

TRANSPORT FOR NSW (TfNSW)
QA SPECIFICATION R50
STABILISATION OF EARTHWORKS

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REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
R24	1.1	Clause redrafted	GM, CMS	Jun 91
Ed 1/Rev 2	1.3	New clause		
	1.4	(prev. R24.1.3) T137 added		
	2.2	Verification requirements changed		
	2.3	Verification requirements changed		
	2.4	New clause		
	2.5	(prev R24.2.4) Verification requirements changed		
	2.6	(prev R24.2.5)		
	3.1	Minor changes to allow other stabilising agents as well as quicklime		
	3.2(b)	New requirements		
	4.1	Slag/lime blend included		
	4.2(a)	1st line amended		
	4.3	Generalised to include all stabilising agents		
	4.4	Deleted		
	5	Amendments to all pay items		
App R24/B	New Appendix			
Ed 1/Rev 3	1.4	AS 3972 added AS 1315 & AS 1317 deleted	GM, CEC	10.05.93
	2.5	Para 1 & 2. replaced “AS 1315 and AS 1317” in third para replaced with “AS 3972”.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 3 (cont'd)	3.1(e) 4.1(a) 4.4.3 Annex R24/2	Addition to the end of the third paragraph. First paragraph redrafted. Second paragraph changed to reference RTA Specification 3254. New sentence added to end of second paragraph. Delete existing clause and add R24.3.1(b).		
Ed 2/Rev 0	4.4	Clause numbers and lists restructured. Hold Point has been rewritten.	GM, CEC J Woodward	28.07.95
Ed 2/Rev 1	5	Specification Number changed from R24 to R50. Converted to MS Word 6.0c. References to RTA Specifications changed. Para3 deleted. Pay Item R50P1 method (b) redefined. Pay Items R50P2 and R50P3 clarified.	GM, RNIC J Woodward	09.01.97
Ed 2/Rev 2	4.1.1	Table Nos. of the Earthworks specifications changed.	GM, RNIC J Woodward	04.06.97
Ed 2/Rev 3	1.3 2.4, 3.1.5, Pay Item R50P4 4.1.1	Formatting changed. New clause. References transferred to Annexure R50/M. Test Method RTA T143 replaced by AS 1141.71 Reference to R44 changed.	GM, RNIC	27.08.03
Ed 3/Rev 0	Various Foreword 2 2.2 2.4, 2.5 3.1.4, 3.2.3, 4.1.1	Text revised to direct imperative style. "Superintendent" replaced by "Principal". "Shall" replaced by "must". References updated. Reformatting and minor editing. New clause after the Table of Contents. Lime to comply with RTA 3053 & 3054. Highly reactive type specified for quicklime. Comply with RTA 3211. Test T162 to be taken within 8 hours after mixing.	GM, RNIC	31.10.05
Ed 3/Rev 1	3.1.5 Annex M	Uniformity of Mixing Test deleted. Reference to AS 1141.71 deleted.	GM, RNIC	21.12.05
Ed 3/Rev 2	2.1, 2.2, 2.3 Annex M	References to RTA 3053, RTA 3054 replaced by RTA 3211. Referenced specifications RTA 3053, RTA 3054 deleted.	GM, IC	11.10.10

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 3	1.5 2.3 Annex B Annex M	“Definitions”, previously Clause 2.1, moved to Clause 1.5. Subsequent clauses renumbered. Definitions of “you” and “your” added. AS reference updated. Pay Item R50P4: AS reference updated. Referenced documents updated.	GM, IC	01.04.11
Ed 4/Rev 0	Global 1.1 1.3 2.1 2.1.1 2.1.2 2.2 2.3 3.1, 3.2 3.2.2 3.3 3.4 4 4.2.2 4.2.4 4.3	Spec totally reorganised and rewritten. Term “stabilising agent” changed to “binder”. Scope reworded. New definitions added, and previous definitions removed. New clause on binders incorporating previous separate clauses 2.1 to 2.4. Binder requirements cross referred to spec 3211. Type HE cement prohibited for use as binder. Requirement to include details of binders proposed for use in Project Quality Plan. New clause on sampling and testing. Previously clause 2.5. Properties of water taken from non-town water supply specified. Recycled water requirements cross referred to spec G36. MTBS requirements cross referred to spec R44. New clauses on mix design. Provision for alternative proposals from Contractor or Contractor nominated mix design added. Required material properties after stabilisation specified by cross reference to spec R44. Previously clause 1.4. Previously clause 1.2. New clause on stabilisation by insitu mixing, incorporating previous clause 3.1. New sub-clause on determining the proposed binder spread rate. Determination of actual spread rate clarified, frequency changed to each spreader run. New clause on moisture content requirements for stabilisation by insitu mixing.	GM, CB	08.11.16

