

TRANSPORT FOR NSW (TfNSW)
QA SPECIFICATION R71
CONSTRUCTION OF UNBOUND AND
MODIFIED PAVEMENT COURSE

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REVISION REGISTER

| Ed/Rev Number | Clause Number | Description of Revision | Authorised By | Date |
|----------------------|--|--|--------------------------|-------------|
| Ed 1/Rev 0 | | First Issued | GM, CMS | Jan 91 |
| Ed 2/Rev 0 | Appendix A 3.4 | Clause numbers and lists have been modified to suit the new format Hold points have been rewritten and hold point in Clause 3.2 has been incorporated in the hold point in Clause 2. Spec. 3051 has been removed from the Appendix Use of Test Method T122 has been stopped. Level tolerances amended. | GM, CEC | 02.05.95 |
| Ed 2/Rev 1 | 1.2, 3.5.1 3.5.3 | Specification Number changed from R35 to R71 Converted to MS Word 6.0c References to RTA Specifications changed Reference to RTA Q added Formulae clarified | GM, RNIC (J Woodward) | |
| Ed 2/Rev 2 | 3.1 | References to RTA 3051 clause numbers changed | GM, RNIC (J Woodward) | 22.08.97 |
| Ed 3/Rev 0 | | General Revision including Pavement Modification | GM, RNIC | Jan 06 |
| Ed 3/Rev 1 | “Notice” Foreword Global | RTA PO Box and Fax numbers updated Copyright clause added General reformatting and correction of typos. Clauses reworded to direct imperative style | GM, IC | 20.04.09 |

| Ed/Rev Number | Clause Number | Description of Revision | Authorised By | Date |
|------------------------|----------------------|--|----------------------|-------------|
| Ed 3/Rev 1 (cont'd) | 1.3.6 | Definitions moved here from Annex M. Definition of “you” and “your” added. Commonly used abbreviations deleted | | |
| | 4.1 | Previous clause and sub-clauses on various binders replaced by reference to RTA 3211 | | |
| | Annex L | Testing of binders replaced by reference to RTA 3211 | | |
| | Annex M | References updated | | |
| Ed 3/Rev 2 | Annex M | Referenced specifications RMS 3053, RMS 3054 deleted, RMS R107 inserted. | GM, IC | 11.10.10 |
| Ed 4/Rev 0 | Global | New edition. Title of specification changed to include words “Construction of”. Clauses rearranged and reworded to improve clarity. New clause headings added. | GM, IC | 20.03.13 |
| | 1.1 | From merger of previous clause 1.1 “Intent” with previous clause 1.2 “Scope”. Reference to spec 3051 added. | | |
| | 1.3.1 | Definitions of “Allowable Working Time”, “Nominated Working Time” and “Pavement Course” added. | | |
| | 1.3.2 | New clause on “Abbreviations” added. | | |
| | 2 | Combining previous clauses 2 and 3. | | |
| | 2.2 | Requirements for certified stockpiles expanded. | | |
| | 2.4 | Moisture content requirements for pavement material at time of delivery added. | | |
| | 3 | Previous clause 5.2. Heading title changed to “Other Materials”. | | |
| | 3.1, 3.2 | Headings inserted to form new sub-clauses 3.1.1 and 3.1.2. Content from previous clause 5.4.2 moved to new subclause 3.1.3. Requirements for binders additional to those in spec 3211 added. | | |
| | 3.3 | New clause on Safety Data Sheets added. | | |
| | 4.1 | New clause on design requirements added. | | |
| | 4.2 | Content of previous Annex E incorporated in this clause. Information required for unbound material added. | | |

| Ed/Rev Number | Clause Number | Description of Revision | Authorised By | Date |
|------------------------|----------------------|--|----------------------|-------------|
| Ed 4/Rev 0 (cont'd) | 4.3 | Heading inserted to form new sub-clause 4.3. | | |
| | 5.2.4.4 | New sub-clause on slaking of quicklime added. | | |
| | 6.3 | Previous clause 4. | | |
| | 6.4 | Previous clause 6.3. | | |
| | 6.5 | Previous clause 6.4; heading title changed. Trimming requirements added. | | |
| | 6.6 | Previous clause 6.2. | | |
| | 6.8 | Heading title changed to "Bituminous Seal". | | |
| | 7 | New clause on survey requirements. | | |
| | 7.1 | Requirements on survey staff (or reflector) used in survey added. | | |
| | 7.2 | Hold Point added. | | |
| | 8 | New clause titled "Conformity" incorporating previous clauses under "Process Control" and "End Product Criteria". | | |
| | 8.2 | Sampling and reporting requirements for unconfined compressive strength added. Maximum UCS reduced to 1.0 MPa from 1.5 MPa. | | |
| | 8.3 | Previous clause 8.7 expanded to include submission details for binder application rate. | | |
| | 8.4 | Previous clause 7.1. Previous sub-clause 7.1.6 on progressive compaction assessment deleted. | | |
| | 8.4.3 | Test Method T112 added for determination of wet or dry density. | | |
| | 8.4.4 | Modified compaction for Heavy Duty material in base course added. | | |
| | 8.5 | Previous clause 8.3. Tolerances for thickness amended. | | |
| | 8.6, 8.7 | Content of previous clause 8.4 now under clause 8.6 and 8.7. | | |
| | 8.6 | Tolerances for surface level amended. | | |
| | 8.7 | Requirement for no abrupt change of levels in transition from pavement to fixed structures added. | | |

| Ed/Rev Number | Clause Number | Description of Revision | Authorised By | Date |
|------------------------|---|--|----------------------|-------------|
| Ed 4/Rev 0 (cont'd) | 8.8 8.10 8.12 Annex A Annex D Annex B2.2.2 Annex L | <p>Previous clause 8.6.</p> <p>Test Method for ride quality using laser based profilometer changed from “T187” to “T188”.</p> <p>New clause on assessment of surface of base course.</p> <p>New clause on disposition of nonconforming Lots added.</p> <p>Tables for traffic categories and pavement course details added.</p> <p>Schedule of Planning Documents updated.</p> <p>Equivalent IRIs to NAASRA roughness counts added to Table B.3 on incentives and deductions for ride quality.</p> <p>Frequency of Testing table rearranged.</p> <p>Thermo-tolerant coliform concentration and relative compaction added to table.</p> <p>“T187” changed to “T188”.</p> <p>New table for HD material added.</p> | | |
| Ed 4/Rev 1 | 1.3.1 | Definition of “Material To Be Modified” added to accord with spec 3051. | GM, CPS | 14.09.13 |
| Ed 4/Rev 2 | 8.8, B2.2.2 B2.2 Tables B.1, B.2 and B.3 | <p>Statement on incentives and deductions for ride quality amended to clarify its intent.</p> <p>Symbols corrected.</p> | GM, CSB | 13.10.17 |
| Ed 5/Rev 0 | Global Guide Notes 1.1 1.2.5 2.1 3.1 3.1.1 3.1.3 | <p>Clauses reworded to improve clarity.</p> <p>Guide notes (superfluous) deleted.</p> <p>Statement added that areas of work and design finished surface levels are shown either on Drawings or in Annex A.</p> <p>Standard clause on frequency of testing updated.</p> <p>Permeability and compaction requirements for Class 1 DGB clarified.</p> <p>Heading title changed.</p> <p>Clarified that nominated mix design mentioned is the approved mix design.</p> <p>Certification that blended binders delivered are within 3% of nominated blend added.</p> <p>Requirement to sample and test binders added.</p> | DCS | 23.08.18 |

