SECTION 308 - IN SITU STABILISATION OF PAVEMENTS WITH FOAMED BITUMEN BINDER

308.01 DESCRIPTION

This section covers the requirements for in situ stabilisation of existing pavements by the addition of foamed bitumen and other supplementary binders. The requirements relate to mix design, preparation of existing pavement materials, supply of bitumen and supplementary binders, construction plant, and spreading, mixing, and compaction of pavement layers.

308.02 DEFINITIONS

Available Lime

The amount of Calcium Oxide (CaO2) or Calcium Hydroxide (Ca(OH)2) contained in Quicklime or Hydrated Lime respectively.

Cementitious Binder

A cementitious material capable of being uniformly mixed into a granular pavement material to bind the particles together to increase its strength. Cementitious binders include portland cement (AS 3972) Type GP or blended cement Type GB, or a blend of ground granulated blast furnace slag (GGBFS, AS 3582.2), hydrated lime (AS 1672.1), fly ash (AS 3582.1), alkali activated slag or other pozzolanic material supplied in accordance with this section.

Expansion Ratio

The expansion ratio is the ratio of the maximum volume of the bitumen in its foamed state to the volume of bitumen once the foaming has subsided.

Foamed Bitumen

Foamed bitumen is a mixture of air, water and hot bitumen. When hot bitumen comes in contact with cold water the mixture expands to greater than ten times its original volume and forms a fine mist or foam.

Half-life

Half-life is the time taken (measured in seconds) for the foamed bitumen to settle to one half of the maximum expansion volume.

Hydrated Lime

Hydrated lime is a powdered form of lime consisting primarily of calcium hydroxide, also referred to as slaked lime.

Initial Working Time

The time required to mix, fully compact and trim the stabilised pavement layer after the addition of bituminous binder.

Quicklime

Quicklime is a fine granulated powder consisting primarily of Calcium Oxide that can be readily slaked by the application of water after it has been evenly spread to form Calcium Hydroxide.

Reference Density

The reference density is the maximum dry density or the peak converted wet density determined in accordance with the appropriate test method, but adjusted for oversize material as appropriate.

Slag (Ground Granulated Blast Furnace Slag)

Ground Granulated Blast Furnace Slag (GGBFS) is a pozzolan produced by fine grinding of slag produced as a by-product from the smelting of iron ore.

Supplementary Binder

Bitumen stabilisation may incorporate a supplementary binder comprising. lime, a cementitious binder or a combination of each in certain proportions.

308.03 CONFORMITY WITH DRAWINGS

Completed stabilised base and subbase layers shall conform within the following limits to the levels, lines, grades, thicknesses and cross sections shown on the drawings, as specified, or directed by the Superintendent.

(a) Surface Level

The level of the top of the stabilised layer shall not differ from the specified level by more than 15 mm above or 15 mm below the specified level.

(b) Thickness

The thickness of the stabilised layer at any point shall be not less than the thickness specified by more than 15 mm. The average thickness of the layer over any 100 m section for the full carriageway width shall be not less than the specified thickness as determined from measurements taken in accordance with Section 173.

(c) Alignment

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

(d) Width

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

(e) Shape

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

308.04 MATERIALS

(a) Bitumen

Bitumen shall comply with the requirements of the Australian Standard for Residual bitumen for pavements as listed in Section 175.

The Contractor is permitted to incorporate bitumen foaming additives to the bitumen provided a test certificate is produced confirming that the half-life and expansion ratio as specified in Clause 308.14(c) are met at the bitumen foaming temperature. The test certificate shall include:

(i) the form of the foaming additive i.e. a solid, liquid or paste;
(ii) chemical and physical properties of the additive;
(iii) method of handling and mixing;
(iv) dosage rate for bitumen used;
(v) mixing time and effective life in the bitumen;
(vi) shelf life;
(vii) half-life in seconds and expansion ratio of bitumen with additive and the specified bitumen temperature; and
(viii) Materials Safety Data Sheet.

(b) Lime

(i) Quicklime

Quicklime shall be supplied in accordance with the requirements of the Australian Standard Limes and limestones – Limes for building as listed in Section 175.