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 0 (cont'd)	4.4.1	New sub-clause on mixing equipment.		
	4.4.2	Requirements for spreading in a single pass and in multiple passes added.		
	5	New clause on stabilisation using plant mixed material, incorporating previous clause 3.2.		
	6.1	Requirement added that stabilisation process be a continuous process.		
	6.2	New clause on compaction, previously part of clause 4.1.1.		
	6.3	New clause on trimming.		
	6.4	New clause on working time, previously part of clause 4.1.1.		
	6.5	Previously clause 4.2, but see below for sub-clauses 6.5.1 and 6.5.2.		
	6.5.1, 6.5.2	Requirements for forming longitudinal and transverse joints by insitu mixing added.		
	6.6	Previously clause 4.3.		
	6.7	Previously part of clause 3.1.2.		
	7	Previously clause 4.4.		
	8	New clause on conformity requirements.		
	8.2	Uniformity of mixing requirements (previously in Annex B) moved here.		
	8.3	Times for sampling and testing after mixing changed.		
	8.4	CBR and PI conformity requirements cross referred to spec R44.		
	Annex A1	Table for Principal nominated mix design details amended.		
	Annex B1	New pay item P1.5 added for "other blends". Pay items P2 and P3 title description changed.		
	Annex B2	New section on deductions for nonconformities, incorporating pay items P4 and P5. Percent deductions in relation to compaction changed to align with specs R73 and R75.		
	Annex D	Schedule of Planning Documents amended.		
Annex E	Previously Annex L2.			
Annex L	Minimum frequency of testing amended.			
Annex M	Referenced documents updated.			

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 1	Global	References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively.	DCS	22.06.20



STABILISATION OF EARTHWORKS

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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 R50 Edition 4 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 R50

STABILISATION OF EARTHWORKS

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for stabilisation of earthworks, involving the supply and mixing of binder, and placement, compaction, trimming and curing of the mixed material.

The binder may be incorporated either by insitu mixing of the binder into the soil, or by premixing the binder with other materials in a stationary mixing plant before placing.

Typical uses include improvement of embankment foundations or cutting floors, intermediate embankment layers and Selected Material Zones.

1.2 STRUCTURE OF 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 R50/A.

1.2.2 Measurement and Payment, Resolution of Nonconformities

The method of measurement and payment is detailed in Annexure R50/B.

Acceptance of materials and work will be in accordance with Annexure R50/B.

1.2.3 Schedule of HOLD POINTS

The schedule in Annexure R50/C lists the **HOLD POINTS** that must be observed. Refer to Specification TfNSW Q for the definition of **HOLD POINTS**.

1.2.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure R50/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 item, which must not be less than the frequency specified in Annexure R50/L. Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of TfNSW Q.

1.2.6 Referenced Documents

Unless specified otherwise, 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 R50/M.

1.3 DEFINITIONS

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

The following meanings apply to this Specification:

“**Stabilisation**” includes modification.

“**Binder**” refers to any one of the following: quicklime, hydrated lime, slag/lime blend, or cement.

“**MTBS**” refers to the material to be stabilised.

2 MATERIALS

2.1 BINDERS

2.1.1 General

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

Do not use high early strength cement (Type HE) as a binder.

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

2.1.2 Sampling and Testing

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

2.1.3 Supply of Binder

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

2.2 WATER

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

Water that is not taken from a town water supply system must comply with the requirements shown in Table R50.1.

Table R50.1 – 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 a 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.

2.3 MATERIAL TO BE STABILISED

Material to be stabilised must comply with the requirements of Specification TfNSW R44.