| Ed/Rev Number | Clause Number | Description of Revision | Authorised By | Date |
|------------------------|---|---|----------------------|-------------|
| Ed 5/Rev 0 (cont'd) | 4 | Heading title changed. | | |
| | 4.1, 4.2, 4.3 | Heading title changed. | | |
| | 4.1 | Statement added that whether modification using quicklime is permitted is specified in Annex A. | | |
| | 4.3 | Clarified that Hold Point will again apply if mix design is varied. | | |
| | 5.1.1 | Statement added that whether pugmill mixing of pavement material with binder is required is specified in Annex A. | | |
| | 5.2 | Previously sub-clause 5.2.4. Lower tier sub-clauses renumbered accordingly. | | |
| | 5.2.2 | Previously 2 nd paragraph of sub-clause 5.2.4.1 including Hold Point. | | |
| | 5.2.3 | Previously sub-clause 5.2.4.2. | | |
| | 5.2.4 | Previously sub-clause 5.2.4.3. | | |
| | 5.2.5 | Previously sub-clause 5.2.3. | | |
| | 5.2.6 | Previously sub-clause 5.2.4.4. | | |
| | 5.2.7 | Previously sub-clause 5.2.4.5. | | |
| | 5.2.8 | Previously sub-clause 5.2.4.6. | | |
| | 5.3 | Previously sub-clause 5.2.5. Lower tier sub-clauses renumbered accordingly. | | |
| | 5.3.2 | Headings added to form lower tier sub-clauses 5.3.2.1 to 5.3.2.3. | | |
| | 6.5 | Clause on trial pavement moved here from previous clause 6.3. Other clauses renumbered accordingly. Headings added to form new sub-clauses 6.5.1 to 6.5.3. | | |
| | 6.5.1 | Requirement to demonstrate compliance of any alternative construction method during trial section paving added. | | |
| | 6.6 | Headings added to form new sub-clauses 6.6.1 and 6.6.2. | | |
| | 6.7 | Headings added to form new sub-clauses 6.7.1 to 6.7.3. | | |
| | 8.10 | Clause reworded to improve clarity. | | |
| 8.12 | Headings added to form new sub-clauses 8.12.1 to 8.12.2. | | | |
| Annex A | Guidance notes on how to complete tables in Annex A added. Tables amended. | | | |

| Ed/Rev Number | Clause Number | Description of Revision | Authorised By | Date |
|------------------------|----------------------------------|--|----------------------|-------------|
| Ed 5/Rev 0 (cont'd) | Annex C, D Annex L Annex M | Schedules updated. Clause references updated. Referenced Documents updated. | | |
| Ed 5/Rev 1 | Global | References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively. | DCS | 22.06.20 |



CONSTRUCTION OF UNBOUND AND MODIFIED PAVEMENT COURSE

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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 R71 Edition 5 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 R71

CONSTRUCTION OF UNBOUND AND MODIFIED PAVEMENT COURSE

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the construction of unbound and modified pavement course. It includes requirements for:

- (a) supply and incorporation of binder for modification of the pavement course;
- (b) placement, compaction and trimming of Unbound or Modified Material;
- (c) construction of a trial section of pavement, where specified.

The areas of work and design finished surface levels are either shown on the Drawings or specified in Annexure R71/A.

The requirements for unbound pavement material or Material To Be Modified for use in subbase and/or base courses are set out in Specification TfNSW 3051.

This specification is for use in new construction or major rehabilitation works. It is not intended for 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 details of work are shown in Annexure R71/A.

1.2.2 Measurement and Payment, Resolution of Nonconformities

The method of measurement and payment is detailed in Annexure R71/B.

Acceptance of materials and work will be in accordance with Annexure R71/B.

1.2.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure R71/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification TfNSW Q for the definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure R71/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 listed in Annexure R71/D and must be implemented.

In all cases where this Specification refers to the manufacturer's recommendations, these must be included in the PROJECT QUALITY PLAN.

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 R71/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 reference 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 R71/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 the terms used in this Specification:

| | |
|----------------------------------|--|
| Allowable Working Time | The lesser of the Nominated Working Time and 8 hours. |
| Binder | For the purpose of this Specification, a hydraulic stabilising agent, such as lime, cement or granulated ground blast-furnace slag used singly or in combination, to which may be added pozzolanic materials such as fly ash or other additives and which sets when mixed with pavement materials and water. |
| Design Target Spread Rate | The binder content expressed as a percentage of the dry mass of the material to be stabilised as nominated in the nominated mix design and converted to an application rate in kg/m ² . |
| Field Target Spread Rate | The design target spread rate to which a tolerance has been added. |
| Final trimming | Trimming to achieve the finished surface level and surface evenness prior to sealing. |

| | |
|---|--|
| Material To Be Modified | The material prior to addition of small amounts of binder. |
| Modified Material | Material To Be Modified mixed with small amounts of binder to improve its properties (e.g. to adjust plasticity or prevent material breakdown) without significantly increasing its tensile strength. |
| Nominated Working Time | The lesser of the Working Times determined for maximum dry density and for unconfined compressive strength, in accordance with Test Method TfNSW T147. |
| Pavement course | A pavement course consists 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 modified 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. |
| Target moisture content envelope | The range of moisture content (on the dry side of the optimum moisture content) determined for compaction. |
| Unbound Material | Natural, manufactured or recycled mineral blends of graded particles which have not been modified or bound. |

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 |
| UCS | Unconfined compressive strength |

2 UNBOUND MATERIAL OR MATERIAL TO BE MODIFIED

2.1 REQUIREMENTS

Unbound material and Material To Be Modified must comply with TfNSW 3051 for the relevant Traffic Category.

Class 1 DGB placed in base courses of Traffic Category A roads must meet the permeability requirement specified in TfNSW 3051, and assessed for compaction conformity using modified compaction.

