



SPECIFICATION FOR SLURRY SURFACINGS

RNZ 9806: June 2010

Specification developed by
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SPECIFICATION FOR SLURRY SURFACING RNZ 9806

1 SCOPE

This specification states the requirements for the supply and application of slurry surfacings including capeseals and rut-filling.

2. RELATED DOCUMENTS

Unless specified otherwise, related documents shall be the current edition of the following:

ISSA	A105 Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal.
ISSA	A143 Recommended Performance Guidelines for Microsurfacing.
TNZ M/1	Specification for Roothing Bitumens
TNZ M/10	Specification for Asphaltic Concrete
TNZ T/3	Standard Test Procedure for Measurement of Texture by the Sand Circle Method
TNZ T/4	Standard Procedure for Description of Test Locations on State Highways
TNZ T/10	Specification for Skid Resistance Investigation and Treatment Selection
TNZ	Chip Sealing Textbook
AP – T26	Guidelines and Specifications for Bituminous Slurry Surfacing

3. DEFINITIONS & ABBREVIATIONS

The definitions and abbreviations stated below are for use with this specification.

AP-T26: Guideline and Specification produced by the Austroads Bituminous Surfacing Technology Project Group.

Austroads: The Association of Australian and New Zealand Road Transport and Traffic Authorities.

Capeseal: A two coat seal; the first coat is a chip seal and the second coat is a slurry seal. The chipseal is covered by the slurry seal that fills the surface voids of the chip seal.

Components: The materials comprising the slurry, such as bituminous emulsion, mineral aggregates, fillers, additives and modifiers and water.

Flushing: The loss of surface texture caused by binder rising from the slurry or through the slurry from the underlying surface, to be level with or over the slurry surface.

ISSA: International Slurry Surfacing Association.

Lot: An amount of slurry, of a given type, defined as either a day's production or 100 tonnes of dry mass aggregate or the equivalent surface area whichever is the lower, or as stated in the quality plan.

Job Mix Formula: The target grading, binder quantity, and properties of the proposed slurry.

Mixing Unit: A unit that proportions and uniformly blends the components to form the slurry, which is then transferred to the spreader box for placement on the surface to be treated.

Maximum Size: A designation indicating the largest-sized aggregate particles present in the slurry.

Pre-levelling: The process by which slurry is placed on existing surfaces to fill wheel-path ruts, surface depressions and deformations prior to the application of the final slurry surfacing.

Pre-seal Repair: The process by which defects in the existing surface, such as potholes, irregularities (including texture), service cover adjustments and the like, are rectified prior to slurry surfacing.

Rut-filling: Slurry is applied using a device called a rut box that fills longitudinal depressions with slurry without resurfacing the whole lane. The device drags the coarse aggregate into the deeper areas allowing the finer material to feather out.

Slurry or Micro-surfacing: A mixture of bituminous emulsion, mineral aggregates, filler, additives, modifiers and water proportioned to form a fluid mixture.

Spreader Box: A device fitted with a rear strike-off screed to produce a uniform surface.

Surface Texture Depth: The small scale (0.2mm – 3mm) deviations of a pavement surface below a true planar surface. Measured volumetrically, by spreading a known volume of material over a measurable area and calculating the average depth of material. Reference TNZ T/3.

Type I Slurry (Size 3 Austroads) – Is used where a very fine texture is required. The maximum aggregate size is 3mm and the slurry typically has a surface texture depth of 0.3mm. It is suitable for use on footpaths or void-filling on airport runways.

Type II Slurry (Size 4 Austroads) – Is used as a reseal, wearing course and/or void-fill on urban residential streets, low to medium volume roads, carparks, and footpaths where fine texture, low traffic noise and avoidance of loose chips are desirable. The aggregate has a maximum particle size of 5mm and the slurry typically has a surface texture depth of 0.5mm.

Type III Slurry (Size 7 Austroads) – Offers a coarser texture for use on roads with higher traffic volumes (e.g. on state highways). The aggregate has a maximum particle size of 7mm and the slurry typically has a surface texture depth of 0.7mm.

Type IV Slurry (Size 10) – Offers the coarsest texture when used as a wearing course on high traffic volume sites. It is normally used for rut-filling and minor shape correction of the surface as a stand alone repair or pre-reseal treatment.

4. SITE INSPECTION & ACCEPTANCE

The Contractor shall inspect each site and consider whether the treatment selection specified by the client is appropriate for the site and whether all pre-seal repairs have been completed satisfactorily. Where the treatment selection is not specified the contractor shall nominate the slurry treatment and required pre-seal repairs that will meet the specific requirements for each site.

The Contractor shall advise the Engineer if any area is unacceptable or not suitable to receive a slurry treatment. The Engineer shall arrange for remedial work to be performed, or delete the relevant section of work from the schedule, or propose alternative acceptance criteria to be used in those locations.

5. SURFACE PREPARATION

The Contractor shall ensure that all loose materials and deleterious matter are removed from the road surface before any slurry is placed.

