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

##This section cross-references Sections 173, 175 and 812.

If any of the above sections are relevant, they should be included in the specification.

If any of the above sections are not included in the specification, all references to those sections should be struck out, ensuring that the remaining text is still coherent:

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.

Section 175 details the relevant references to Australian Standards (AS) Test Methods and Codes of Practice referenced in this section.

308.02 DEFINITIONS

**Available Lime**

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

**Available Lime Index (ALI)**

The Calcium Oxide or Calcium Hydroxide content of quicklime or hydrated lime respectively, expressed as a percentage of the total mass of lime determined in accordance with AS 4489.6.1.

**Expansion Ratio**

The expansion ratio is the ratio of the maximum volume of the bitumen in its foamed state to the final 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 bitumen volume forming a fine mist or foam.

**Half-life**

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

**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.

**Initial Working Time**

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

**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.

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Section 308 (Page 1 of 15)

**Supplementary Binder**

Foamed bitumen stabilisation may incorporate a supplementary binder comprising either hydrated lime or quicklime.

**Target Depth**

The target depth is the cutting depth required by the reclaimer/stabiliser to achieve the lower reference level (LRL). To achieve the LRL, the cutting depth (target depth) should take into account the bulk height. Refer to Figure 1 Diagramatic Representation of Foam Bitumen Stabilisation’s key terms. In establishing the target depth the following should be noted.

(a) Pulverisation/secondary additive incorporation

 Preliminary pulverisation and incorporation of supplementary binder is mixing to 50 mm less than the design depth.

(b) Bulking after secondary additive incorporation

 After surface compaction and trimming, the volume of materials change due to incorporation of the supplementary binder. The bulking height above the finished surface level (FSL) needs to be identified and added to the design depth.

(c) Target depth/final foam bitumen stabilisation pass

 The cutting depth required on the final pass by the reclaimer/stabiliser to reach the LRL will need to account for the additional bulking above the FSL.

Figure 1 Diagramatic Representation of Foam Bitumen Stabilisation’s key terms

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 as directed by the Superintendent.

(a) Finished Surface Level

 The level of the top of the stabilised layer shall not differ from the specified level and shall be in accordance with Table 308.031.

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Section 308 (Page 2 of 15)

**Table 308.031 Finished Surface Levels Tolerances for Stabilised Layers**

|  |  |  |
| --- | --- | --- |
| **Road Category** | **Base** | **Subbase** |
| **Scale A**All Freeways and Class M roads | -5 to +10 mm | -5 to +15 mm |
| **Scale B**All freeway ramps**Rural Roads**All Class A ArterialsClass B and C Arterials where the posted speed of travel is 80 km/h or more, with an AADT of greater than 1000 vpd or greater than 75 HVs/day**Metropolitan Roads and Roads in Provincial Towns and Cities**All Arterials with a speed limit of greater than 60 km/hAll other Urban Arterial Roads with a speed limit of more than 60 km/h and an AADT greater than 20,000 vpd or greater than 1000 HVs/day | -5 to +15 mm |  |
| **Scale C****Rural Roads**All other Class B and C Arterials**Metropolitan Roads and Roads in Provincial Towns and Cities**All other Arterials with a speed limit of less than or equal to 60 km/h |  |  |

(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 50 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 the shape tolerances shown in Table 308.032 below a 3 m straight edge placed in any direction on the surface.

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Section 308 (Page 3 of 15)

**Table 308.032 Shape Tolerances for Stabilised Layers**

|  |  |  |
| --- | --- | --- |
| **Road Category** | **Base** | **Subbase** |
| **Scale A**All Freeways and Class M roads | 5 mm | 8 mm |
| **Scale B**All freeway ramps**Rural Roads**All Class A Arterials Class B and C Arterials where the posted speed of travel is 80 km/h or more, with an AADT of greater than 1000 vpd or greater than 75 HVs/day.**Metropolitan Roads and Roads in Provincial Towns and Cities**All Arterials with a speed limit of greater than 60 km/hAll other Urban Arterial Roads with a speed limit of more than 60 km/h and an AADT greater than 20,000 vpd or greater than 1000 HVs/day | 8 mm | 15 mm |
| **Scale C****Rural Roads**All other Class B and C Arterials.**Metropolitan Roads and Roads in Provincial Towns and Cities**All other Arterials with a speed limit of less than or equal to 60 km/h. | 15 mm | 15 mm |

308.04 MATERIALS

Materials supplied under the Contract shall comply with the following properties.