2.2 CERTIFIED STOCKPILES

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

Prior to the release of material from a Certified Stockpile, provide the Principal with a statement signed by you, verifying that the material from the Certified Stockpile meets the requirements of this Specification and the relevant properties stated in TfNSW 3051. Attach NATA endorsed test results

to the statement. Indicate clearly in the statement the quantity of material represented by the test results.

HOLD POINT

| | |
|------------------------|--|
| Process Held: | Deliveries of materials 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 further materials to the stockpile unless the additional material has been tested and shown to conform to this Specification. Provide to the Principal test certificates verifying the conformity of all such additional material.

Material supplied from Certified Stockpiles will generally require no further testing.

However, 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 assessed on the basis of these test results.

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

2.3 SITE STOCKPILES

Delivery of unbound material or Material To Be Modified to site stockpiles must comply with the requirements of Clause 2.4. If the material has not been sourced from a Certified Stockpile, the site stockpile must be certified in accordance with Clause 2.2 prior to using the material.

Place site stockpiles of unbound material or Material To Be Modified only at the locations shown on the Drawings or approved by the Principal.

You are responsible for the preparation of the stockpile sites, unless otherwise specified in Annexure R71/A.

When stockpiling material 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 otherwise approved 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 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 procedures for the construction, operation and restoration of stockpile sites, and measures to be taken to meet the requirements of this Clause.

2.4 DELIVERY OF MATERIAL

Transport any unbound material or Material To Be Modified 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 Test Method TfNSW T111, T112 or T162.

Material delivered to the Site which is unsuitable for reasons such as segregation, contamination or non-homogeneity 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 (FOR MODIFIED PAVEMENT COURSE)

3.1.1 General

Use only the binder(s) stated in the approved nominated mix design for the Works.

Binders, and components of blended binders, must comply with the requirements of Specification TfNSW 3211.

Include in the PROJECT QUALITY PLAN details of all cementitious and pozzolanic materials, and the blended proportions of blended binders if applicable, proposed for use in the Works, together with supporting test results traceable to the materials supplied.

3.1.2 Blended Binders

The actual proportions of the components of a blended binder must not vary by more than $\pm 3\%$ from the blend percentages in the approved nominated mix design.

Test each component at the respective minimum frequencies stated in Annexure R71/L. A reduced testing frequency may be permitted in accordance with TfNSW Q.

3.1.3 Delivery of Binder

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

With each delivery of blended binders to Site, provide certification that the actual blend proportions are within $\pm 3\%$ of the blend percentages nominated.

Sample and test the binder in accordance with TfNSW 3211. Detail in the PROJECT QUALITY PLAN the method of sampling the binder.

3.2 WATER

Water for use in the Works must be free from deleterious amounts of materials such as oils, salts, acids, alkalis and vegetable substances.

Water taken from other than a town water supply system must not contain more than:

- (a) 600 parts per million of chloride ion, when measured using Test Method TfNSW T1004;
- (b) 400 parts per million of sulfate ion, when measured using Test Method TfNSW T1014;
- (c) 1% by mass of undissolved solids, when measured in accordance with AS 3550.4.

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.

3.3 SAFETY DATA SHEETS

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

4 MIX DESIGN (FOR MODIFIED PAVEMENT COURSE)

4.1 MIX DESIGN REQUIREMENTS

Unless specified elsewhere, the mix design for modification of material must be nominated by the Contractor. Annexure R71/A will state whether quicklime may be used for the purpose of modification.

Nominated mix designs must comply with the following:

- (a) Have a Nominated Working Time (determined in accordance with Test Method TfNSW T147) in excess of 6 hours, using a slow setting binder.
- (b) Have a unconfined compressive strength (UCS) at 28 days normal curing or 7 days accelerated curing of less than 1 MPa without soaking, when tested in accordance with Test Method TfNSW T116.

4.2 SUBMISSION OF CONTRACTOR NOMINATED MIX DESIGN

Submit to the Principal, at least 10 working days prior to the commencement of work, your nominated mix design.

For each Contractor nominated mix design, provide the following information:

(a) Material To Be Modified

- (i) Details and test results of the Material To Be Modified in accordance with TfNSW 3051;
- (ii) Optimum moisture content;
- (iii) Target moisture content envelope, as detailed in Clause 6.4.

(b) Binders

- (i) Type and source of each component;
- (ii) Proportion of each component in a blended binder;
- (iii) Proportion of binder by dry mass of Material To Be Modified; where the binder is lime, nominate the content based on hydrated lime;
- (iv) Test results for the binder, or for each component in a blended binder complying with TfNSW 3211.

(c) Water

- (i) Source;
- (ii) Test results verifying compliance with Clause 3.2.

(d) Modified Material

Details, including test results, verifying that each nominated mix complies with the requirements of Clause 4.1.

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.

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 R71/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 accepting the Contractor nominated mix design and authorising the release of the Hold Point. |

4.3 VARIATION TO APPROVED CONTRACTOR 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 the approved Contractor nominated mix design, submit a new nominated mix design for approval in accordance with Clause 4.2.

The Hold Point in Clause 4.2 will again apply.

5 MODIFICATION OF PAVEMENT MATERIAL

5.1 GENERAL

5.1.1 Method of Modification

Modification of pavement material can be carried out by:

- (a) spreading the binder on the pavement and mixing it into the pavement with purpose built mixing equipment; or
- (b) premixing the binder with the pavement material in a batch or a continuous type mixing plant before placing the mixed material.

Annexure R71/A will specify whether premixing of the binder with the pavement material in a mixing plant (pugmill) is required.

5.1.2 Spillage of Binder

Remove, as soon as possible and not later than 12 hours, any spillage of binder on the Site or at any loading locations. Do not incorporate spilled binder into the pavement material.

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

5.2 INSITU SPREADING AND MIXING OF BINDER

5.2.1 General

Include in the PROJECT QUALITY PLAN the procedures, including any Inspection and Test Plan, for spreading and mixing of binder.

5.2.2 Alternative Construction Method

Any proposed procedure for incorporation of binder by methods other than spreading the binder 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 binder, 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.

5.2.3 Design and Field Target Spread Rates

Determine the Design Target Spread Rate of binder in kg/m^2 from the nominated mix design and the specified compacted course thickness.

Add a minimum tolerance of 0.2 kg/m^2 to the Design Target Spread Rate to obtain the Field Target Spread Rate.

Where quicklime is used, multiply the design spread rate (based on hydrated lime) by a factor of 0.76.

At least 14 days prior to the commencement of spreading of binder, submit to the Principal details of the Design and Field Target Spread Rates.

5.2.4 Spreading of Binder

Spread the binder using vehicles fitted with load cells or other forms of weighing systems capable of providing a recordable output of the rate at which the binder 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.