3 STABILISATION – GENERAL

3.1 PRINCIPAL’S MIX DESIGN

Where the mix design is nominated by the Principal, details of the mix design are given in Annexure R50/A. The Principal may vary the specified proportion to suit the actual properties of the material to be stabilised (MTBS).

You may propose different types or different proportions of binder to those specified in Annexure R50/A. Do not implement such alternative proposals without the written authorisation of the Principal.

3.2 CONTRACTOR’S MIX DESIGN

3.2.1 General

Where the Principal has not nominated a mix design, prepare a mix design with the appropriate binder type and proportion to achieve the material properties specified in Clause 3.2.2. Submit the proposed mix design to the Principal for approval at least 10 working days before the proposed commencement of stabilisation work.

The submission must include the details of the MTBS, the proposed binder and application rate, the proposed water source, and NATA endorsed test certificates to verify that the required material properties can be achieved with the proposed mix design.

3.2.2 Required Material Properties After Stabilisation

Unless specified otherwise, the proposed mix design must not result in a material after stabilisation with a UCS (after 7 days accelerated curing) greater than 1.5 MPa, when tested in accordance with Test Method TfNSW T131.

When stabilisation is used to create a working platform in the floor of cutting as a foundation treatment, or to improve the properties of the material in the top 150 mm layer of the Selected Material Zone, as part of the work carried out under Specification TfNSW R44, the proposed mix design must be such that, after stabilisation, the CBR and PI values comply with that specified in TfNSW R44.

3.3 WEATHER CONDITIONS

Do not carry out stabilisation work:

- (a) during wet weather, or if wet weather appears imminent;
- (b) 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.

3.4 CONSTRUCTION SEQUENCE FOR PAVEMENT SUBSOIL DRAINS

Where subsoil drains are required for the drainage of the pavement, carry out any stabilisation of the Selected Material Zone prior to construction of the subsoil drains.

4 STABILISATION BY INSITU MIXING

4.1 PREPARATION OF LAYER

Prior to insitu mixing, compact the layer to be stabilised to a minimum of 95% relative compaction as determined by Test Method TfNSW T166, and trim the surface parallel to the Designed Finished Surface Level.

Prior to spreading the binder, tyne and/or rip the insitu material where required, to facilitate insitu mixing, but do not disturb any material beneath the layer to be stabilised.

4.2 SPREADING OF BINDER

4.2.1 General

If not nominated in Annexure R50/A, provide your proposed binder type, spread rate and stabilisation depth to the Principal for approval at least 5 working days before commencing any stabilisation work.

Include in the PROJECT QUALITY PLAN the procedures and equipment for the spreading of binder.

4.2.2 Required Binder Spread Rate

Determine the required spread rate of the binder, using the specified (or approved alternative/nominated) proportion of stabilising binder, nominated depth of stabilisation, and density of MTBS stated in Annexure R50/A.

4.2.3 Spreading Equipment

Spread the binder using a mechanical spreader capable of spreading it uniformly within -10% and +20% of the nominated rate.

4.2.4 Actual Binder Spread Rate

Determine the actual spread rate achieved for each spreader run using Test Method TfNSW T136.

For each spreader run, carry out at least two tests, with the first within 20 m of the start of each spreader run, and the spacing between tests must not exceed 200 m. The actual spread rate is calculated as the average of the two spread rate tests.

4.2.5 Slaking of Quicklime

Where quicklime is used as a binder, commence slaking of the quicklime within 30 minutes after spreading by spraying water on the spread quicklime. Repeat spraying until slaking is complete.

When carrying out stabilisation with quicklime over uneven ground to form a working platform, apply the water uniformly and in such quantities sufficient to produce a material that is at least 80% hydrated. Avoid allowing water to concentrate in ruts and hollows, or over-application of water causing the production of a wet hydrate.

In all other applications using quicklime, the quicklime must be fully slaked prior to mixing with the soil.

4.2.6 Spillage of Binder

Remove any spilt binder within 4 hours of its occurrence.

4.3 MOISTURE CONTENT

Develop a work method with a target moisture content envelope that will ensure that there is adequate moisture in the mixed material to achieve binder hydration and the specified 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 for compaction.