(a) Bitumen

 Bitumen shall comply with the requirements of AS 2008 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

 (viii) Materials Safety Data Sheet.

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Section 308 (Page 4 of 15)

(b) Lime

 Quicklime and hydrated lime shall meet the requirements of AS 1672 as listed in Section 175.

 At the time of spreading, the supplementary binder shall not be more than 3 months old, measured from its date of manufacture.

 All quicklime and hydrated lime supplied to the job shall be provided with delivery docket showing an assigned ALI at the start of each production week. The assigned ALI shall be determined by averaging the six most recent test results for ALI. A test certificate for determination of the ALI shall be made available on request.

 Lime shall be stored in a moisture free environment and shall be re-tested for compliance with AS 1672.1 *Limes and limestones - Limes for building* if stored for more than 14 days after receipt from the manufacturer.

(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. Water sources classified by the relevant Water Authority as potable water shall be exempt from this requirement.

(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, unless otherwise specified.

308.05 PAVEMENT MATERIALS INVESTIGATION AND MIX DESIGN

(a) General

 Unless 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 Austroads Guide to Pavement Technology Part 4D : Stabilised Materials. 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.

 The design is to provide a modified material with the following properties:

 (i) Initial modulus > 700 MPa;

 (ii) Three day cured modulus >2500 to 4000 MPa;

 (iii) Three day soaked modulus >1500 to 2000 MPa; and

 (iv) Retained modulus > 0.5 (ratio wet modulus to dry modulus), a foam bitumen stabilised pavement that does not lose greater than 50% of strength when inundated.

(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**

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Section 308 (Page 5 of 15)

|  |  |  |
| --- | --- | --- |
| **Sieve Size****(mm)** | **Base****(% passing by mass)****with ≤ 1000 ESA/day** | **Base****(% passing by mass)****with > 1000 ESA/day** |
| 53.0 | 100 |  |
| 26.5 | 73 - 100 | 100 |
| 19.0 | 64 - 100 | 80 - 100 |
| 9.5 | 44 - 75 | 55 - 90 |
| 4.75 | 29 - 55 | 40 - 70 |
| 2.36 | 23 - 45 | 30 - 55 |
| 1.18 | 18 - 38 | 22 - 45 |
| 0.600 | 14 - 31 | 16 - 35 |
| 0.300 | 10 - 27 | 10 - 24 |
| 0.150 | 8 - 24 | 8 - 19 |
| 0.075 | 5 – 20 | 5 - 15 |
| Plasticity Index (max) | 10 | 10 |
| Note: Materials with a Plasticity Index (PI) between 10 and 20 may be used if they are pre‑treated with lime to reduce the PI to a maximum of 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) a computer controlled bitumen flow meter to determine binder application rate for process control

 (iii) a bitumen injection system linked to the ground speed to ensure an accurate application throughout runs, irrespective of the speed of the equipment

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Section 308 (Page 6 of 15)

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

 (vii) self cleaning bitumen jets

 (viii) an inspection or test jet fitted to allow for sampling

 (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 specified 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 the number and minimum mass of rollers and the compaction routine to be used.

 Otherwise, the following items of compaction plant shall be used:

 • a vibrating pad foot roller for initial compaction, minimum of 18 tonnes for compacted thicknesses up to 200 mm, or minimum of 21 tonnes for compacted thicknesses up to 300 mm

 • a vibrating steel flat roller for densification, minimum of 18 tonnes for compacted thicknesses up to 200 mm, or minimum of 21 tonnes for compacted thicknesses up to 300 mm

 • 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 the supplementary binder 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

 (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 below 10ºC

 (v) when the air temperature, measured in the shade, exceeds 40ºC.