6. MATERIALS

6.1 Bitumen

Unless specified otherwise, the bitumen used for emulsion manufacture shall comply with the TNZ M/1 Specification for Roading Bitumens.

6.2 Mineral Aggregates and Filler

Mineral aggregates and filler used in the manufacture of slurry surfacings shall comply with the properties specified in TNZ M/10 with the exception that the sand equivalent shall meet a minimum of 60.

No provision is given for acceptance of an aggregate stockpile based on clay index test results.

Mineral aggregates shall be crushed from quarried rock or water worn gravel. All particles shall consist of hard sound material of uniform quality, free from soft or disintegrated rock or other deleterious material.

6.3 Water

The water that is used to control the slurry consistency shall be potable and compatible with the other slurry components.

6.4 Additives

Additives may be added to the slurry at the discretion of the contractor to control, by retarding or accelerating, the rate of break. The additives shall be compatible with the other slurry components.

7. SLURRY MIX DESIGN

The Contractor shall design the slurry in accordance with ISSA A105 or ISSA A143 mix design procedures.

All material sampling, testing and mix design shall be performed by a laboratory which is accredited to ISO/IEC 17025 by an accreditation agency which is either internationally recognized or specifically recognized by Roothing New Zealand and the New Zealand Transport Agency.

The slurry shall comply with the following property specifications.

Table 1. Performance requirements for slurry design.

Test Property	Method	Specification
Wet Track Abrasion 1 hour: 6 day:	ISSA TB-100	538 g/m ² maximum 807 g/m ² maximum
Wet Stripping:	ISSA TB-114	Pass (90% minimum retained coating)
Wet Cohesion 30 minutes: 60 minutes:	ISSA TB-139	12 kg-cm minimum 20 kg-cm minimum

Table 2 - Suggested¹ Grading, Residual Binder Content, Application Depth

Thickness and Typical Texture Depth for Slurry

SIEVE SIZE (mm) (Austroads Name)	PERCENTAGE PASSING BY MASS			
	TYPE 1 (Size 3)	TYPE II (Size 4)	TYPE III (Size 7)	TYPE IV (Size 10)
Maximum Aggregate Size (mm)	3mm	5mm	7mm	10mm
13.2	100	100	100	100
9.5	100	100	100	85-100
6.7	100	100	85-100	80-90
4.75	100	90-100	70-90	60-85
2.36	90-100	65-90	45-70	40-60
1.18	65-90	45-70	28-50	28-45
0.6	40-65	30-50	19-34	19-34
0.3	24-42	18-30	12-25	12-25
0.15	15-30	10-21	7-18	7-18
0.075	10-20	5-15	5-15	4-8
Nominal Application Depth ⁱⁱ (mm)	3-5mm	5-7mm	7-10mm	10-15mm
Typical Texture Depth after 12 months (mm)	0.3mm	0.5mm	0.7mm	0.9mm
Typical Residual Binder ⁱⁱⁱ % by Mass	6.5-10.5	5.0 - 9.0	4.2 - 7.5	3.5 - 6.5

Note i. The JMF particle size distribution may need to deviate outside the limits in the above table to achieve the required properties. This is acceptable.

Note ii. The nominal application depth for Rut-filling may be up to 40mm, beyond which it is recommended that it be carried out in two layers

Note iii. Residual Binder % is determined during mix design and forms part of the job mix formula. The figures provided are only an indication of the typical range.

8. TRAFFICKING

The slurry shall be capable of being trafficked within two hours of placement.

9. SAMPLING AND TESTING

The sampling and testing frequency of the aggregates shall be in accordance with the guidelines given in the Roothing New Zealand publication RNZ 9805.

The sampling frequency of the slurry shall be one per mixing unit per day’s production or as specified which ever is the higher. The slurry shall be tested for the binder content and aggregate grading.

Table 3. Recommended Test and Sampling Methods

Test	Method
Sampling of Aggregate	NZS4407: Part 2
Sampling of Binder	ASTM D140
Sampling of Slurry	AG:PT T221 (Austroads)
Aggregate Grading	ASTM 136 & ASTM C117 or NZS4407: Test 3.8.1
Sand Equivalent	NZS4407: Test 3.6
Binder Content	ASTM D2172 or ASTM D6307 or ADL 4.02/15a

All testing shall be performed by a Laboratory Accredited by IANZ to ISO/IEC 17025.

10. CALIBRATION

Slurry Machines shall be calibrated and tested at least annually to ensure they are capable of mixing the components of the mix (within the tolerances stated in the quality assurance plan) in accordance with the job mix formula. Records of the calibration tests shall be available for inspection.

11. JOINTS

Where possible, longitudinal joints shall be at or adjacent to the lane or centre-line markings and transverse joints shall be perpendicular to the centre-line or kerb.

Joints shall be butted-up to the adjacent run or shall be lapped, with the lap not exceeding the nominal layer thickness. Joints shall not have gaps or uncovered areas.