Prior to mixing, calculate the actual spread rate. Where the spread rate (kg/m^2) achieved for each run is less than 95% of the Field Target Spread Rate, spread extra binder to achieve the Field Target Spread Rate.

5.2.5 Over-application of Binder

Nominate in the PROJECT QUALITY PLAN the rectification procedure for situations where binder has been over-applied, such as ripping and re-compaction, to ensure that the unconfined compressive strength (UCS) at 7 days accelerated curing does not exceed 1.0 MPa.

Following the rectification treatment, take a further set of UCS samples as described in Clause 8.2. If, after the rectification treatment, the UCS still exceeds 1.0 MPa, the modified pavement material is considered to be nonconforming.

5.2.6 Slaking of Quicklime

Where quicklime is used, carry out slaking of quicklime, by spreading water over the quicklime spread onto pavement material, before it is mixed. All quicklime must be fully slaked before being mixed into the pavement course.

Include in the PROJECT QUALITY PLAN details of the procedures, including any Inspection and Test Plan, for ensuring that the quicklime is fully slaked.

5.2.7 Mixing Equipment

Use mixing equipment purpose built for insitu mixing of pavement materials, capable of mixing to the depth specified, pulverising and mixing all bituminous surfacing and/or patches, and of distributing both the binder and moisture uniformly for the full depth and over the total area.

The equipment must be capable of applying moisture uniformly during mixing through a series of nozzles on a spray bar located in the mixing hood. Each nozzle on the spray bar must be independently controlled to ensure a uniform transverse moisture distribution in overlapping runs.

Include in the PROJECT QUALITY PLAN details of the mixing equipment proposed for use and its suitability for the materials to be processed.

Replace any mixing tools, blades or tynes which are worn out or damaged so as to maintain mixing efficiency as demonstrated in the trial section of pavement.

5.2.8 Mixing Operation

A minimum of two passes of the mixing equipment is required.

Each mixer run must overlap the previous adjacent longitudinal run by at least 75 mm but not more than 150 mm.

The resultant mix must be uniform over the full depth and total area, with no lenses, pockets, lumps or granules of either incompletely mixed pavement material or incompletely mixed binder present.

Include in the PROJECT QUALITY PLAN details of the mixing operation, proposed width of passes and nominated depth of mixing to ensure that the specified modified pavement thickness is achieved.

Where the binder is spread in advance of the mixing operation, minimise disturbance to the unmixed binder.

Where visual inspection indicates that the binder is not uniformly mixed with the existing 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 modified; and/or

- (b) distribution of the binder; and/or
- (c) distribution of moisture.

5.3 PLANT MIXING OF PAVEMENT MATERIALS

5.3.1 Mixing Plant

The mixing plant must be capable of:

- (i) mixing the Material To Be Modified with the binder and water so as to produce a moist and homogeneous material suitable for compaction, without the addition of further water after the material leaves the mixing plant;
- (ii) providing measurements of the binder incorporated in the mix for each 200 tonnes produced to within 0.3% of the dry mass of the Material To Be Modified.

Include in the PROJECT QUALITY PLAN details of the proposed mixing plant, and its operational and calibration procedures. The information provided must include, but not be limited to, the following:

(a) Mixing plant

- (i) type;
- (ii) proposed location;
- (iii) mixing time;
- (iv) discharge hopper capacity;
- (v) output capacity;
- (vi) control of binder content and moisture content (including methods to ensure uniformity).

(b) Calibration

- (i) method(s) and frequency;
- (ii) daily calculations to ensure compliance with the mix requirements.

(c) Materials handling

- (i) loading of mixer;
- (ii) control of segregation during loading and mixing;
- (iii) moisture control.

Operate the mixing plant in accordance with the manufacturer's recommendations.

5.3.2 Delivery of Plant Mixed Pavement Materials

5.3.2.1 Discharge from Mixer

After mixing, discharge the plant mixed pavement material from the mixer to a timed discharge hopper, or alternatively to a storage bin. Do not discharge any material directly from conveyor belts into trucks or onto the ground. The drop from the conveyor to the minimum level of material in the timed discharge hopper or the storage bin must not exceed 4 m.

5.3.2.2 Delivery Vehicle Requirements

After mixing, deliver the mixed pavement materials in vehicles so constructed that loss of material does not occur. Vehicles must be fitted with suitable covers to prevent loss of moisture during transport.

Vehicles used for the delivery of plant mixed pavement materials to the hopper of a spreading machine or to a spreader box must have bodies or discharge equipment which enable the load to be discharged directly into the hopper or spreader box without spillage on the road or segregation of material.

Provide sufficient number of delivery vehicles to ensure delivery of the mixed pavement material at a uniform rate which is compatible with the capacity of the spreading and compacting equipment.

Do not allow delivery vehicles, either loaded or unloaded, to travel over any bound pavement layer without the approval of the Principal.

Provide in the PROJECT QUALITY PLAN details of your methods for transporting the plant mixed pavement material to the spreading equipment, including:

- (a) number, type and capacity of transport vehicles;
- (b) measures to prevent loss of moisture during transport;
- (c) time delay between completion of mixing and discharge into the spreading equipment;
- (d) proposed method of discharge from the transport vehicle into the spreading equipment.

5.3.2.3 Delivered Material Unsuitable

Mixed pavement material delivered to the spreading equipment which is unsuitable for reasons such as segregation or contamination is considered to be nonconforming, and must not be used in the Works.

The plant mixed pavement material must, at the time of delivery, have a uniformly distributed moisture content, determined by Test Method TfNSW T120, T121 or T180, which is not greater than the optimum moisture content determined using Test Method TfNSW T111 or T112. The moisture content must be within the target moisture content envelope as described in Clause 6.3.

6 CONSTRUCTION

6.1 GENERAL

Carry out the work in a manner which will:

- (a) prevent segregation or loss of material;
- (b) prevent slurring of the surface;
- (c) provide an interface between layers that will not compromise bonding;
- (d) meet the conformity requirements of Clause 8.

Where the specified pavement course thickness is constructed in two or more layers, include in the PROJECT QUALITY PLAN details of the procedure to ensure that a homogeneous pavement course that is continuous across the interface between layers is created.

6.2 WEATHER CONDITIONS

Do not carry out insitu modification when any of the following conditions are present.

- (a) when the wind is sufficiently strong to cause particles of binder to become air-borne;
- (b) during conditions that, in the opinion of the Principal, may cause nuisance to people, property or the environment.

Do not carry out modification work (insitu or otherwise) when any of the following conditions are present.

- (i) during rain or when rain appears imminent;
- (ii) when the pavement temperature measured at a depth of 50 mm below the surface of the road is below 10° C.

