

SECTION Q

IN SITU STABILISATION OF EXISTING PAVEMENT MATERIALS

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Q.1 DESCRIPTION

This specification covers the requirements for in situ stabilisation of existing pavement layers by the addition of lime and other specified pozzolanic material. The requirements relate to the preparation of existing pavement materials, quality of the additive, construction plant and spreading, mixing and compaction procedures.

Q.2 DEFINITIONS

Hydrated Lime:	The powdered form of lime consisting primarily of calcium hydroxide.
Equivalent Calcium Oxide Content:	The equivalent calcium oxide content (E.C.O.C) is the amount of calcium oxide expressed as a percentage by mass, which in hydrated lime is chemically proportional to the amount of calcium hydroxide available after slaking.

Q.3 CONFORMITY WITH DRAWINGS

Lime stabilised layers shall be finished to conform within the following limits to the levels, lines, grades, thicknesses and cross sections specified or shown on the drawings:

(a) **Surface Level**

The level of the 4op of the stabilised layer shall not differ from the specified level by more than 20mm.

(b) **Thickness**

The thickness of the stabilised layer at any point shall not be less than the thickness specified by more than 15mm. The average thickness of the layer over any 100m section for the full carriageway width shall be not less than the specified thickness as determined from measurements taken at intervals no greater than 20m.

(c) **Alignment**

The edges of the stabilised layer shall be not more than 50mm inside and not more than 100mm outside the specified offset from the centre line or design line.

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Q.3 CONFORMITY WITH DRAWINGS (cont'd)

(d) **Width**

The width of the stabilised layer shall be not less than the specified width by more than 50mm and not greater than the specified width by more than 100mm. The average width of the layer determined from measurements at six (6) sites selected randomly over any 300m shall be not less than the specified width.

(e) **Shape**

No point on the surface of the stabilised layer shall lie more than 15mm below a 3m straight edge laid in any direction on the surface.

Q.4 MATERIALS

(a) **Hydrated Lime**

The equivalent calcium content of hydrated lime shall be not less than 60%. Bulk hydrated lime shall be dry and shall have been produced not more than 14 days before delivery. Hydrated lime shall comply with the grading requirements specified in table Q.4.1 below

Table Q.4.1

AS Sieve Size (mm)	Test Value (% passing)
4.75	100
0.600	95-100
0.075	85-100

(b) **Ground Granulated Blast Furnace Slag (GGBFS)**

A by-product of the manufacture of Steel.

(c) **Roadment**

A by-product of the manufacture of Steel and cement.

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Q.4 MATERIALS (cont'd)

(d) Additive Availability and Distributors

Hydrated Lime and Ground Granulated Blast Furnace Slag are readily available products:

Note 1:

Recognised distributors include:

Independent Cement and Lime Pty Ltd. and
Blue Circle Southern Cement Pty Ltd.

Note 2:

Roadment is solely distributed by:
Blue Circle Southern Cement Pty Ltd.

(e) Water

Water shall be clear and substantially free from impurities such as oils, salts, organic substances acids, alkalis and vegetable matter. The amounts of chloride and sulphate shall each be no greater than 0.03%.

(f) Pavement

The material to be stabilised shall be the existing surfacing and pavement material and any additional material placed over the existing pavement for mixing with the layer below.

Q.5 CONSTRUCTION PLANT

(a) General

The Contractor shall provide and operate sufficient spreading, mixing, watering and compacting plant to carry out the specified work.

(b) Additive Spreader

Mechanical equipment specifically designed for the spreading of stabilising additives shall be used to spread the additive onto the prepared roadbed. It shall be capable of accurately regulating the discharge of the additive.

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Q.5 CONSTRUCTION PLANT (cont'd)

(c) **Stabilisation Machine**

A machine specifically designed for stabilisation of road materials shall carry out the pulverisation and mixing of pavement material, water and additive. Rotary hoes and other agricultural type machinery shall not be used. The machine shall be capable of uniformly mixing the additive throughout the specified depth. The machine shall be capable of pulverising the pavement such that most of the material shall pass a 50mm sieve after pulverisation.

(d) **Watering Plant**

Watering plant shall be capable of uniformly distributing water in a fine spray.

Q.6 CONSTRUCTION

(a) **General**

Construction includes the preparation of in situ materials, spreading and mixing additives and materials, compaction, trimming and curing of the stabilised layer. Unless otherwise specified, stabilisation work undertaken each day shall be completed across the full pavement width. Stabilisation operations should only continue in the event of rain, if the moisture content of the pavement is kept below modified optimum moisture content.