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

4.4 MIXING OF BINDER

4.4.1 Mixing Equipment

For insitu stabilisation, use purpose built mixing equipment which is capable of mixing to the depth specified, and distributing both the binder and moisture uniformly over the full depth and over the total area. It must also be capable of pulverising and mixing all bituminous surfacing and/or patches.

The moisture must be applied uniformly 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 worn or damaged mixing blades or tynes to maintain mixing efficiency.

Fit the equipment with an adjustable screed plate and cover flaps.

4.4.2 Mixing Operation

Where the total amount of binder is spread in a single pass, mix the spread binder into the full specified depth of stabilisation.

Where the binder is spread in two or more passes, mix the binder spread in the first pass into approximately 90% of specified depth of stabilisation. Spread and mix the remaining binder to the required depth in the second and any successive mixing pass(es).

Mix to the depth required to obtain the required compacted thickness of stabilised material (after trimming) within a tolerance of -10 mm and +15 mm.

The resultant mixed material must be uniform over the full depth with no lenses, pockets, clumps or granules of binder visible within the mixed layer or in adjacent layers.

Adjust the screed bar of the machine throughout the process to obtain a smooth surface without humps or hollows, which will allow uniform compaction with minimal trimming and grading.

Do not add any further water to the mixed material after completion of mixing but before compaction is complete, other than light surface wetting to reduce moisture loss and dust.

5 STABILISATION USING PLANT MIXED MATERIAL

5.1 PLANT MIXING

5.1.1 Mixing Equipment

Carry out the premixing of the various constituent materials in a stationary mixing plant of the driven pugmill type, capable of processing at least 200 tonnes per hour. The mixing plant must be capable of incorporating the binder to an accuracy of 10% of the nominated rate.

Before commencing the mixing, calibrate the mixing plant to determine the rate of addition of the binder at various plant speeds. Detail the method of calibration in the PROJECT QUALITY PLAN. A suggested method is given in Annexure R50/E.

5.1.2 Mixing Operation

Feed the component materials of the mix, including water where necessary, into the pugmill at a steady and continuous rate and mix together for at least 30 seconds measured from the time all component materials have entered the pugmill until the time when the binder is uniformly distributed throughout the mix.

The mixing operation must avoid segregation occurring in the mix.

Do not use quicklime as the binder when mixing by stationary mixing plant.

Remove any spilt binder within 4 hours of its occurrence.

5.1.3 Quantity of Binder

Where the binder is hydrated lime or a blended binder, verify on a daily basis that the device for administering the binder remains within the tolerance of the mixing plant speed being used.

Where the binder is cement, determine the amount of binder incorporated on a daily basis using Test Method TfNSW T137.

Maintain the actual rate of incorporation of binder to within 10% of the specified rate.

5.2 MOISTURE CONTENT

If the mix is delivered in open bodied vehicles, cover the load to minimise loss of moisture during transport to the location where it is to be placed.

Control the moisture content of the mixed material delivered to a moisture content of between 60% and 90% of its optimum moisture content, determined using Test Method TfNSW T162.

Take samples of the mixed material before placing it, to determine the field moisture content, and complete the testing in accordance with TfNSW T162 as soon as practicable after mixing but no later than 8 hours after mixing.

5.3 PLACEMENT OF PLANT MIXED MATERIAL

Immediately prior to placement of the plant mixed material, lightly scarify/tyne the surface on which it is to be placed to a depth not exceeding 25 mm.

Do not incorporate segregated or non-uniformly mixed material that has been delivered into the Works.

Place and spread the plant mixed material such that the material is not segregated and can be compacted and trimmed to achieve the requirements of TfNSW R44.

6 COMPACTION, TRIMMING, CURING AND PROTECTION OF WORK

6.1 GENERAL

The entire process from spreading and mixing the binder into the insitu material, or mixing binder into and spreading plant mixed stabilised material, to final compaction and trimming, must be a continuous operation.

6.2 COMPACTION

After spreading the plant mixed material (refer Clause 4), or mixing the binder into the insitu material (refer Clause 5), commence compaction of the mixed material immediately.

Compact the stabilised material in accordance with TfNSW R44, to a characteristic relative compaction not less than the lower limits specified in Table R44.10.

