2.1	Lime spread rate	As per Clause 7.2.1	Tray test: 1 per Lot; and where required to verify load cell spread rate, 1 per 100 m spreader run Load cell assessment: 1 per 200 m for each spreader run
7.2.2	Bitumen application rate	As per Clause 7.2.2	1 per mixing run
7.3.1	Insitu density	TfNSW T173	As per TfNSW Q for specified relative compaction
7.3.2	Maximum wet density	TfNSW T162	
7.3.3	Relative compaction	TfNSW T166	
7.3.4	Field moisture content	TfNSW T120, T121 or T180	
7.4	Pavement course thickness	As per Clause 6.3	At each location as defined in Clause 6.3
7.6	Deviation from straight edge	As per Clause 7.6	1 per 20 m ²
7.7	Ride quality	TfNSW T182 or T188	Continuous reading per Lot
7.8	Width	As per Clause 7.8	1 per 20 m
7.9	Base surface	TfNSW T271	At each location as defined in Clause 7.9

ANNEXURE R76/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.6.

TfNSW Specifications

TfNSW Q	Quality Management System
TfNSW G10	Traffic Management
TfNSW G22	Work Health and Safety (Construction Work)
TfNSW G36	Environmental Protection
TfNSW G38	Soil and Water Management
TfNSW G71	Construction Surveys
TfNSW R101	Cold Milling of Road Pavement Materials
TfNSW R106	Sprayed Bituminous Surfacing (with Cutback bitumen)
TfNSW R107	Sprayed Bituminous Surfacing (with Polymer Modified Binder)
TfNSW R178	Vegetation
TfNSW 3051	Granular Pavement Base and Subbase Materials
TfNSW 3211	Cements, Binders and Fillers
TfNSW 3253	Bitumen for Pavements

TfNSW Test Methods

TfNSW T111	Dry Density/Moisture Relationship of Road Construction Materials
TfNSW T120	Moisture Content of Road Construction Materials (Standard Method)
TfNSW T121	Moisture Content of Road Construction Materials (Sand Bath or Hot Plate Method)
TfNSW T136	Rate of Spread of Dry Powder Binders
TfNSW T153	The Half-Life and Expansion Ratio of Foamed Bitumen
TfNSW T162	Compaction Control Test (Rapid Method)
TfNSW T166	Relative Compaction of Road Construction Materials
TfNSW T173	Field Wet Density of Road Construction Materials (Nuclear Gauge in Direct Transmission Method)
TfNSW T180	Moisture Content of Road Construction Materials (Microwave Oven Method)
TfNSW T182	Road Roughness Testing
TfNSW T188	Project Ride Quality (Vehicular Laser Profilometer)
TfNSW T271	Ball Penetration Test
TfNSW T1004	Quantitative Determination of Chloride Ion in Water
TfNSW T1014	Quantitative Determination of Sulphate Ion in Water
TfNSW T1015	Microbiology of Water Used in Road Works (Thermotolerant Coliforms)

TfNSW Forms & Technical Directions

TfNSW Form 5113 Foamed Bitumen Stabilisation Record Sheet for Binder Application Rates
PTD 2015/001 Foamed Bitumen Stabilisation

Australian Standards

AS 3550.4 Waters – Determination of solids – Gravimetric method

Austrroads

Bituminous Materials Safety Guide