All quicklime supplied to the job shall be provided with evidence showing the manufacturers batch number. A test certificate shall be produced on request. The certificate shall clearly show compliance with the Australian Standard and the percentage of Available Lime in the product.

(ii) Hydrated Lime

Hydrated Lime shall be supplied in accordance with the requirements of the Australian Standard for Limes and limestones – Limes for building as listed in Section 175.

All hydrated lime supplied to the job shall be provided with evidence showing the manufacturer's batch number. A test certificate shall be produced on request. The certificate shall clearly show compliance with the Australian Standard and the percentage of Available Lime in the product.

Bulk hydrated lime shall be dry and shall have been produced not more than 14 days before delivery unless testing on the material shows that the equivalent calcium oxide content meets specified requirements.

(c) Cementitious Binders

(i) Cement

Cement shall be supplied by the Contractor and shall be General Purpose Portland Cement Type GP or Blended Cement Type GB complying with the requirements of the Australian Standard for Portland and blended cements as listed in Section 175. The Contractor shall nominate the type, brand and source of cement or blended cement.

(ii) Slag/Lime Blends

Slag and hydrated lime may be used in blended combination as a stabilising additive. The requirements for hydrated lime shall be as specified in Clause 308.04(b)(i) and (ii) above. Slag used shall be Ground Granulated Blast Furnace Slag (GGBFS) meeting the requirements of the Australian Standard for Supplementary cementitious materials for use with portland and blended cement Part 2, Slag-Ground granulated iron blast furnace as listed in Section 175. The Contractor shall nominate the type, brand and source of the GGBFS to be used.

Slag/lime shall be blended uniformly in the ratio of 85% slag to 15% hydrated lime unless laboratory testing indicates that superior strength of the stabilised mixture is achieved by using a different ratio. If the blend is to be varied, the proportion of lime shall not be less than 10%. The Contractor shall provide evidence that the blend ratio has been met for all material supplied to the job. Slag/lime blend shall have a mortar bar 7 day compressive strength of 10 MPa and 28 day compressive strength of 16 MPa. The test shall be the same test specified in the Australian Standard for Portland and blended cements listed in Section 175, except that the cement to water ratio shall be adjusted to match the consistency of mortar produced for the compressive strength test for GB cement in accordance with the relevant Australian Standard Test Method.

(iii) Slow Cementitious Blends Incorporating Alkali-activated Slag or Fly Ash

Special blends of slow setting cementitious stabilising agents incorporating alkali-activated slag or fly ash which are not produced to meet the requirements of a GB cement may be used subject to the blend satisfying the mortar bar test requirement specified in Clause 308.04(ii) above and the specified mix requirements. The maximum binder working time shall be determined in accordance with the VicRoads Test Method for Determination of the Maximum Allowable Working Time for a Cementitious Binder as listed in Section 175, to confirm that the binder is a slow setting binder.

Fly ash shall be supplied to meet the requirements of the Australian Standard for Supplementary cementitious materials for use with portland and blended cement Part 1 Fly ash as listed in Section 175.

(d) Water

Water added to the material shall be clear and substantially free from sediments and detrimental impurities such as oils, salts, acids, alkalis and vegetable substances. Water supplied from sources where dissolved salts are unknown or likely to be present shall be tested for electrical conductivity prior to use. The electrical conductivity shall not be more than 3500 µS/cm and the amount of chloride and sulphate in any water used shall each be no greater than 300 ppm.

(e) Pavement

The in situ pavement 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 pavement below.

308.05 PAVEMENT MATERIALS INVESTIGATION AND MIX DESIGN

(a) General

Unless otherwise specified in Clause 308.16(c) and (d), the Contractor shall produce a mix design for the in situ stabilised pavement material in accordance with VicRoads Test Methods; Cementitious Binder and Granular Additive Content for Stabilisation of Pavement Materials, Determination of the Maximum Allowable Working Time for Cementitious, and Decay Correction Factor for Granular Materials Stabilised with Cementitious Binder and Codes of Practice Acceptance Testing for Field Compaction, and Selection of Test Methods for the testing of Materials and Work, as listed in the Section 175. The aim of the mix design procedure under the Test Method for Determination of the Proportion of Additives to be added to Granular Pavement Materials Stabilised with Bituminous Binders is to improve the material grading if necessary, reduce the plasticity and to optimise the type and amount of bituminous binder required having regard to the chemical and physical properties of the in situ material. The in situ stabilised pavement material is required to meet the specified grading, plasticity and strength requirements, and contain a bituminous binder which will allow sufficient working time to mix, place, compact and trim the material before the initial set takes place. The mix design procedure shall ensure that the bituminous stabilised material is a flexible cohesive pavement material capable of withstanding ravelling under traffic prior to sealing.

