# BRISBANE CITY COUNCIL

# REFERENCE SPECIFICATIONS FOR ENGINEERING WORK

# S336 POLYMER MODIFIED EMULSION MICRO-SURFACING TREATMENT

## Amendment Register

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## GENERAL

### Section Content

The design, supply, mixing and application of bituminous treatment for surface correction and wearing surface applications on the existing bituminous surfaced road pavements, car parks, cycle ways and footpaths.

### Standards

|  |  |  |
| --- | --- | --- |
| Australian/New Zealand Standard, International Standards Organization | AS/NZS ISO 9001 | Quality management systems – Requirements |

### References

|  |  |  |  |
| --- | --- | --- | --- |
| Queensland Department of Transport and Main Roads |  | MUTCD | Queensland Manual or Uniform Traffic Control Devices |

Refer to the following other Reference Specifications for Engineering Work:

|  |  |
| --- | --- |
| S110 | General Requirements |
| S120 | Quality |
| S310 | Supply of Dense Graded Asphalt |
| S330 | Sprayed Bituminous Surfacing: Materials |
| S335 | Polymer Modified Emulsion Surface Treatment |

### DEFINITIONS

Micro-surfacing: One of two types of bituminous slurry surfacing. It is distinguished from the other type, slurry seals, by the incorporation of polymer and other additives to the bitumen to improve the performance of the slurry surfacing. It may be known under various proprietary names such as ‘cold overlay’, ‘microsealing’, ‘paveseal’, ‘microasphalt’, etc.

Micro-surfacing consists of a mixture of emulsified polymer modified bitumen, mineral aggregate, mineral filler, additives and water proportioned and mixed to form a slurry which is placed and spread evenly on the road surface. It is capable of being spread in variably thickness layers for surface correction and for wearing surface applications.

Nominal size: The size of the bituminous micro-surfacing is based on the nominal largest stone size in the mix. For the purpose of this Specification, the size is either Size 5, Size 7 or Size 10.

Polymer: A predominantly organic substance comprising a very large number of chemical entities. These chemical entities may comprise identical segments (producing a homopolymer) or a combination of two or more different segments (producing a copolymer).

Polymer modified bitumen: Bitumen containing dispersed polymeric material to give enhanced bitumen performance for particular applications.

## QUALITY

### Quality System

The supplier must maintain a Quality Assurance System with third party accreditation to *AS/NZS ISO 9001*. The supplier must notify the Contractor or Superintendent within two days of becoming aware that process control tests relevant to the work have fallen outside the specified limits.

### Inspection

Witness points

Give sufficient notice so that inspection can be made of the following stages:

* Line marking removed.
* Surfaces cleaned and prepared for surfacing.
* Protection of road fixtures and features.
* Commencement of application of surfacing.
* Verification of surface finish and shape.

Hold points

Do not proceed without approval of the following stages:

* Approval of mix design.
* Format and wording of the notice to be given to residents and business owners whose access will be temporally restricted.
* Submission of calibration and approval to commence spreading.

### Tests

General

Methods: Use Australian Standard, Queensland Department of Transport and Main Roads, Austroads or International Slurry Surfacing Association test methods.

Testing authority: Use a testing facility registered by NATA for the test required.

Process control testing

Perform sampling and testing of the type and frequency necessary to adequately control the work. Comply with the minimum requirements specified in *Reference Specification S120, Clause* *7.1*

Compliance assessment tests

General: The Contractor or Superintendent may carry out compliance assessment testing using a testing laboratory registered with NATA for the particular test.

Frequency: Perform compliance testing for binder content and aggregate gradation as per approved mix design for each lot.

Test lot

A homogeneous section of the completed micro-surfacing applied on any calendar day on the same street, not greater than 50 m3, nor greater than half of one days production.

Sampling location: Sample from agreed sample sites within designated uniform test lots.

### Submissions

Mix Design

Requirement: Submit for approval, at least seven days before commencing micro-surfacing work, the nominated micro-surfacing mix design along with supporting evidence of previous satisfactory performance on pavements under Australian conditions. Include NATA certification and test results demonstrating that the nominated mix and its components satisfy this Specification.