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

6.3 MOISTURE 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 binder hydration if applicable and the specified compaction;
- (b) the pavement to be capable of taking traffic load without shoving or ravelling on completion of compaction.

The field moisture content during placement and compaction must be within the target moisture content envelope.

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 for compaction.

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

6.4 SPREADING, COMPACTION AND TRIMMING

The entire process from spreading of binder, shaping and compacting through to final trimming must proceed continuously until completion.

Where the work involves modification, complete all activities associated with spreading, mixing, compaction and trimming within the Allowable Working Time of the mix.

Spread and compact each pavement layer in uniform thicknesses which, after final trimming, will provide the course thickness specified on the Drawings or detailed in Annexure R71/A. Place each layer to achieve a compacted thickness which is not more than 150 mm or less than 100 mm, unless otherwise approved by the Principal.

Compact the full depth of the pavement over the entire area.

Include in the PROJECT QUALITY PLAN details of the equipment and methods to be used for spreading, compacting and finishing to meet the requirements of this Specification. Where applicable,

include in the PROJECT QUALITY PLAN procedures for working adjacent to concrete structures such as a bridge or concrete median.

Should a method of placement other than by a self-propelled paver or grader with automated level control be approved, assess the pavement base course thickness in accordance with the requirements of Clause 8.5 (a) (ii). The associated increase in base course thickness is to be allowed for in the construction of earthworks and underlying pavement courses and must not affect finished surface level requirements.

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

6.5 TRIAL PAVEMENT

6.5.1 General

When specified in Annexure R71/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 5.2.2 is proposed, demonstrate compliance with the requirements of Clause 5.2.2 during the trial.

The trial section of pavement must be between 100 m and 200 m long 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 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 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.

6.5.2 Nonconformities

If there are nonconformities in the trial section of 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 the nonconforming trial section of pavement in accordance with Clause 8.12.

6.5.3 New Trial Section

The Principal may 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.

6.6 PROTECTION OF WORK

6.6.1 Adequate Drainage

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

6.6.2 Trafficking of Newly Placed Pavement

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

Prevent the surface from drying out to the point where excessive dust is generated by traffic.

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

6.7 TREATMENT OF PAVEMENT PRIOR TO PLACING WEARING SURFACE

6.7.1 Subsequent Wetting

If any pavement layer which has been placed by you to the specified compaction, but has subsequently wetted up such that the moisture content exceeds the upper limit of the target moisture content envelope, rework the material in the layer to reduce the moisture content to comply with the requirements of Clause 6.3.

Include the method of reworking in the PROJECT QUALITY PLAN. The cost of such reworking will be borne by you.

6.7.2 Surface Deterioration

Should the surface of the base deteriorate prior to placing the wearing surface, rectify such deterioration. The cost of such work will be borne by you.

6.7.3 Dry Back

Immediately prior to placing a bituminous seal or asphalt wearing surface, dry back the base course over the full depth, such that the moisture content as determined by Test Method TfNSW T120, T121 or T180 of the base does not exceed 70% of the optimum moisture content determined by TfNSW T111, T112 or T162.

Include in the PROJECT QUALITY PLAN the procedure for testing the moisture content prior to sealing.

Describe in the PROJECT QUALITY PLAN a procedure to ensure that the finished surface of the pavement provides a tightly bound matrix of coarse and fine material without a slurry of fines and is ready to receive a sprayed bituminous seal without punching of the sealing aggregates into the base.

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Construction of Unbound and Modified Pavement Course

Where specified in Annexure R71/A, assess the surface of the base course by ball penetration test in accordance with Test Method TfNSW T271 prior to placing the wearing surface.

6.8 BITUMINOUS SEAL

Where specified in Annexure R71/A, place a prime or primerseal layer over the base.

Application of the prime or primerseal must be in accordance with either Specification TfNSW R106 or R107, as specified in Annexure R71/A.

HOLD POINT

| | |
|------------------------|---|
| Process Held: | Priming or primer sealing of pavement surface. |
| Submission Details: | Conformity reports verifying that each Lot conforms with respect to specified level, thickness, surface deviation and compaction, and notification that the 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. |

7 SURVEY

7.1 GENERAL

Carry out survey in accordance with Specification TfNSW G71.

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

- (a) underlying surface, over which the pavement course is to be placed; and
- (b) finished surface of the 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 on a sealed surface, remove any loose foreign matter, including loose aggregate, before the survey and determine the levels by deducting the Average Least Dimension of the cover aggregate of the seal.

7.2 SURVEY FOR UNDERLYING SURFACE LEVELS

Where design finished surface levels are provided for the pavement course, submit to the Principal a schedule of levels of the underlying surface at least 7 working days before the programmed commencement of work. The schedule must highlight all locations where the actual levels at the underlying surface are higher than the design levels.

After consideration of the schedule of levels, the Principal may redesign the pavement finished levels. The Principal will advise you of any such redesign within 5 working days of the receipt of the schedule.

HOLD POINT

Process Held: Placement of pavement course.

Submission Details: Schedule of levels of the underlying surface.

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

7.3 SURVEY FOR PAVEMENT COURSE FINISHED SURFACE LEVELS

Where design finished surface levels are specified, submit to the Principal a schedule of the pavement course finished surface levels for each Lot within 6 working days of completion of final trimming. Highlight in the schedule all levels which are nonconforming.

7.4 SURVEY FOR THICKNESS

Submit to the Principal a schedule of the calculated thickness of the pavement course for each Lot within 6 working days of completion of final trimming.

Determine the locations of survey points on a random basis. Determine levels for layer thickness calculations using survey or any other method approved by the Principal that will produce the required accuracy of ± 5 mm. The location of each survey point must be recoverable in the horizontal plane to within ± 50 mm.

At each survey point, determine the levels of:

- (a) underlying surface prior to placing the pavement course;
- (b) surface of the pavement course after completion of compaction and trimming.

Document in the PROJECT QUALITY PLAN the procedure for assessing layer thickness and include the procedure for the random selection of test sites and their location.

8 CONFORMITY

8.1 GENERAL

Each Lot must comply with following requirements. Nonconforming Lots must be dealt with in accordance with Clause 8.12.

8.2 UNCONFINED COMPRESSIVE STRENGTH

This Clause applies only to pavement courses that have been modified.

For each Lot, prior to compaction, take samples at the minimum frequency specified in Annexure R71/L. Do not take samples from areas of overlap between runs.

Prepare and test the samples as follows:

- (a) store the samples in a loose state inside airtight sealed containers prior to compaction;

- (b) mould the samples within 3 hours of initial mixing of the binder. The moisture content may be adjusted for laboratory compaction; and
- (c) test the samples in accordance with Test Method TfNSW T116, at 7 days accelerated curing.