(b) **Preparation of Pavement**

The existing pavement shall be scarified and mechanically mixed prior to spreading of additive and in such a manner as not to disturb the material beneath the layer to be stabilised. The pavement materials shall be conditioned with moisture 1.0% to 1.5% below the modified optimum moisture content prior to the spreading of the stabilising additive to allow the absorption of moisture into the material, with the remaining moisture to be added at the time of mixing. The scarified pavement shall be compacted sufficiently to provide a reasonably even surface. The Contractor shall remove any large masses of asphalt patching materials and replace with granular material as specified.

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Q.6 CONSTRUCTION (cont'd)

(c) **Spreading of Additive**

Spreading shall not be carried out during windy periods if the additive could be dispersed or become a nuisance or a hazard to people, property or livestock. Where the additive to be spread is lime, the lime additive shall be spread uniformly over the prepared surface at rate determined as follows:

$$\text{Spreading Rate} = \frac{\text{Specified Distribution Rate} \times 100}{\text{Equivalent Calcium Oxide Content}}$$

The specified distribution rate is that rate specified in Q.14 below. No traffic or construction Plant unless engaged in the stabilisation operations shall traffic the prepared pavement until the spread additive has been mixed into the underlying layer.

(e) **Mixing**

Mixing shall commence as soon as practical after spreading of the additive and sufficient mixing shall be undertaken to ensure that all pavement materials and additives are uniformly blended throughout the full depth of the stabilised layer. The moisture content of the stabilised material at the time of mixing shall be within a range 80% to 105% of the modified optimum moisture content.

(f) **Compaction**

Compaction of the mixed material shall commence immediately after mixing and shall be carried out in a continuous operation from initial to final rolling. Unless otherwise specified, compaction of pavement materials stabilised with additives other than cement shall be completed on the same day that mixing occurs. Where necessary during compaction, the Contractor shall water the material to maintain the moisture content within 80% to 105% of modified optimum moisture content.

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Q.6 CONSTRUCTION (cont'd)

(g) Trimming

On completion of initial rolling, the stabilised material shall be trimmed to the specified surface tolerances. Light applications of water may be applied during this operation to replace evaporated moisture and to assist in rapid achievement of tightly knit surface. Surface irregularities, deficiencies in level and high areas shall be rectified by the Contractor within half of one hour of trimming. Within this period scarification, addition or removal of material, reshaping and recompaction shall be permitted. Rectification after half of one hour shall be carried out by replacing material with freshly stabilised materials as necessary. The material trimmed off shall be cut to waste and shall be removed from the site.

Q.7 JOINTING

The work shall be organised such that the longitudinal joints between compacted and freshly mixed material are avoided. Transverse joints shall be formed where stabilisation has been halted for more than six (6) hours and at the end of each day's work. Longitudinal joints shall be constructed parallel to the centre line of the carriageway and transverse joints at right angles to the centre line.

Joints shall be formed by cutting back into the previously stabilised material to a fully compacted section, over the full depth and width of the layer(s) and continuing stabilisation from that point. The material disturbed during cutting back shall be remixed and incorporated into the new work. Additional stabilising additive shall be spread adjacent to the joint. Placement of additional additive shall be deemed to be part of the joint operation.

The level and shape of the surface at all joints shall be within the limits specified in Q.3 (a) and Q.3 (e) above.

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Q.8 TEST ROLLING

The stabilised layer shall be compacted to withstand test rolling and shall be test rolled in accordance with the procedure below. The Contractor shall rectify any unstable areas detected by test rolling.

(a) General

HP The Contractor shall submit to the Superintendent for review a test rolling procedure to be used where specified or directed. The procedure submitted by the Contractor shall include details of when test rolling will be undertaken, the method of preparing an area for test rolling and the extent of test rolling.

Plant, which is nominated for use in test rolling procedures, shall comply with the following requirements:

- (i) Static smooth steel-wheeled rollers shall have a mass of not less than 12 tonnes and a load intensity under either the front or rear wheels of not less than 6 tonnes per metre width of wheel.
- (ii) Pneumatic tyred plant shall have a ground contact pressure under either the front or rear wheels of not less than 450 kPa per tyre. The area over which this ground contact pressure shall be applied shall not be less than 0.035 m² per tyre.
- (iii) Water tanker with a load capacity of 12,000 litres.

(b) Testing

HP Test Rolling shall be undertaken in accordance with the accepted procedure in the presence of the Superintending Officer.

(c) Compliance

Compliance with the test rolling requirements shall be when an area withstands test rolling without visible deformation or springing.