Samples

On request, submit samples of all materials to be supplied under the Contract.

Work Method Statement

Submit the proposed Work Method Statement and testing program at least 14 days prior to the commencement of the works.

Work Method Statement shall detail all methods and equipment to be used for the works, including the following:

* Staging of the work, access and traffic control methods.
* Methods and equipment for each operation.
* Sources of materials.

Test program

Submit details of the inspection and test program covering all specified properties of the materials and details of recent test results demonstrating sustained compliance of similar work with the same properties.

Records of measurement

Record details of all materials applied immediately after each application.

Submit Daily Record Sheets recording plant, equipment, labour, traffic control, times of closure of road and areas of work completed including placing records.

## MATERIALS

### General

The Polymer Modified Bitumen Emulsion Micro-surfacing mix shall incorporate mineral aggregate, mineral filler and polymer modified bitumen emulsion. Additives may be used to control the break and setting times of the bituminous slurry mix, depending on ambient conditions and traffic requirements.

### Aggregate

Mineral aggregate shall consist of natural sand particles and/or crushed rock or stone and shall be clean, hard, angular, durable, and free from laminated particles, clay and other aggregations of fine material, soil, organic material and any other deleterious material. The combined coarse aggregate shall have the properties for Type 1 asphalt given in *Table* *3.1 of Reference Specification S310*.

### Filler

Filler shall comply with *Reference Specification S310, Clause* *3.3*.

### Bitumen

Bitumen used for emulsion manufacture shall comply with the requirements of *AS 2008*.

Polymer shall be added to the formulation of the emulsion to enhance its behaviour and field performance and meet the mix design performance requirements specified in *Clause 5.3* of this Specification. The minimum softening point of the polymer modified bitumen shall be 57°C.

Provide evidence to verify that the polymer modified binder supplied is the same as that nominated in the approved mix design.

### Additives

Additives may be used to control the setting speed of the mix depending on ambient conditions and traffic requirements.

Provide evidence to verify that the any additive supplied is the same as that nominated in the approved mix design.

## MIX DESIGN

### General

Requirement: Manufacture micro-surfacing to the mix design approved by the Superintendent.

Notwithstanding these requirements, the Contractor shall take full responsibility for the mix design, manufacture, supply and laying of micro-surfacing.

### Grading

Requirement: Grading of the combined mineral aggregates and added filler must comply with the following limits. The grading curve must be smooth and must not vary from the outer one-third of the range between the specified limits to the opposite one-third of the range between the specified limits for an adjacent sieve size.

Table 4.1 – Aggregate gradings

|  |  |  |  |
| --- | --- | --- | --- |
| AS Sieve Size (mm) | Percentage Passing by Mass  Micro-Surfacing Nominal Size (mm) | | |
| Size 5 | Size 7 | Size 10 |
| 13.2 |  |  | 100 |
| 9.5 |  | 100 | 85 - 100 |
| 6.7 | 100 | 85 - 100 | 70 - 90 |
| 4.75 | 85 - 100 | 72 - 87 | 60 - 80 |
| 2.36 | 60 - 85 | 50 - 70 | 42 - 60 |
| 1.18 | 42 - 65 | 33 - 51 | 28 - 46 |
| 0.60 | 28 - 47 | 22 - 38 | 19 - 34 |
| 0.30 | 18 - 32 | 13 - 27 | 12 - 25 |
| 0.15 | 11 - 22 | 8 - 19 | 7 - 18 |
| 0.075 | 6 - 15 | 5 - 13 | 4 - 12 |

### Mix Properties

Requirement: The mix design must satisfy the following properties for the design mix and for mixes prepared with the maximum permitted variations in grading and binder content.