Record and report the following in addition to the reporting requirements of TfNSW T116:

- (i) chainage and offset dimension of each sampling location;
- (ii) time of commencement and completion of mixing at the sampling location;
- (iii) time of taking each sample;
- (iv) time of commencement of compaction of each UCS sample.

Where the average strength of a pair of UCS cylinders, when tested in accordance with TfNSW T116 at 7 days accelerated curing but without soaking is greater than 1.0 MPa, the Lot represented by the sample will be rejected.

8.3 BINDER APPLICATION RATE

This clause applies only to pavement courses that have been modified.

Where binder is incorporated into the pavement course, submit the following information to the Principal.

- (a) At the completion of each spreader run for insitu mixed binder:
 - (i) chainage and offset dimensions of start and finish locations;
 - (ii) width of spread and depth of incorporation of binder;
 - (iii) type and quantity of binder spread if monitored by load cells;
 - (iv) type and quantity of binder spread if monitored by tray tests in accordance with Test Method TfNSW T136;
 - (v) calculated rate of spread in kg/m² for each 200 m length, expressed as a percentage of the Field Target Spread Rate. Any length less than 200 m must be combined with the length preceding it, and the average rate per spread determined for the combined length;
 - (vi) percentage of binder (rounded to 0.05%) of the dry mass of Material To Be Modified.
- (b) At the completion of each Lot for plant mixed binder:
 - (i) percentage of binder (rounded to 0.05%) of the dry mass of Material To Be Modified, from the total amount of binder used in that Lot (determined from delivery dockets, silo dippings, etc.) and the total quantity of material mixed and placed in the Lot (determined by appropriate measurement).

Where the calculated percentage of binder (by dry mass of Material To Be Modified) for modification is less than the nominated proportion, the nonconforming Lot will be dealt with in accordance with Annexure R71/B2.

For insitu modification, where the measured spread rate is less than the Field Target Spread Rate and you elect to provide additional binder to make up the shortfall, no deduction will apply.

8.4 COMPACTION AND MOISTURE CONTENT

8.4.1 General

Where multiple layers are constructed to obtain the course thickness specified in Annexure R71/A, test each layer separately.

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

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

All test holes must be reinstated with similar material to an equivalent compaction level. Detail in the PROJECT QUALITY PLAN the method of repairing test holes.

8.4.2 Insitu Density

Carry out insitu density tests in accordance with Test Method TfNSW T119 or T173. Use only one of these test methods. Nominate in the PROJECT QUALITY PLAN the method to be used for insitu density measurement.

Where the use of TfNSW T173 is nominated, provide a smooth surface at each test location. Extend the probe as close as practicable to match the course or layer thickness but do not exceed it.

8.4.3 Maximum Wet or Dry Density

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

Determine the maximum wet or dry density in accordance with Test Method TfNSW T111, T112 or T162 as appropriate.

Where material has been modified, compact the sample within 3 hours of sampling and within the mix's Allowable Working Time.

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

8.4.4 Relative Compaction

For Class 1 DGB placed in the base course on Traffic Category A roads, determine the relative compaction using modified compaction, at the minimum frequency of testing specified in Annexure R71/L (rather than TfNSW Q).

Conformity of a Lot for compaction is achieved if the Characteristic Value of Relative Compaction of the Lot, reported to one decimal place, is not less than that specified in Table R71.1:

Table R71.1 – Relative Compaction Requirements

| Material Designation ⁽¹⁾ | Compaction Type | Compaction Level |
|--|------------------------|-------------------------|
| Class 1 DGB in Traffic Category A base course | Modified | 100% |
| Class 1 DGB other than in Traffic Category A base course | Standard | 102% |
| Material other than Class 1 DGB | Standard | 102% |

Note:

⁽¹⁾ Refer to TfNSW 3051 for material designation.

8.4.5 Field Moisture Content

At each test location where an insitu density test was performed, take a sample for the determination of field moisture content.

Determine the moisture content in accordance with Test Method TfNSW T120, T121 or T180 over the full depth of the base.

The field moisture content of base courses that are to receive a bituminous seal must not exceed 70% of the base material's optimum moisture content, determined by Test Method TfNSW T111, T112 or T162, at the time that the bituminous seal is applied.

8.5 THICKNESS

Determine by survey the respective surface levels for use in calculation of the pavement course thickness, in accordance with Clause 7.

After compaction and final trimming, the thickness of the pavement course at any point must not vary from that specified in Annexure R71/A by more than:

- (a) base course**
 - (i) automatic level control used: -0 mm, +20 mm;
 - (ii) automatic level control NOT used: +10 mm, +30 mm.
- (b) subbase course**
 - (i) ±10 mm.

8.6 SURFACE LEVELS

Determine surface levels in accordance with Clause 7.

After compaction and final trimming on both the base and subbase courses, the pavement surface must be parallel to the finished surface.

Levels must not vary from those shown on the Drawings or specified in Annexure R71/A, by more than:

- (a) base course: -0 mm, +10 mm,
- (b) subbase course: -10 mm, +0 mm.

8.7 SURFACE DEVIATION

After final trimming on both the base and subbase courses, 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 base and subbase courses must not deviate from a 3 metre 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.

8.8 RIDE QUALITY

Where specified in Annexure R71/A, measure the ride quality of the finished pavement surface within 2 weeks after the prime or primerseal 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 Test Method 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), the pavement course placed for that length may be accepted, in which case the incentives or deductions in accordance with Annexure R71/B2 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.

8.9 WIDTH

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

The width of pavement must not be less than the width shown on the Drawings or specified in Annexure R71/A.

8.10 BASE COURSE SURFACE ASSESSMENT

Where specified in Annexure R71/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 Test Method 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 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_s* at each test location is less than 3.0 mm; and

(b) the characteristic value of Pen_s for a Lot as calculated above is less than 2.5 mm.

8.11 CERTIFICATE OF CONFORMITY

Unless approved otherwise by the Principal, submit weekly to the Principal a signed certificate verifying conformity with the requirements of Clause 8.

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.

8.12 TREATMENT OF NONCONFORMING LOTS

8.12.1 General

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

Nonconforming Lots not accepted with a deduction in accordance with Annexure R71/B2.2 must be either rectified or replaced.

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

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. |

8.12.2 Removal and Replacement

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

ANNEXURE R71/A – PROJECT SPECIFIC REQUIREMENTS**A1 AREAS OF WORK AND FINISHED SURFACE LEVELS**

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R71/A)

Complete the tables below by deleting whichever option is not applicable and filling in the required details. If “areas of work” are nominated in Table R71/A.1 as “shown on Drawings” AND the Traffic Category is also shown on the Drawings, then delete Table R71/A.2 in its entirety and change the table title to “Not Used”; otherwise, complete the relevant sections of Table R1/A.2.