6.3 TRIMMING

On completion of compaction, carry out trimming to produce a surface which is parallel to the Designed Finished Surface Level shown on the Drawings and within the tolerances stated in Table R44.11 of TfNSW R44.

Do not incorporate any cut material from the trimming into the mixed layer, but reuse it as earth fill or dispose of it as spoil.

After trimming, the thickness of the stabilised layer must not be less than that specified.

6.4 WORKING TIME

Where the binder is quicklime, hydrated lime or slag/lime blend, complete the compaction and trimming within 24 hours after commencement of mixing. Reworking of the stabilised materials may be carried out up to 24 hours after mixing with the approval of the Principal.

Where the binder is cement, complete the compaction and trimming within two hours after commencement of mixing. Reworking of the stabilised material is not permitted after mixing.

6.5 CONSTRUCTION JOINTS

Compact joints so that all the material complies in all respects with the Specification and the material placed on both sides of the joint is not damaged.

6.5.1 Longitudinal Joints

Longitudinal joints are permitted only where you can demonstrate that the joints are unavoidable. Plan your stabilisation work such that the full specified width of carriageway is completed within the one day's operation, without the need for longitudinal joints.

If compaction of adjoining runs cannot be carried out within 2 hours of incorporating the binder where the binder is cement, and within 4 hours where the binder is other than cement, form a longitudinal joint between the runs as follows:

(a) Insitu Mixing

- (i) Spread the binder on the side of the previously stabilised area to overlap the joint by 0 mm to +50 mm.
- (ii) Mix the material on the side of the previously stabilised area to overlap the joint by +50 mm to +100 mm.

(b) Plant Mixing and Placing

- (i) Just prior to placing the next run, cut back the edge of the previously placed and compacted run to the extent that the compacted mix at the cut face complies with the requirements of this Specification.
- (ii) Remove and dispose of the cutback material from the joint area and leave the joint area clean. Do not incorporate cutback material into subsequent pavement courses.
- (iii) Maintain the cut face of the previous run in a damp condition prior to placing the next run.
- (iv) Support the roller partly on the previously compacted run when compacting the fresh mix placed against the cut face.

6.5.2 Transverse Joints

Transverse joints may be formed in the following circumstances:

- (i) Just prior to the commencement of the day's stabilising operation.
- (ii) Following any delay in excess of 2 hours in the continuity of the stabilising operation.

Form a transverse joint as follows:

(a) Insitu Mixing

- (i) Spread the binder on the side of the previously stabilised area to overlap the joint by 0 mm to +50 mm.
- (ii) Mix the material on the side of the previously stabilised area to overlap the joint by half a mixing drum to ensure no unmixed material remains below the surface between runs.

(b) Plant Mixing and Placing

- (i) Just prior to placing the next run, cut back the edge of the previously placed and compacted run to the extent that the compacted mix at the cut face complies with the requirements of this Specification.
- (ii) Remove and dispose of the cutback material from the joint area and leave the joint area clean. Do not incorporate cutback material into subsequent pavement courses.
- (iii) Maintain the cut face of the previous run in a damp condition prior to placing the next run.
- (iv) Support the roller partly on the previously compacted run when compacting the fresh mix placed against the cut face.

6.6 CURING

Protect stabilised layers against rapid drying by keeping the surface of the layer continuously damp until such times as a covering layer is placed.

If the stabilised layer lies immediately beneath the pavement, and a pavement layer or bituminous surfacing will not be placed within 5 days of the completion of stabilisation, apply a layer of rapid setting bitumen emulsion complying with the requirements of Specification TfNSW 3254 for Grade CRS, at the rate of at least 0.5 L/m², within 2 days of the completion of compaction and trimming.

Repair any damage to the emulsion coat caused by construction traffic within 24 hours of the damage occurring.

6.7 TRAFFICKING OF WORK AREAS

Do not allow any traffic and any equipment not actually used in the stabilisation work from travelling over the stabilised material until completion of compaction.

7 TRIAL SECTION

7.1 GENERAL

Prior to the commencement of stabilisation, and subsequent stabilisation for a different purpose, construct a trial section at a location agreed with the Principal, using the same materials, equipment and methods for placing and finishing which will be used for the remaining work. Demonstrate during construction of the trial section the methods proposed for the construction of joints.