(b) Grading

The final grading limits for the material to be stabilised after addition of any granular additive, if required to correct the grading shall be in accordance with Table 308.051.

Table 308.051 - Grading and Plasticity Index Requirement

Sieve Size (mm)	Base (% passing by mass)
53.0	100
26.5	73 – 100
19.5	64 – 100
9.5	44 – 75
4.75	29 – 55
2.36	23 – 45
1.18	18 – 38
0.6	14 – 31
0.3	10 – 27
0.15	8 – 24
0.075	5 – 20
Plasticity Index (max)	10

308.06 COMMENCEMENT OF WORK

HP **The Contractor shall not commence work until all mix design details have been presented to the Superintendent showing compliance with the requirements of Clause 308.05 and approval has been given for stabilisation work to proceed.**

308.07 CONSTRUCTION PLANT

(a) General

The Contractor shall provide and operate sufficient spreading, mixing, watering and compaction plant to complete the work in accordance with the requirements of this section.

(b) Spreader for Supplementary Binder

Mechanical equipment specifically designed for the spreading of supplementary binder directly on to the prepared roadbed shall be used. The spreader shall be fitted with calibrated load cells and be capable of accurately regulating the discharge of the supplementary binder at various widths such that the requirements of Clause 308.14 are met. When hydrated lime is used as a supplementary binder it is preferable to use a reclaimer with an integrated spreader to minimise binder loss due to wind.

(c) Stabilisation Machine

The pulverisation and mixing of pavement material together with water and bituminous binder shall be carried out using a purpose designed machine for bituminous stabilisation of road pavements.

The stabilisation machine shall satisfy the following requirements:

(i) a minimum engine power capacity of 315 kW to ensure adequate mixing of materials;

(ii) computer controlled bitumen flow meter to determine binder application rate for process control;

(iii) bitumen injection systems shall be linked to the ground speed to ensure an accurate application throughout runs, irrespective of the speed of the equipment;

(iv) each jet on the bitumen injection bar shall have separate on and off controls to maintain uniform transverse control in the overlapping runs;

(v) bitumen temperature gauges to verify bitumen temperature in the injection system;

(vi) the bitumen injection bar and supply lines shall be equipped with a heating system to maintain the bitumen temperature;

(vii) bitumen jets shall be self cleaning;

(viii) an inspection or test jet shall be fitted for sampling; and

(ix) water spray bars located in the mixing hood to control moisture.

Rotary hoes and other types of agricultural machinery, including skidsteer machines with attachments shall not be used. The stabilising machine shall be capable of pulverising the existing pavement and mixing the bituminous and/or supplementary binder uniformly throughout the layer within its enclosed mixing chamber. After pulverisation and mixing, all material shall be capable of passing a 53 mm sieve.

When mixing tools are damaged they shall be replaced to maintain mixing efficiency.

(d) Watering Plant

Watering plant shall be capable of uniformly distributing water in a fine spray and coupling to the stabilising machine to ensure correct addition of water.

(e) Compaction Plant

Compaction plant shall be of such mass to be capable of compacting the stabilised layer to the minimum density ratio uniformly throughout the depth of the layer.

Where compaction is to be accepted on a procedural basis rather than lot testing, the Superintendent shall approve on the number and minimum mass of rollers and the compaction routine to be used. If the compacted depth of layer exceeds 150 mm, the following items of compaction plant shall be used:

- a vibrating pad foot roller for initial compaction, minimum of 18 tonnes;
- a vibrating steel flat roller for densification, minimum of 18 tonnes; and
- a multi wheel roller, minimum of 12 tonnes, for finishing and sealing the surface prior to trafficking.