In Table R71/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 R71/A.1 – Areas of Work and Finished Surface Levels

| Clause | Description | Requirement |
|---------------|-----------------------------|---|
| 1.1 | Areas of work shown on | Drawings / Table R71/A.2 |
| 1.1 | Finished surface levels are | shown on Drawings / to match existing surface levels / to be mm above existing surface levels |

Table R71/A.2 - Specified Areas of Work

| Road Reference | Location | | Traffic Category^(1, 2) | Subbase (mm) | | Base (mm) | |
|-----------------------|-----------------|------------|--|---------------------|------------------|------------------|------------------|
| | From: | To: | | Width | Thickness | Width | Thickness |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Notes:

⁽¹⁾ Applicable Traffic Category derived from Design Traffic, as shown in Table R71/A.N1 below.

Table R71/A.N1 - Relationship Between Design Traffic and Traffic Category

| Design Traffic for 20 Year Design Life, N (Design Equivalent Standard Axle loading, DESA) | Traffic Category |
|--|-------------------------|
| $N \geq 10^7$ | A |
| $10^7 > N \geq 4 \times 10^6$ | B |
| $4 \times 10^6 > N \geq 10^6$ | C |
| $N < 10^6$ | D |

⁽²⁾ Granular pavement base and subbase material must comply with TfNSW 3051.

Table R71/A.3 - Other Project Specific Requirements

| Clause | Description | Requirement |
|---------------|---|--------------------|
| 2.3 | Preparation of stockpile site by Contractor | Yes / No |
| 4.1 | Modification using quicklime permitted | Yes / No |
| 5.1.1 | Pugmill mixing of Material To Be Modified with binder required | Yes / No |
| 6.5.1 | Trial section of pavement required | Yes / No |
| 6.7 | Surface hardness assessment by ball penetration test prior to application of bituminous seal required | Yes / No |
| 6.8 | Application of the following bituminous sealing layer required: | |
| | Prime | Yes / No |
| | Primerseal | Yes / No |
| 6.8 | Application of prime or primerseal to be in accordance with | R106 / R107 |
| 8.8 | Measurement of ride quality required | Yes / No |

ANNEXURE R71/B – MEASUREMENT AND PAYMENT

B1 MEASUREMENT AND PAYMENT

Payment will be made for all costs associated with completing the Works detailed in this Specification, excluding bituminous seal, in accordance with the following Pay Items.

Where required, bituminous seal will be paid for under the specification nominated in R71/A.

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

Pay Item R71P1 - Supply and Place Subbase

The unit of measurement is the cubic metre.

The quantity is determined from the width and thickness as specified on the Drawings or in Annexure R71/A.

Pay Item R71P2 - Supply and Place Base

The unit of measurement is the cubic metre.

The quantity is determined from the width and thickness as specified on the Drawings or in Annexure R71/A.

B2 DISPOSITION OF NONCONFORMITIES

B2.1 General

If the nonconformity is not acceptable in accordance with Annexure R71/B2.2, the nonconforming Lot must be either rectified or replaced.

The costs of rectifying nonconformities, including any restoration work to any underlying or adjacent surface or structure, which becomes necessary as a result of such rectification or replacement, must be borne by you. Replace materials removed from the Site with materials that conform to this Specification.

B2.2 Acceptance of Nonconformities

Nonconformities may be accepted by the Principal, subject to deductions to the schedule rate, as specified hereunder. The deduction will be applied to the quantity of material represented by the test results.

B2.2.1 Compaction

Where the characteristic value of relative compaction (refer to Clause 8.4.4) is nonconforming, deductions to the Lot in accordance with Table R71/B.1 or R71/B.2, as appropriate, will apply.

B2.2.1.1 Standard Compaction**Table R71/B.1 - Deductions for Characteristic Value of Relative Compaction**

| Characteristic Value of Relative Compaction (%) | Deduction to Pay Item R71P1 or R71P2 (%) |
|--|---|
| 101.0 – 101.9 | 10 |
| 100.0 – 100.9 | 30 |
| < 100.0 | Rework, or remove and replace |

B2.2.1.2 Modified Compaction**Table R71/B.2 - Deductions for Characteristic Value of Relative Compaction for Base**

| Characteristic Value of Relative Compaction (%) | Per cent Deduction applied to Pay Item R71P2 |
|--|---|
| 99.0 – 99.9 | 10 |
| 98.0 – 98.9 | 30 |
| < 98.0 | Rework, or remove and replace |

B2.2.2 Ride Quality

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), the pavement course placed for that length may be accepted, in which case the incentives or deductions in accordance with Table R71/B.3 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 R71/B.3 – Incentives and Deductions for Ride Quality

| NAASRA Roughness Counts per kilometre over 100 metre length | Equivalent IRI_s (m/km) per 100 metre length | Incentives/Deductions to Pay Item R71P2 |
|--|---|--|
| < 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 | Rework, or remove and replace |

Where a Lot is nonconforming with regard to ride quality, payment for the Lot, after rectification, will be in accordance with Table R71/B.3. Incentives will not apply to this Lot.

B2.2.3 Percentage of Binder

Where the calculated proportion of binder is less than the nominated proportion of binder deductions in accordance with Table R71/B.4 will apply.

Table R71/B.4 - Deductions for Binder Content

| Range of Binder Content Variation below Nominated Proportion⁽¹⁾ (percentage by mass of Material To Be Modified) | Deductions to Pay Item R71P1 or R71P2 |
|---|--|
| ≥ 0.01% to < 0.25% | 5% |
| ≥ 0.25% to < 0.50% | 15% |
| ≥ 0.50% | Reject |

Note ⁽¹⁾: For binder spread at Site, the nominated proportion must include the tolerance specified in Clause 5.2.3.