Edges and joints to existing surfaces shall be tapered to provide a smooth transition from the slurry to the adjacent surfaces.

12. ACCEPTANCE CRITERIA

Acceptance, inspections and testing shall be performed between 10 and 12 months after completion of the work, or at the end of the maintenance period, if this is less than 12 months. For the purposes of this clause, a lot may be a day's production, 100 tonnes of dry mass aggregate, a residential street or a cul-de-sac whichever is the smaller.

Slurry, Capeseal, and Rut-filling are used for different purposes and so have different acceptance criteria as follows.

12.1 Acceptance Criteria for Slurry

The acceptance criteria for slurry include those for aesthetics, surface texture and aggregate loss as stated in clauses 12.4 - 12.6 below.

12.2 Acceptance Criteria for Capeseals

The acceptance criteria for capeseals include those for aesthetics, surface texture and aggregate loss as stated in clauses 12.4 - 12.6 below. Capeseal surfacings, while very different from those of normal slurry, should also display a uniform finish.

12.3 Acceptance Criteria for Rut-filling

The acceptance criteria for rut-filling include those for aesthetics, surface texture and aggregate loss as stated in clauses 12.4 - 12.6 below.

The surface of the rut-fill slurry is much coarser than that of normal or standard slurry, but the finished surface should display uniformity. The method of application into ruts requires that the coarser aggregate is pushed into the centre of the rut leaving fine aggregate to feather out at the edge, creating an acceptable but segregated surface.

Rut-fill slurry is the only slurry product that is laid at depths much greater than the maximum aggregate size and deformation and depressions may be possible within the slurry.

12.4 Aesthetics

The finished slurry shall provide a smooth surface with uniform colour and texture. There shall be no bare patches, gaps and/or missed areas, or areas with obvious segregation, track marks, drag marks, indentations or other permanent blemishes. There shall be smooth transitions onto other surfacings at the ends with finished edges following parallel to the existing margins of the road surface.

12.5 Surface Texture

The surface texture at the end of the maintenance period shall equal or exceed the minimum value specified. Using random sampling, the longitudinal positions should be chosen for each measurement location within each lot. The measurements should be taken at the following locations as defined by TNZ T/4 - Outer wheel-path, between wheel-path, centreline, inner wheel-path, and outer wheel-path. The frequency and location of testing shall be stated in the Quality Plan.

Remedial work shall be required if, within 12 months of completion of work, more than 10% of a lot has a finished surface with a texture depth less than the specified value.

12.6 Abrasion Loss

Remedial work shall be required if, within 12 months of completion of the work or within the maintenance period, the effects of normal use and environmental conditions cause abrasion or loss of the slurry surface to reveal more than 0.5 m² of the underlying surface, within any lot.

12.7 Skid Resistance

Where specified, the finished surface shall comply with the surface friction requirements as set out in TNZ T/10.

12.8 Deformation and Depressions

The Contractor shall not be responsible for areas of deformation or depressions arising from failure of any kind in the underlying pavement.

Remedial work shall be required if deformations or depressions exceeding 10 mm occur within the slurry surfacing, within 12 months of completion of work, when measured under a 2.0 metre straightedge.

13 BASIS OF PAYMENT

13.1 Surface Preparation

The Contractor shall allow for all costs associated with sweeping, cleaning or removal of detritus and deleterious materials. All damage resulting from the removal of raised pavement markers or roughening of pavement markings shall be made good. Payment for surface preparation shall be at the unit rate per square metre tendered.

13.2 Pre-Levelling

The Contractor shall allow for all costs associated with pre-levelling when this is specified, including supply of materials, cartage, mixing and placing, programming, supervision and quality assurance. Payment shall be at the unit rate tendered for tonnes of pre-levelling material applied.

13.3 Slurry

Payment for slurry will be in accordance with the tendered unit rate per square metre for the total area in square metres of slurry surface.

The Contractor shall allow for all costs associated with completing a slurry surfacing, including establishment on site, supply of materials, cartage, mixing and placing and rolling, programming, supervision, traffic control, quality assurance and, unless separately specified, reinstatement of road marking, and replacement of raised pavement markers.

Payment will not be made for slurry surfacing applied outside the specified scheduled areas unless directed by the engineer to the job.

13.4 Capeseal

Payment for capeseal will be in accordance with the tendered unit rate per square metre for the total area in square metres of capeseal surface.

The Contractor shall allow for all costs associated with the capeseal, including establishment on site, supply of materials, cartage, mixing and placing and rolling, programming, supervision, traffic control, quality assurance and, unless separately specified, reinstatement of road marking, and replacement of raised pavement markers.

Payment will not be made for capeseal surfacing applied outside the specified scheduled areas unless directed by the engineer to the job.

13.4 Rut-filling

The Contractor shall allow for all costs associated with rutfilling, including supply of materials, cartage, mixing and placing, programming, supervision, traffic control and quality assurance. Payment shall be at the unit rate tendered for tonnes of rut-filling material applied.