Table 4.2 – Mix properties

|  |  |  |  |
| --- | --- | --- | --- |
| Property | Test | Description | Requirement |
| Traffic Time | *Austroads AGPT271* | Wet Cohesion |  |
| @ 30 minutes (Initial set) | 12 kN.m (min) |
| @ 60 minutes (Trafficking) | 20 kN.m (min) |
| Wear Loss | *Austroads AGPT272* | Wet Track Abrasion Loss |  |
| One hour soak | 540 g/m2 (max)*(1)* |
| Six day soak | 800 g/m2 (max)*(2)* |

(1) Traffic ≤3,000 vehicles per lane per day (v/l/d)

(2) Traffic >3,000 v/l/d

Table 4 3 – Mix properties: permitted variations in grading and binder content

|  |  |
| --- | --- |
| Maximum Permitted Variations From The Approved Mix Design | |
| Property | Maximum permitted deviation |
| A.S. sieve size ≥9.5 mm | ±7% by mass |
| A.S. sieve size 4.75 mm | ±6% by mass |
| A.S. sieve size 2.36 mm | ±5% by mass |
| A.S. sieve size 0.600 mm | ±4% by mass |
| A.S. sieve size 0.300 mm | ±3% by mass |
| A.S. sieve size 0.150 mm | ±2% by mass |
| A.S. sieve size 0.075 mm | ±1.5% by mass |
| Residual Binder Content | -0.5% or +1.0% |

### Surface Texture

After trafficking for one month, wearing course micro-surfacing shall have average texture depths (Volumetric Sand Patch Method) not less than the minimum value specified.

Table 4.4 – Surface texture depth

|  |  |
| --- | --- |
| Micro-Surfacing Nominal Size (mm) | Minimum Texture Depth (mm) |
| Size 5 | 0.4 |
| Size 7 | 0.8 |
| Size 10 | 1.2 |

## PLANT

General: Provide the required plant necessary for the performance of the particular operation.

Paving Unit:Provide a purpose-built continuous flow mixing unit capable of accurately metering each individual component material into a mixer which thoroughly blends these materials to form homogeneous bituminous slurry and transfers the micro-surfacing into a spreader box for application to the pavement surface. The spreader box shall be capable of spreading micro-surfacing in one pass at varying widths up to 3.75 m.

Paving Unit Calibration: Prior to commencing paving, calibrate the paving unit for the materials used in the approved mix. The documentation shall include an individual calibration for each component material at various settings which can be related to the paving unit's metering devices.

## PLACING

### Traffic Control

Traffic

General: Traffic control shall be undertaken in accordance with the approved Traffic Management Plans and Permits.

Method: Provide for traffic while undertaking the works in accordance with the requirements of *Manual of Uniform Traffic Control Devices (Queensland), Part 3: Works on Roads.*

Public Notification

General: Notify all affected residents and business owners whose access will be temporally restricted by the proposed works. Wording of the notification to be approved by the Superintendent and be in accordance with Council requirements and distributed within approved timelines.

### Preparation for Micro-Surfacing

Removal of Existing Line Marking

Requirement: Remove all thermoplastic markings, painted markings and pavement markers prior to sealing operations, unless indicated otherwise. Do not remove more than 7 days prior to micro-surfacing.

Method: Remove existing painted or thermoplastic lines/markings by grinding. Removal shall be to the satisfaction of the Superintendent.

Temporary Markings: Install temporary pavement delineation where existing markings on major roads are removed and maintained until the day of micro-surfacing application.

Cleaning

General: Immediately before surfacing remove loose and foreign material on the existing pavement surface, including dust, debris, silt, soil, flaking paint and any other deleterious material. Keep traffic off the cleaned surface.

Method: Use suitable power blowers or road brooms, or use hand methods where inaccessible to power equipment.

Pre-dampening

The surface may be pre-dampened if necessary by lightly spraying with water ahead of the spreader box. The application rate shall be adjusted to suit temperature, surface texture, humidity and dryness of the surface being covered.

Tack Coat

A tack coat is not required unless the surface to be covered is extremely oxidised and ravelled or comprises concrete or other non-bituminous surfacing. If necessary, a tack coat of bitumen emulsion should be applied at a rate of 0.12 to 0.24 l/m2 of residual binder at 15°C. Such work shall only be carried out when directed by the Superintendent.

### Placing Operations

Protection

Protect adjacent surfaces during placing. Take all necessary precautions to prevent micro-surfacing or other material used in the work from entering or adhering to grates, hydrants, valve boxes, manhole covers, bridge or culvert decks or other road fixtures. After the micro-surfacing has been laid, any such material which has entered or adhered to road furniture and structures shall be removed or, if this is not possible, replace and make good.