The section selected for the trial, if conforming, will become part of the Works.

The trial section must be between 100 m and 200 m long for the proposed Lot width.

HOLD POINT

Process Held: Stabilisation of earthworks using a particular combination of materials, equipment and methods not previously trialled.

Submission Details: Documentation, including test results, verifying that the trial section 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.

7.2 NONCONFORMITIES

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

Remove any stabilised earthworks carried out during the trial which does not conform to the Specification but avoid any damage to the remaining conforming stabilised earthworks and underlying materials.

Dispose of the removed materials at a location of your choice acceptable to the Principal.

The removal of nonconforming trial stabilised earthworks and the making good of any damage caused by such removal to other parts of the Work must be at no cost to the Principal.

7.3 NEW TRIAL SECTION

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

8 CONFORMITY

Each Lot must comply with the requirements in Clause 8.1 to 8.3.

8.1 UNIFORMITY OF MIXING

When stabilisation is carried out using insitu mixing, determine the uniformity of mixing in the vertical direction by comparing the added binder content of the top half of a test hole against the added binder content of the bottom half of the same test hole in accordance with AS 5101.3.2.

This test must be undertaken only after at least 48 hours has elapsed after compaction of the stabilised area.

Mixing is considered to be uniform when the percentage difference in added binder content between the top half and bottom half of the layer is not greater than 0.3%.

Lots that are nonconforming with respect to uniform of mixing may be accepted with a deduction to the rate for Pay Item R50P2 as shown in Annexure R50/B2.

8.2 COMPACTION

Determine the characteristic relative compaction in accordance with TfNSW R44 Clause 7.3, except that the sample for determination of the maximum density of the stabilised material in the layer must be taken as soon as practicable after mixing (refer Clause 4.4) or placement (refer Clause 5.3), and before compaction.

Compact the sample within 3 hours of sampling. Record the time of sampling and compaction on the compaction test report submitted to the Principal.

Determine the insitu density within 200 mm of the location of sampling for maximum density and within 24 hours of compaction.

The characteristic relative compaction of each compacted layer must conform to the requirements of TfNSW R44.

Lots that are nonconforming with respect to compaction may be accepted with a deduction to the rate for Pay Items R50P2 or R50P3 as shown in Annexure R50/B2.

8.3 MATERIAL PROPERTIES – CBR AND PI

Where stabilisation is undertaken to meet the CBR and/or PI requirement specified in TfNSW R44, the stabilised material must conform to the requirements of TfNSW R44.

ANNEXURE R50/A – PROJECT SPECIFIC REQUIREMENTS**A1 PRINCIPAL NOMINATED MIX DESIGN**

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R50/A1)

Where the mix design is to be nominated by the Principal, complete the table below by filling in the required details.

“Road Reference” can be either the road name or control line designation. “From” and “To” can be either the road intersection name or chainage.

Binder can be quicklime, hydrated lime, slag/lime blend or cement.

Road Reference	Location		Binder			Dry Density of MTBS ⁽⁴⁾	Depth of Stabilisation ⁽⁵⁾
	From	To	Type ⁽¹⁾	Blend Proportion ⁽²⁾	Binder Proportion ⁽³⁾		

Notes:

- ⁽¹⁾ Refer to TfNSW R44 for guidance on binder requirements where stabilising SMZ layer.
- ⁽²⁾ Where cementitious binders are used and the binder consists of a blend of cement, slag, fly ash and/or lime, the mass of each binder type must be expressed as a percentage by mass.
- ⁽³⁾ Proportion of binder to be added expressed as a percentage by dry mass of MTBS.
- ⁽⁴⁾ Nominate if known or determine on site prior to stabilisation if not nominated.
- ⁽⁵⁾ Nominate if known or determine on site prior to stabilisation if not nominated.

ANNEXURE R50/B – MEASUREMENT AND PAYMENT

B1 MEASUREMENT AND PAYMENT

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Items.

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.

Payment will not be made for stabilising work carried out which are not specified in Annexure R50/A or shown on the Drawings or directed by the Principal.

No additional payment will be made for the formation of longitudinal and transverse joints.