308.08 CONSTRUCTION

(a) General

Construction includes the pulverisation of any seal or asphalt surfacing, premixing of in situ materials, supply and spreading of any additional granular material, supply, spreading and mixing of bituminous and/or supplementary binder into the in situ pavement material, and compaction, trimming and curing of the stabilised layer.

Stabilisation work undertaken each day shall be completed across the full pavement width.

(b) Climatic Conditions

Stabilisation shall not be undertaken:

(i) when the wind is sufficiently strong to cause particles of lime to become air-borne;

(ii) during conditions that in the opinion of the Superintendent are a hazard and may cause nuisance to people, livestock, property or the environment;

(iii) during rain or when rain appears imminent; and

(iv) when the pavement temperature prior to the commencement of work and measured at a depth of 50 mm below the surface of the road is below10ºC.

Details of procedures for measuring pavement temperature and ceasing operations in the event of rain or strong wind shall be submitted to the Superintendent for review.

(c) Preparation of the Existing Pavement

The Contractor shall remove or pulverise lumps of asphalt or seal which would otherwise be retained on a 53 mm sieve. The volume of any large size material removed from the site shall be replaced with an equivalent volume of suitable granular material.

If the Unconfined Compressive Strength (UCS) of a core of the upper layer of the existing bound pavement tested to 1:1 height to diameter ratio exceeds 2 MPa, the material shall be pulverised with a profiler to a depth of 90% of the final stabilised layer. The profiling operations may allow side casting of the existing material to inspect the supporting formation, and as instructed by the Superintendent, weak or wet spots can be treated. UCS testing will not be required if the pavement being foam bitumen stabilised is an unbound pavement.

(d) Spreading of Supplementary Binder

Spreading of the supplementary binder shall be carried out in accordance with the mix design rate or as specified in Clause 308.16(c).

If quicklime is used it shall be slaked with sufficient water to allow complete hydration such that the material remains friable after slaking. Water shall be applied by spraying water over the quicklime spread over the road surface.

(e) Foaming of Bitumen

At the start of each stabilisation operation the Contractor shall confirm that all bitumen foaming nozzles are operating by conducting a foaming test adjacent to the site. The foamed bitumen from the test shall not be incorporated in the pavement material and the Contractor is responsible for the management of this waste. At the start of each tanker load of bitumen, the half-life and expansion ratio of the foamed bitumen shall be determined and reported.

(f) Initial Mixing

Initial mixing shall commence as soon as practical after spreading of the supplementary binder. The supplementary binder shall be incorporated into the pavement materials to 90% of the specified pavement depth. Water may be added during the mixing process to meet the target moisture content envelope which is required for compaction following the mixing of the foamed bitumen.

Where indicated by visual inspection that the resultant mix is not uniform and/or the moisture distribution throughout the layer is variable, the Contractor shall carry out additional passes with the mixing equipment to improve the uniformity of the:

(i) material;
(ii) distribution of the supplementary binder; and
(iii) distribution of the added moisture.

The mixed material is to be lightly compacted prior to the addition of the foamed bitumen.

(g) Foam Bitumen Mixing

The incorporation of the bitumen is to be carried out to the specified thickness in one or more mixing passes. Foam bitumen stabilisation should not proceed if the bitumen temperature does not comply with the specified bitumen temperature included in the test certificate required in Clause 308.04(a).

Where indicated by visual inspection that the foamed bitumen is not uniformly mixed and/or the moisture distribution throughout the layer is variable, the Contractor shall carry out additional passes with the mixing equipment to improve the uniformity of the:

(i) material being stabilised; and/or
(ii) distribution of the bitumen; and/or
(iii) distribution of moisture.

Mixing shall cease if bitumen streaks, blotches or bitumen rich masses form in the mixed material.

(h) Compaction

Compaction of the stabilised layer shall commence immediately after mixing of foam bitumen. Compaction equipment shall work as close as practicable behind the mixer to maximise the time available for compaction. Compaction and trimming shall be carried out in a continuous operation until completed.

(i) Trimming

The material trimmed off shall be either cut to waste and if necessary, removed from site.

On completion of trimming and final rolling ensure compaction equipment marks are eliminated if a sprayed sealed surfacing is to be applied to the foamed bitumen stabilised layer.