If required by the Superintendent, further test rolling shall be carried out by the Contractor on the layer prior to being covered by the succeeding layer. No additional payment will be made for any requirement to carry out such further test rolling.

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Q.9 MAINTENANCE PRIOR TO SURFACING

HP The Contractor shall apply a bituminous prime or primer seal and shall confirm with the Superintendent which one is to be used.

Q.10 REQUIREMENTS FOR TESTING AND ACCEPTANCE OF COMPACTION

Each layer of material shall be compacted separately. Not more than six (6) hours shall elapse between the time of completion of mixing and the time of completion of initial rolling, nor more than eight (8) hours between the time of completion of mixing and the time of completion of final rolling. On completion of compaction any segregated areas shall be rectified as agreed with the Superintendent.

The calculation of density ratio shall be based on modified compactive effort.

For work to be tested for compliance with density requirements, the number of tests per lot shall be six. A lot shall consist of a single layer of pavement material and all lots shall be tested for compliance with the requirements in this section.

Q.11 REQUIREMENTS FOR TESTING AND ACCEPTANCE OF ADDITIVE CONTENT

The average spreading rate of additive shall be ascertained by dividing the mass of additive spreading by the area over which the additive has been spread. Where the average spreading rate is less than the specified rate, additional additive shall be spread to bring the average rate up to at least the specified rate.

The Contractor shall check the uniformity of the spreading of additive by placing mats with a plan area no less than 1m² in the path of the spreading vehicle and dividing the mass of additive deposited on each mat by the plan area of the mat. Where the spreading rate so determined for any mat is less than the specified rate by more than 10%, additional additive shall be spread over the part or all of the area which the additive has been spread.

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Q.12 MINIMUM TESTING REQUIREMENTS

The Contractor shall test the materials and stabilised pavement layer at a frequency which is sufficient to ensure that the materials and work under contract comply with the specified requirements but which is not less than that shown in Table Q.12.1 below

Table Q.12.1

Test	Minimum Frequency of Testing
Additive Properties	
Unconfined Strength Tests in accordance with AS 1141.51 (28 day curing)	One test for every 200m of stabilised pavement
Additive Content	
Uniformity of Spreading Average Spread Rate	Three tests for each separate area of work Each separate area of works
Compaction	
Lot size to be within the range of: min: 500m ² max: one day's production	100% of lots to be tested. (Field and laboratory compaction test must be carried out between 2-8 hrs after mixing).

Q.13 PERCENTAGE ADDITIVE TO BE USED

The percentage by weight of additive to be used is to be determined from Table Q.13.1 below:

Table Q.13.1

Subbase Material to be Stabilised	Stabilising Additive	Percentage by Weight to be Used
Road Making Sands	Slag/Lime blend (85% GGBFS/15% Hydrated Lime)	4.0%
or In Situ Sands	or Roadment.	4.0%
Granitic Crushed Rock	Slag/Lime blend (85% GGBFS/15% Hydrated Lime)	3.0%
or Granitic Gravel	or Roadment.	3.0%
Basaltic Crushed Rock	Slag/Lime blend (85% GGBFS/15% Hydrated Lime)	2.0-3.0%
or Basaltic Gravel	or Roadment.	2.0-3.0%

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Q.14 SCHEDULE OF DETAILS – REFER TO ADDENUM

Q.15 TESTING AUTHORITY

The appointed testing authority approved by the Superintendent shall carry out all field and laboratory testing in accordance with the following Australian Standards:

(a) **Determination of Moisture Contents**

AS 1289.2.1.1	Determination of the Moisture Content of a Soil - Oven Drying Method.
AS 1289.2.1.4	Determination of the Moisture Content of a Soil - Microwave-Oven Drying Method.
AS 1289.2.1.6	Determination of the Moisture Content of a Soil - Hot Plate Method.

(b) **Determination of Dry Densities**

AS1289.5.2.1	Determination of Dry Density/Moisture Content Relation of A Soil using Modified Compactive Effort.
AS 1289.5.4.1	Dry Density Ratio, Moisture Ratio and Moisture Variation.
AS 1289.5.4.2	Assignment of Maximum Dry Density and Optimum Moisture Content Values.

(c) **Determination of Field/Laboratory Densities**

AS 1289.5.7.1	Hilf Density Ratio.
AS 1289.5.8.1	Determination of Field Density and Field Moisture Content of a Soil Using a Nuclear Surface Moisture-Density Gauge - Direct Transmission Mode.

(d) **Determination of Unconfined Compressive Strength**

AS 1141.51	Unconfined Compressive Strength of Compacted Materials.
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