Pay Item R50P1 - Supply of Binder

The unit of measurement for Pay Items R50P1.1 to R50P1.5 is the “tonne” (of binder).

Pay Item R50P1.1 - Quicklime

Pay Item R50P1.2 - Hydrated Lime

Pay Item R50P1.3 - Slag/lime Blend

Pay Item R50P1.4 - Cement

Pay Item R50P1.5 - Other Blend

The quantity to be paid for is determined as follows:

(a) For Insitu Mixing

The lesser of the nominated spread rate multiplied by the area directed to be stabilised, or the actual tonnage used.

(b) For Mixing by Stationary Mixing Plant

The lesser of the actual tonnage used and the calculated value based on the specified rate, the maximum dry density of the material being stabilised, the minimum specified characteristic value of compaction and the volume of material stabilised as calculated by the end area method in Pay Item R50P3.

No account will be taken of allowed tolerances in the thickness of the layer(s) or the tolerances allowed in the nominated quantity of binder.

Pay Item R50P2 - Stabilisation of Earthworks by Insitu Mixing

The unit of measurement is the “cubic metre”.

The volume is determined by the end area method using the area to be treated and the compacted thickness as specified or as directed by the Principal. No account will be taken of depth tolerances.

The rate covers any additional costs, over and above those allowed for in the Pay Items in Specification TfNSW R44, for the preparation of the layer, spreading and mixing in of the binder, slaking of quicklime where required, compacting, trimming and curing of the stabilised layer, and application of bitumen emulsion.

Separate rates must be given for each type of binder specified for insitu mixing.

Pay Item R50P3 - Stabilisation of Earthworks Using Plant Mixed Material

The unit of measurement is the “cubic metre”.

The volume is determined by the end area method using the area to be treated and the compacted thickness as specified or as directed by the Principal. No account will be taken of depth tolerances.

The rate covers any additional costs, over and above those allowed for in the Pay Items in Specification TfNSW R44, for supply of the MTBS to the mixing plant, mixing with binder, preparation of the insitu surface, spreading, compacting, trimming and curing of the stabilised layer, and application of bitumen emulsion.

Separate rates must be given for each type of binder specified for mixing by stationary mixing plant.

B2 DEDUCTIONS FOR NONCONFORMITIES

Pay Item R50P4 - Deductions to Pay Item R50P2 for Non-uniform Mixing.

Where there is non-uniform mixing between top half and bottom half of the layer, expressed as the difference in added binder content between the two layers, deductions in accordance with Table R50/B.1 will apply to the rate provided for under Pay Item R50P2.

Table R50/B.1 – Deductions for Non-uniform Mixing

Difference In Added Binder Content (%) ⁽¹⁾	Deduction ⁽²⁾
0 to ≤ 0.3%	Nil
> 0.3 to ≤ 0.7%	20%
> 0.7 to ≤ 1.2%	50%
> 1.2	Reject ⁽³⁾

Notes:

- ⁽¹⁾ Difference in added binder content (%) between top half and bottom half of layer.
- ⁽²⁾ Applied as % deduction to rate for Pay Item R50P2 for quantity represented by test results.
- ⁽³⁾ Rectify, or remove and replace, quantity represented by test results. No additional payment will be made for the cost of rectification.

Pay Item R50P5 - Deduction to Pay Items R50P2 or R50P3 for Inadequate Compaction

Where the specified characteristic value of relative compaction is not achieved, deductions in accordance with Table R50/B.2 will apply to the rate provided for under Pay Item R50P2.

Table R50/B.2 – Deductions for Relative Compaction

Where specified compaction is 98%		Where specified compaction is 102%	
Relative Compaction ⁽¹⁾	Deduction ⁽²⁾	Relative Compaction ⁽¹⁾	Deduction ⁽²⁾
≥ 97 to < 98%	10%	≥ 101 to < 102%	10%
≥ 96 to < 97%	30%	≥ 100 to < 101%	30%
< 96%	Reject ⁽³⁾	< 100%	Reject ⁽³⁾

Notes:

⁽¹⁾ Characteristic value of relative compaction.

⁽²⁾ Applied as % deduction to rate for Pay Item R50P2 or R50P3 for quantity represented by test results.