ANNEXURE R71/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 | Certification of stockpiles |
| 4.2 | Hold | Submission of Contractor nominated mix design |
| 5.2.2 | Hold | Submission of details of proposed Alternative Construction Method |
| 6.5.1 | Witness | Construction of trial section of pavement |
| 6.5.1 | Hold | Submission of documentation verifying conformity of trial section of pavement |
| 6.8 | Hold | Submission of reports verifying conformity of level, thickness, surface deviation and compaction prior to placing bituminous seal |
| 7.2 | Hold | Submission of schedule of levels of underlying surface |
| 8.12.1 | 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 the Identified Record |
|---------------|--|
| 2.2 | Certification of stockpiles |
| 3.3 | Safety Data Sheets |
| 4.2 | Approved Contractor nominated mix design |
| 4.3 | Variation to approved Contractor nominated mix design |
| 5.2.2 | Details of Alternative Construction Method |
| 5.2.3 | Contractor's Design and Field Target Spread Rates |
| 6.3 | Target moisture content envelope |
| 6.5.1 | Conformity documentation for trial section of pavement |
| 7.2 | Underlying surface levels |
| 7.3 | Pavement course finished surface levels |
| 8.2 | UCS sampling locations and test results |
| 8.5 | Thickness of subbase/base course |
| 8.11 | Certificate of conformity |

ANNEXURE R71/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. Review the requirements of this Specification and other contract documents to determine any additional documentation requirements.

| Clause | Description |
|---------------|--|
| 2.3 | Procedures for construction, operation and restoration of stockpile sites |
| 2.4 | Methods to prevent segregation and/or loss of fines during delivery of material |
| 3.1.1 | Details of cementitious and pozzolanic materials, and blended proportions of blended binders if applicable |
| 3.1.3 | Method of sampling the delivered binder |
| 3.2 | Details of source of water |
| 3.3 | Safety Data Sheets and procedures for safe handling of materials |
| 5.1.2 | Procedures for dealing with spillage of binder |
| 5.2.1 | Procedures for spreading and mixing of binder |
| 5.2.4 | Method of monitoring of binder spread rate and calibration |
| 5.2.5 | Rectification procedure for over-application of binder |
| 5.2.6 | Method of slaking of quicklime |
| 5.2.7 | Details of the proposed mixing equipment capability |
| 5.2.8 | Details of mixing, width of passes and nominated depth |
| 5.3.1 | Details of mixing plant, operational and calibration procedures |
| 5.3.2.2 | Method of transporting plant mixed pavement material to spreading equipment |
| 6.1 | Method to ensure homogeneity through multiple layers |
| 6.2 | Procedures for cessation of operations in the event of adverse weather conditions |
| 6.3 | Procedure for incorporation of water and achievement of uniform distribution of water |
| 6.4 | Equipment and methods for spreading, compacting and finishing |
| 6.4 | Method for working adjacent to concrete structures |
| 6.6 | Procedures for protection of works |
| 6.7.1 | Procedure for reworking of material if moisture content exceeds requirements prior to placing of wearing surface |
| 6.7.3 | Procedure for testing moisture content prior to sealing |
| 6.7.3 | Procedure to ensure finished surface provides a tightly bound matrix |
| 7.4 | Procedure for assessing layer thickness |
| 8.4.1 | Method of repairing test holes |
| 8.4.2 | Method of measurement of insitu density |
| 8.7 | Locations for straight edge measurements |

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| Clause | Description |
|---------------|--|
| 8.8 | Details of equipment for measuring ride quality and calibration data |

ANNEXURES R71/E TO R71/K – (NOT USED)

ANNEXURE R71/L – FREQUENCY OF TESTING

| Clause | Characteristic | Test Method/ Specification | Minimum Frequency of Testing |
|---------------|--|--|--|
| 2.1 | Properties of unbound material and Material To Be Modified | TfNSW 3051 | As per TfNSW 3051 |
| 3.1.1 | Quality of binder | TfNSW 3211 | As per TfNSW 3211 |
| 3.2 | Quality of water: Chloride ion concentration Sulfate ion concentration Undissolved solids Concentration of thermo-tolerant coliforms | TfNSW T1004 TfNSW T1014 AS 3550.4 TfNSW T1015 | 1 per contract per source 1 per contract per source 1 per contract per source 1 per contract per source |
| 8.2 | Unconfined compressive strength | TfNSW T116 | One pair per 400 tonnes or part thereof |
| 8.3 | Spread rate of binder | As per Clause 8.3 | 1 per 200 metres for each spreader run |
| 8.3 | Percentage of binder | As per Clause 8.3 | 1 per 200 tonnes or part thereof |
| 8.4.2 | In situ density | TfNSW T119 or T173 | As per TfNSW Q for specified relative compaction |
| 8.4.3 | Maximum wet or dry density | TfNSW T111, T112 or T162 | As per TfNSW Q for specified relative compaction |
| 8.4.4 | Relative compaction | TfNSW T166 | As per TfNSW Q for specified relative compaction |
| 8.4.5 | Field moisture content | TfNSW T120, T121 or T180 | As per TfNSW Q for specified relative compaction |
| 8.5 | Pavement course thickness | As per Clause 8.5 | At least one site per 75 metres, with a minimum of 2 per Lot |
| 8.6 | Surface level | As per Clause 8.6 | As per Clause 7 |
| 8.7 | Deviation from straight edge | As per Clause 8.7 | Minimum 1 per 20 m ² |
| 8.8 | Ride quality | TfNSW T182 or T188 | Continuous reading per Lot |
| 8.9 | Pavement width | As per Clause 8.9 | Minimum of 1 per 20 linear metres |

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For heavy duty materials placed in the base (refer Clause 8.4.4), use Modified Compaction and substitute the Minimum Testing Frequency in Clause L3.1 of TfNSW Q with the value specified below:

| Material ⁽¹⁾ | Minimum Testing Frequency for Lot Area of: | | | | |
|--|---|--|--------------------------------------|-----------------------------------|---------------------------|
| | > 5,000 m² | 1,000 – 5,000 m² | 500 – 1,000 m² | 50 – 500 m² | ≤ 50 m² |
| Class 1 DGB placed in base course (Traffic Category A) | 1 per 1,000 m ² (min. 10) | 1 per 500 m ² (min. 5) | 4 | 3 | 1 |

Note ⁽¹⁾: For Material Designation, refer to TfNSW 3051.

ANNEXURE R71/M – REFERENCED DOCUMENTS**TfNSW Specifications**

| | |
|------------|---|
| TfNSW G36 | Environmental Protection |
| TfNSW G38 | Soil and Water Management |
| TfNSW G71 | Construction Surveys |
| TfNSW Q | Quality Management System |
| 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 Test Methods

| | |
|-------------|--|
| TfNSW T111 | Dry Density/Moisture Relationship of Road Construction Materials |
| TfNSW T112 | Dry Density/Moisture Relationship of Road Construction Materials (Modified Compaction) |
| TfNSW T116 | Unconfined Compressive Strength of Remoulded Road Construction Materials |
| TfNSW T119 | Field Density of Road Construction Materials (Sand Replacement Method) |
| 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 T147 | Working Time for Road Construction Materials (Blended in the Laboratory with Slow Setting Binders) |
| 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 Sulfate Ion in Water |
| TfNSW T1015 | Microbiology of Water Used in Road Works (Thermotolerant Coliforms) |

Australian Standards

AS 3550.4 Waters - Determination of solids - Gravimetric method