 **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.**

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Section 308 (Page 7 of 15)

(c) Preparation of the Existing Pavement, Primary Pulverisation

 One (1) pass of a reclaimer/stabiliser or profiler shall be used to pulverise the material to be stabilised to a depth that is 50 mm less than the target depth of the stabilised layer.

 Preliminary pulverisation shall occur:

 (i) after the removal and replacement of material identified as material not suitable for stabilisation;

 (ii) prior to the addition of shape correction material, and

 (iii) prior to the application or addition of either bituminous or supplementary binders.

 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 existing pavement material is not suitable for stabilisation, granular material that complies with the requirements of Standard Section 812 Crushed Rock for Pavement Base and Subbase shall be used to replace this material prior to stabilisation.

\*\*\* The Contractor shall be responsible for the procurement of sufficient specified material to complete the work. The Contractor shall supply details demonstrating compliance of the materials meeting Class 1, Class 2 or Class 3. ##(strikethrough whichever is not relevant):

(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 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 50 mm less than 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.

 Incorporation of the supplementary binder shall be achieved using a reclaimer/stabiliser before the foamed bitumen is added to the pavement material.

 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

 (iii) distribution of the added moisture.

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

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Section 308 (Page 8 of 15)

(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.

 The relative moisture ratio (RMR) prior to incorporation of the foamed bitumen shall be not less than 55% or greater than 75% of optimum moisture content (OMC) of the 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 cut to waste and, if necessary, removed from site.

 On completion of trimming and final rolling compaction equipment marks shall be removed 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.

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 maximum 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

Water curing shall commence immediately after the completion of compaction.

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. Where the pavement is opened to traffic within 3 hours of compaction being completed the initial modulus measured after 3 hours of air drying at 25°C (+ 5°C) shall be a minimum of 700 MPa.

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

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Section 308 (Page 9 of 15)

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

(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 m2 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 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.

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Section 308 (Page 10 of 15)

 (ii) Determination of the Density Ratio

 Field density shall be measured at the completion of compaction of the foamed bitumen stabilised pavement. Material shall be sampled 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. The Density Ratio shall be determined in accordance with Section 173.

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

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 98%.

If the characteristic value of density ratio of the lot is less than 98%, but greater than or equal to 93% 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 = 6Rc - 488**

in which Rc 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).

Work which has a mean value of density ratio of less than 93% 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 100%.

If the mean of the individual density ratio test values for the lot is less than 100% but greater than or equal to 95%, 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 = 6Rm - 500**

where Rm 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.

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Section 308 (Page 11 of 15)

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 m2 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/m2 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 by the Contractor and work shall stop when bitumen streaks or blotches are observed.

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Section 308 (Page 12 of 15)

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 Frequency of Testing**

|  |  |
| --- | --- |
| **Test** | **Minimum Frequency of Testing** |
| Bitumen Application Rate | One test per continuous spraying run ascertaining the quantity of bituminous binder sprayed per m2 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 m2 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). |
| Relative moisture ratio (RMR) | The ratio of the in situ moisture content at each compaction sample location prior to the incorporation of the foamed bitumen and material OMC as a percentage. |
| Resilient Modulus | Each day’s production. The Contractor shall produce evidence that the laboratory design modulus has been achieved in the field. |

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Section 308 (Page 13 of 15)

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/m2)** | **Spread Rate for Additional Granular Additive****(kg/m2)** | **Type of Bituminous Binder** | **Application Rate for Bituminous Binder****(l/m2)** |
| **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** |
| ##: | ##: | ##: | ##: | ##: | ##: | ##: | ##: | ##: | ##: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

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Section 308 (Page 14 of 15)

(e) Tolerances for Stabilised Layers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Road** | **Location** | **Layer** | **Tolerances for stabilised layers (Scale A, B or C)** | **Shape Tolerances for stabilised layers****(Scale A, B or C)** |
| **From** | **To** |
| ##: | ##: | ##: | ##: | ##: | ##: |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Refer to Table308.031 and Table 308.032 for details.

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Section 308 (Page 15 of 15)