⁽³⁾ Rectify, or remove and replace, quantity represented by test results. No additional payment will be made for the cost of rectification.

ANNEXURE R50/C – SCHEDULE OF HOLD POINTS

Refer to Clause 1.2.3.

Clause	Description
7.1	Completion of trial section of stabilisation

ANNEXURE R50/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
2.1.1	Details of all cementitious and pozzolanic materials and blend proportions of blended binders
2.1.2	Method of sampling binders
2.2	Details of water proposed for use in the Works, including water source
3.3	Procedures for cessation of work in event of adverse weather conditions
4.3	Procedure to incorporate water into MTBS to achieve uniform distribution of water
4.4.1	Details of mixing equipment for insitu stabilisation
5.1.1	Method of calibration of mixing plant

ANNEXURE R50/E – SUGGESTED METHOD OF CALIBRATION OF STATIONARY MIXING PLANT

The rate of addition of the binder may be determined by the following method:

- (a) Establish the rate of addition of binder, in mass per unit time, for various plant speeds, by running the plant at a specific speed and directing the flow of additive into a suitable sampling tray or container for a specific period of time. Calculate and record the rate of addition of binder for this plant speed.

Repeat this procedure for each plant speed setting which is to be used.

- (b) Establish the rate of production of the mixing plant in dry mass per unit time, by loading a truck of known mass for a specific period of time with the mixing plant running at a specific speed. Weigh the truck on a weighbridge and calculate the mass of material. When carrying out this procedure, do not add the binder.

Determine the moisture content of the material at the point of loading using Test Method TfNSW T120. Calculate and record the output rate for this plant speed.

Repeat this procedure for each plant speed setting which is to be used.

- (c) Calculate the rate of addition of the binder at each speed of operation of the mixing plant using the formula shown below:

$$\left[\frac{\text{Mass of additive per unit time}}{\text{Dry mass of material per unit time}} \right] \times 100\%$$

ANNEXURES R50/F TO R50/K – (NOT USED)

ANNEXURE R50/L – MINIMUM FREQUENCY OF TESTING

Clause	Characteristic Tested	Test Method	Minimum Frequency of Testing
2.1.1	Quality of binder	TfNSW 3211	As per TfNSW 3211
2.1.1	Proportion of blended binder	Verify proportion of constituents	1 per binder delivery
2.2	Quality of water:		
	Chloride ion concentration	TfNSW T1004	1 per Contract per source
	Sulfate ion concentration	TfNSW T1014	1 per Contract per source
	Undissolved solids	AS 3550.4	1 per Contract per source
	Concentration of thermo-tolerant coliforms	TfNSW T1015	1 per Contract per source
3.2.2	UCS	TfNSW T131	2 per Lot
4.2.4	Actual spread rate achieved	TfNSW T136	2 per spreader run ⁽¹⁾
8.1	Uniformity of mixing	AS 5101.3.2	1 per 200 m of insitu stabilisation
8.2	Compaction	As per TfNSW R44	As per TfNSW R44
8.3	CBR and PI	As per TfNSW R44	As per TfNSW R44

Note:

⁽¹⁾ Refer Clause 4.2.4. The first test must be within 20 m of the start of each spreader run, and the second test must be within 200 m of the first.

ANNEXURE R50/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.6.

TfNSW Specifications

TfNSW Q	Quality Management System
TfNSW G36	Environmental Protection
TfNSW R44	Earthworks
TfNSW 3211	Cements, Binders and Fillers
TfNSW 3254	Bitumen Emulsion

TfNSW Test Methods

TfNSW T120	Moisture Content of Road Construction Materials (Standard Method)
TfNSW T131	Unconfined Compressive Strength of Road Construction Materials (Blended in the Laboratory with Cementitious Binders)
TfNSW T136	Rate of Spread of Dry Powder Binders
TfNSW T137	Cement Content of Cement Stabilised Material (Heat of Neutralisation)
TfNSW T162	Compaction Control Test (Rapid Method)
TfNSW T166	Relative Compaction of Road Construction Materials
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
AS 5101.3.2	Methods for preparation and testing of stabilized materials – Lime or cement content of stabilized pavement materials (EDTA method)