308.09 JOINTING

Longitudinal joints shall be avoided by completing a full carriageway width each day. If a longitudinal joint is required, because of rain or traffic control requirements, it shall be located at a lane line or in the centre of the carriageway. Transverse joints shall be formed where stabilisation operations have been halted and at the end of each day's work.

Joints shall be formed by cutting back into the fully compacted previously stabilised material by a minimum of 100 mm which shall be remixed into the new work.

The level and shape of the surface at all joints shall be within the limits specified in Clause 308.03 except when a sprayed sealed surfacing is to be applied, to the stabilised layer where a 5 mm tolerance shall be adopted.

308.10 TEST ROLLING

Stabilised layers shall pass test rolling in accordance with Section 173, prior to acceptance of the layer.

Any unstable areas detected by test rolling shall be rectified.

308.11 MAINTENANCE OF THE STABILISED SURFACE PRIOR TO SURFACING OR OVERLAY

The Contractor shall keep the stabilised pavement surface moist and protected from damage by traffic or construction activities until either a further pavement layer or the bituminous surfacing is applied.

The Contractor shall maintain drainage of all stabilised areas throughout the period of construction to ensure run-off of rainfall without ponding.

308.12 PRELIMINARY TRIAL

If directed by the Superintendent, the Contractor shall carry out a preliminary trial of the proposed stabilising operation.

The trial shall determine:

(a) effectiveness of the construction plant;

(b) effectiveness of spreading lime and slaking of quicklime, and mixing to the required depth;

(c) number of passes of the stabilisation machine necessary to achieve uniform pulverisation and mixing or the combined work of a profiler and stabilisation machine to achieve the specified requirements;

(d) field moisture content required to achieve specified compaction requirements;

(e) effectiveness of bitumen foaming process with the bitumen supplied by tanker and tested using the inspection jet;

(f) visual observation of the full depth of the mixed material to ensure no bitumen streaks and uniform incorporation of the foamed bitumen and supplementary binder;

(g) jointing of the mixing runs;

(h) the rolling routine required to meet specified compaction requirements; and

(i) preliminary and final trimming of the surface to the specified levels and tolerances.

The trial section shall be located within the works area.

The length of the trial section shall be between 100 and 200 metres over the full width proposed to be stabilised.

HP **Stabilisation work shall not proceed outside the trial section until the Superintendent has reviewed all aspects of the stabilising operation.** The Superintendent's review of the stabilising plant and procedures will be provided to the Contractor by the end of the work on the trial day. If the specification requirements are not met for this trial section, the Superintendent may direct that another trial section be stabilised or the rejected section be re-stabilised and presented for re-assessment.

The payment for all costs associated with the direction of the Superintendent to carry out a preliminary trial or re-trial shall be made under the relevant scheduled item for the construction of the foam bitumen stabilised layer.

308.13 REQUIREMENTS FOR TESTING AND ACCEPTANCE OF COMPACTION AND STRENGTH

(a) General

(i) Lot Testing Requirements

Where a Scale A or Scale B compaction standard is specified in Table 308.16, compaction is to be accepted by density testing in lots of similar material and work. The maximum lot size shall be the area of work completed on the same day up to 4,000 m^2 provided that the whole of the lot is essentially a uniform material similar to material used for the relevant mix design applicable to the lot.

If the material is too variable to be able to assign a single maximum dry density for the lot, a separate reference density shall be determined for each test site.

If a compaction scale is not specified in Table 308.16, the Scale C compaction procedure shall be adopted.

The calculation of density ratio shall be based on Modified compactive effort of the laboratory prepared sample containing the design rate of bituminous and/or supplementary binder.

The work shall be assessed for compliance with Scale A, Scale B or Scale C requirements for testing and acceptance of compaction as specified in Clauses 308.13(b), (c) and (d) and Clause 308.16

(ii) Determination of the Density Ratio

Measure field density at the completion of compaction of the foamed bitumen stabilised pavement. Extract enough material from the site to enable three samples to be prepared in the laboratory, for determination of the reference density, before three hours have elapsed after foam bitumen stabilisation. Calculate the Density Ratio in accordance with Section 173.