Immediately following the drying of the micro-surfacing, remove the protective coverings and dispose of them off site.

Protect freshly placed surfaces from contamination.

In the event of rain occurring before the micro-surfacing has dried, take all steps necessary to prevent the materials from contaminating the surrounding area and associated drainage systems. Any pools of micro-surfacing/water created by the rain shall be removed and disposed in an approved manner compliant with Environmental Legislation.

Reinstate any micro-surfacing washed off the pavement surface due to rain. The extent of reinstatement shall be determined by a joint inspection conducted by the Superintendent and the Contractor.

Restrictions

Pavement surface temperature: Do not commence placing micro-surfacing until the ambient air and pavement temperatures are at least 10°C and rising and likely to remain at least at that temperature during all placing operations.

Weather conditions: Do not place during rain or if rain is forecast by the Bureau of Meteorology within the following 8 hours.

Do not proceed with the application unless there is sufficient time for the material to cure before opening to traffic within the specified approved period of road closure.

Minimum period between bituminous treatments: New asphalt surfaces must be at least 28 days old before placing the polymer modified emulsion surface treatment.

Method of application

Micro-surfacing shall be mixed and applied using a purpose built paver. The mix shall be of the desired consistency when deposited in the spreader box, and nothing more shall be added other than minor amounts of water for the purpose of overcoming temporary build-up of micro-surfacing in the corners of the spreader box.

Mix for sufficient time to produce a complete and uniform coating of the aggregate and convey the resulting mixture into the moving spreader box at a sufficient rate to always maintain an ample supply across the full width of the strike-off.

The strike-off shall be adjusted to provide an application rate which will completely fill the surface voids and provide the approved nominal application rate of micro-surfacing.

Surface Texture

General: The resulting surface after spreading shall be uniform in appearance, and free of areas exhibiting segregation or excessive or insufficient binder. The surface texture shall be demonstrated on a short test run for approval by the Superintendent. Where increased surface texture is required, a fabric skirt may be trailed behind the spreader box. If the surface texture is acceptable to the Superintendent, then all subsequent work shall be finished to an equivalent surface texture.

Joints

General:Longitudinal joints in the wearing course shall be straight and placed at either the edge or the centre of a traffic lane. All joints shall be overlapped. The maximum overlap shall be 150 mm. The edges and joints shall be lightly screeded with a hand squeegee to achieve a smooth uniform appearance and to remove excess build-up of material.

The end of each run shall be squared off at the point where there is insufficient material in the spreader box to maintain the full width of the spread.

Recording

Actual spread rate: Record details of all materials applied immediately after each application.

### Application Rate

Rut Filling Course

Where wheel ruts average 25 mm or more in depth, apply a rut filling course with the aid of a rut filling attachment to the mixer/spreader prior to placing the wearing course. Open to traffic, sections where rut filling has been carried out for a minimum of 8 hours prior to placing the wearing course.

Regulating Course

Where the existing surface varies by more than 10 mm from a 3 m straight edge, apply a regulating or “scratch” course to the surface prior to placing the wearing course. Do not apply the wearing course until the regulating course has set sufficiently to carry the mixer/spreader without damage.

For regulating or “scratch” courses, the spreader box shall be fitted with skids of not less than 1.6 m in length and where the shape of the existing surface permits, a rigid “strike off” blade may be used.

Wearing Course

The average layer thickness shall not be less than the nominal aggregate size or greater than twice the nominal aggregate size. The layer thickness at any point shall not exceed three times the nominal aggregate size without first applying a regulating course or pre filling isolated low areas.

### Defective Surfacing

Any Slurry lot which fails to achieve conformance with any property specified or which incorporates materials which fail to achieve conformance with any property specified shall constitute a non-conformance.

Non-conforming Slurry may be either overlaid, removed or allowed to remain as agreed by the Superintendent.

## CURING

Time limitations

General: Select materials and processes so that the direct access to properties is not restricted for more than 4 hours at any one time.

Traffic on pavement

Provide adequate means of protection to ensure that the treated area is not trafficked until the micro-surfacing has cured sufficiently to prevent being picked up by vehicular and pedestrian traffic.