(b) Scale A Requirements for Testing and Acceptance of Compaction

(i) Where Material is Sufficiently Consistent to be Assigned a Maximum Dry Density for the Lot

If a single maximum dry density can be assigned to the lot the work represented by the lot will be accepted as far as compaction is concerned if the characteristic value of density ratio obtained from six randomly selected test sites within the lot is not less than 95%.

If the characteristic value of density ratio of the lot is less than 95%, but greater than or equal to 90% the work represented by the lot may be accepted as far as compaction is concerned but payment for the whole of such work will be made at a rate calculated using the formula:

$$P = 6R_c - 470$$

in which R_c is the characteristic value of density ratio of the lot and P is the rate of payment expressed as a percentage of the value of work represented by the lot provided that the value of P shall not exceed 100. For the application of this formula, the value of the work represented by the lot shall be calculated using the unit rate specified in Clause 308.16(b).

(ii) Where Material is Too Variable to Assign a Maximum Dry Density to the Lot

If the material is too variable to assign a single maximum dry density to the lot and requires separate maximum dry densities to be determined for each test site, the work represented by the lot will be accepted, as far as compaction is concerned, if the mean value of the density ratio obtained from three randomly selected test sites within the lot is not less than 97% with no individual value being less than 90%.

If the mean value of density ratio of the lot is less than 97%, but greater than or equal to 92%, the work represented by the lot may be accepted but payment for the whole of such work will be made at a rate calculated using the formula:

$$P = 6R_m - 482$$

in which R_m is the mean value of density ratio of the lot and P is the rate of payment expressed as a percentage of the value of work represented by the lot provided that the value of P shall not exceed 100. For the application of this formula, the value of the work represented by the lot shall be calculated using the unit rate specified in Clause 308.16(b).

Work which has a mean value of density ratio of less than 92% shall be rejected and the Contractor shall submit a proposal to rectify the work to the Superintendent for approval.

(c) Scale B Requirements for Testing and Acceptance of Compaction

The work represented by the lot will be accepted as far as compaction is concerned if the mean of the individual density ratio test values from three randomly selected test sites for the lot is not less than 95%.

If the mean of the individual density ratio test values for the lot is less than 95% but greater than or equal to 90%, the work represented by the lot may be accepted as far as compaction is concerned but payment for the whole of such work will be made at a rate calculated using the formula:

$$P = 6R_m - 470$$

where R_m is the mean of the individual density ratio test values for the lot and P is the rate of payment expressed as a percentage of the value of work represented by the lot provided that the value of P shall not exceed 100. For the application of this formula, the value of the work represented by the lot shall be calculated using the unit rate specified in Clause 308.16(b).

(d) Scale C Requirements for Acceptance of Compaction

The Superintendent may direct the Contractor to construct a trial section of stabilised pavement as specified in Clause 308.12.

Acceptance of work will be based on compaction plant to be used, compaction routine and a density monitoring procedure using a nuclear gauge and proof rolling as specified or approved by the Superintendent.

Any unstable areas within limits of work and depth of stabilisation detected by test rolling shall be rectified by the Contractor and re-presented for test rolling.

(e) Assessment of Compaction for Thick Layers

For compacted layers in excess 250 mm thick, the Contractor shall measure the field density of the layer in two sub-layers of equal thickness in accordance with the relevant test method. At each test site the sub-layer with the lower of the two density test results shall be used in the calculation of the Characteristic or Mean Density Ratio for assessment of compaction.

308.14 REQUIREMENTS FOR TESTING AND ACCEPTANCE OF BINDER CONTENT

(a) Mat or Tray System for Supplementary Binder

The average spreading rate of the supplementary binder shall be ascertained by dividing the mass of binder spreading by the area over which the binder has been spread. Where the average spreading rate is less than 95% of the specified or design spread rate, additional binder shall be spread to bring the average rate up to at least the design spread rate. Lots where the binder is spread at an average rate less than 95% design spread rate will be rejected.

The Contractor shall check the uniformity of the spreading of the supplementary binder at the frequency specified in Clause 308.15 by placing mats or trays with a plan area not less than 1 m^2 in the path of the spreading vehicle and dividing the mass of the supplementary binder deposited on each mat by the plan area of the mat or tray. Where the spread rate so determined for any mat or tray is less than the specified rate by more than 10%, additional supplementary binder shall be spread over the part or all of the area over which the binder has been spread.

(b) Continuous Weighing System

The mass of the supplementary binder spread over the pavement surface may be measured and recorded by a spreader fitted with a fully calibrated electronic weigh scale system capable of continuously measuring and recording the mass of the supplementary binder at intervals of not more than 100 m of forward travel. The recorded measurements of spread rate shall be made available to the Superintendent on request.

(c) Bituminous Binder Application

The binder shall be uniformly incorporated by a controlled device that provides calibration to the application rate in litres/m^2 of residual bitumen. The rate of application shall be such as to provide the specified binder content in the compacted material. In addition, for foamed bitumen the minimum expansion ratio shall be 10 and the minimum half-life shall be 20 seconds.

Mixing uniformity shall be continuously inspected visually by the Contractor and work shall stop when bitumen streaks or blotches are observed.

308.15 MINIMUM TESTING FREQUENCY

The Contractor shall test the materials and the stabilised pavement layer at a frequency which is sufficient to ensure that the materials and work under the Contract comply with the specified requirements but which is not less than that shown in Table 308.151.

Table 308.151

Test	Minimum Frequency of Testing
Bitumen Application Rate	One test per continuous spraying run ascertaining the quantity of bituminous binder sprayed per m^2 by either: (i) dipping the bituminous binder supply tanker at the start and end of each spraying run; or (ii) a calibrated computerised measuring device which continuously monitors the bitumen spray rate per continuous spray run, recorded on a daily report sheet. The Contractor shall have a current certificate of calibration for the computerised bituminous spray monitoring device and shall produce evidence of actual running spray rate when requested by the Superintendent.
Bitumen Foaming Characteristics	Test the half-life and expansion ratio of the bitumen from the test inspection nozzle on the stabilisation machine before the bitumen is used in the mixer and with the tanker connected to the stabilisation machine for every tanker load supplied.
Uniformity of Spreading of Supplementary Binder	After the spread rate is confirmed using three trays or mats not less than 1 m^2 as per Clause 308.14, three randomly selected supplementary binder spreader runs should be tested per lot as per Clause 308.14 unless the forward speed of travel of spreader or the rate of spread of the spreading unit is changed, then the above process shall be repeated for the new forward speed of travel or new rate of spread. Except where calibrated load cell computerised spreading devices are fitted with a system to continuously monitor the spread rate every 100 m, recorded on a daily report sheet. The Contractor shall have a current certificate of calibration for the computerised spreading equipment and shall produce evidence of the actual running spread rate when requested by the Superintendent.
Average Spread Rate of Supplementary Binder	Each day's production.
Pavement Temperature	At the commencement of the shift the pavement temperature shall be measured at a minimum of ten random places at a depth of 50 mm.
Characteristic or Mean Density Ratio	Every lot as defined in Clause 308.13(a).
Resilient Modulus	Each day's production. The Contractor shall produce evidence that the laboratory design modulus has been achieved in the field.

308.16 SCHEDULE OF DETAILS

(a) Job Details

Road	Location		Layer	Compacted Thickness of Stabilised Layer (mm)	Requirements for Acceptance of Compaction (Scale A, B or C)
	From	To			
##:	##:	##:	##:	##:	##:

~~(b) Unit rate to be used to calculate the value of the work represented by the lot for application of payment deduction formulae specified in Clause 308.13(b) and (c) shall be $##:/sq.m.~~

(c) Details of VicRoads Mix Design

Road	Location		Distribution Rate for Supplementary Binder (kg/m^2)	Spread Rate for Additional Granular Additive (kg/m^2)	Type of Bituminous Binder	Application Rate for Bituminous Binder (l/m^2)
	From	To				
##:	##:	##:	##:	##:		##:

(d) Requirements for Granular Additive for VicRoads Mix Design

Material	Percentage passing by mass								PI (max)
	26.5	19	13.2	9.5	4.75	2.36	0.425	0.075	
##:	##:	##:	##:	##:	##:	##:	##:	##:	##: