



Road Emulsion Association Limited

REAL Technical Data Sheet No. 9 - Slurry Surfacing

Introduction

'Slurry Surfacing' is the generic name for a range of cold applied emulsion asphalt processes. This range has evolved to include 'Slurry Seal', 'Slurry Surfacing' and 'Microsurfacing', providing thin, intermediate and thick layers respectively. The thickness of a single layer ranges from a minimum 1.5mm with slurry seal to a maximum 6mm with slurry surfacing, and 15mm with microsurfacing. Microsurfacing are frequently laid in two or more coats.

Pavements suitable for treatment include roads (carriageways, hard shoulders and central reservations), car parks, airports (runways and taxiways), footways and playgrounds. Most slurry surfacing material is rapid setting and is mixed continuously and laid by closely controlled machines. Appreciable amounts are also made by batch methods or are factory pre-prepared, and then laid by hand. Slurry surfacings have a maximum aggregate size (see Table 1) of 4mm, while microsurfacing use larger aggregate sizes (6, 8 or 10mm). These are more durable, have greater texture and are normally reinforced with polymer.

The main purpose of slurry surfacings is to stop fretting of the pavement surfaces caused by loss or ageing of the binder, seal imperfections and repairs and provide an even, consistent running surface. Standard slurry seals/surfacing provide an excellent skid resistance for low speed traffic but because of their relatively low texture depth, microsurfacing are usually preferred for higher speed traffic. Slurry surfacing is therefore preferentially used in town or airport environments where its freedom from dust and flying chippings is an additional advantage. Microsurfacing extends the use of slurry surfacing by providing higher performance in terms of texture, skid resistance and durability. It also has the ability to reshape and reprofile existing surfaces.

Composition

Slurry surfacings are now designed by the contractor to achieve an end performance rather than the original recipe formulations; in accordance with the move towards European Standards – EN12273, EN12274 – however, the following general principals still apply to the composition of conventional slurry surfacing.

A typical 'mix-on-site' slurry surfacing consists of an aggregate to a specified grading, a rapid setting bitumen emulsion 70/100 or 100/150 pen based, to BS EN 13808 (BS434 Pt1) class C60 B7 (K3-60), water and additive. The aggregate grading depends on the use of the slurry surfacing and the residual binder content of the mix may vary from about 6% to 13% depending on the substrate, aggregate grading and traffic density. Generally the aggregate grading is coarsened and bitumen content decreased as the expected traffic density increases. Also the thickness of the surfacing is increased as the aggregate is coarsened. In all cases, aggregate must be assessed to ensure that it is not too reactive to allow insufficient time to mix and lay the slurry surfacing.

Typical aggregate gradings for slurry surfacings are shown in the Table below:

Sieve Size mm	0/4 (CEN) Passing %	0/2 (CEN) Passing %
5.6 or 6.3	100	
4	80-100	100
2	50-80	70-100
1	35-60	50-80
0.063	4-16	5-18

The aggregate incorporated into pre-packed slurry surfacing may be finer than those given in the above table.

For 'mix-on-site' slurry surfacing, it is generally necessary to add water and it is usual to incorporate additives as modifiers to adjust the consistency of the mix, for prevention of segregation during spreading, or to slow the rate of setting sufficiently to allow the mix to be laid without premature breaking of the emulsion. Occasionally additives may be used to adjust the fines content of the aggregate grading or for pigmentation.

The composition of microsurfacings is more complex, and it is not practicable to give information here, each formulation being unique to an individual contractor, and involving different combinations of polymer modified emulsions, aggregate gradings and sources, and possibly the use of cellulose fibres or glass fibres.

Uses

The majority of slurry surfacing takes place on roads with an 85 percentile speed below 50 miles per hour and which carry less than 250 commercial vehicles per lane per day. However, microsurfacing, of suitable design may be used in more stringent conditions where texture depth and/or PSV of aggregate become important factors. The use of a polymer modified binder is normally used under these conditions.

The excellent adhesion between slurry surfacing and old concrete offers a ready solution to an often difficult problem.

Multiple applications are practicable where circumstances demand a heavier coating or where additional protection may be considered useful over an existing slurry surface treatment, or where a greater degree of regulating is wanted. Again microsurfacing is an alternative treatment providing single pass regulating. Typical uses include the following:

1. Housing Estate Roads

Slurry surfacings offer the clean, dense surface desirable in these areas where loose chippings may create a nuisance.

2. Fretted Surfaces

Slurry surfacings may be used to restore mechanical stability to the carpets which are deteriorating due to fretting.

3. Sealing Basecourses

Slurry surfacings are ideal for filling the voids of, and thus sealing, a basecourse construction. A fast-setting slurry surfacing can provide a big advantage over other sealing methods for what is often an 'out of season', i.e. winter, problem.

4. Trenched or Patched Surfaces

Slurry surfacings may be used to provide a uniform sealing coat over the whole surface provided the reinstatements are sound and reasonably level.

5. Polished Surfaces

Slurry surfacings are a means of restoring skid-resistance to general areas.

6. Surface Dressing Failures

Slurry surfacings offer a solution to the essentially difficult problem of treating surface dressings which have partially stripped.

7. Crazed Surfaces

Slurry Surfacing will go some way to restore the shape of roads where minor foundation faults have resulted in unevenness, but existing surface crazing may reappear. Fibre reinforced treatments may help with this but a cure cannot be guaranteed.

8. Motorways

Slurry surfacings may be used for sealing the hard-shoulders and central reservations of motorways. Properly designed systems can provide texture depth where required. However, if the shoulder is to carry large numbers of commercial vehicles in contra flow arrangements, microsurfacing should be considered and further advice should be sought. Coloured slurry surfacings are widely used for central reservations.

9. Airfields

Authorities responsible for maintenance of civil airfields have found slurry surfacings to be a safe useful form of surfacing for runways, taxiways, holding areas and perimeter tracks.

10. Car Parks & Playgrounds

Slurry surfacings are an effective seal on car parking areas and playgrounds. To take full advantage of rapid set slurry surfacings, configuration of these areas must not inhibit the manoeuvrability of mixing/spreading equipment. The surface should be finally lightly dusted to allow tyres to turn.

11. Pad-coat

A slurry surfacing treatment may be used as a 'pad-coat' for surface dressing in circumstances where the chippings would not otherwise embed sufficiently to ensure long term retention, e.g. on cement concrete.

12. Footways, Cycle Tracks and Pedestrian Areas

Coloured slurry surfacings are used widely.

Application

The majority of areas are treated with fast-setting slurry surfacing systems which necessitate the use of a mobile continuous mixer/spreader. Such a machine must be capable of metering continuously aggregate, emulsion, water and additives into a continuous mixer and discharging into a spreader box towed behind the machine.

Slow setting slurry surfacings incorporating emulsion class C60 B7 (K3-60) may be prepared on site using a simple mixer such as a concrete mixer provided proper attention is given to mix composition, i.e. there must be adequate means of metering or weighing the separate ingredients. Alternatively a mobile continuous mixer/spreader may be used. Again, aggregate must be assessed for its activity before use in a slurry surfacing.

Pre-packed slurry surfacings may require on-site agitation, sometimes with a small addition of water, before spreading by means of soft brooms, squeegees or mechanical applicators.

Preparation of Existing Surfaces

The surface to be treated must be freed from all dust and loose material by cleaning thoroughly with a mechanical broom and/or suction sweeper, supplemented if necessary by hand brooming. Open cracks must be cleared of vegetation and other loose material, for which purpose a jet of compressed-air may be useful. All debris and loose material arising must be removed. Although not usually necessary, circumstances may make the use of a bond-coat desirable. In such cases the emulsion should be class C40B3 (K1-40) applied in accordance with REAL Technical Data Sheet No 5, 'Bond Coating'.

Compaction

This is not normally required. However, with slurry surfacings which are virtually untrafficked, one or two passes of a pneumatic tyred roller may be given as soon as the material has set sufficiently to ensure that rutting will not occur. In these cases the pneumatic tyred roller should be multi-wheeled with smooth treads and with off-set front and rear wheels giving a small overlap when rolling. Individual wheel-loading should be between 0.7 and 1.3 tonnes and pressures such that the tyre profile is neither convex nor concave.

After Care

It is usual for slurry surfacings to shed a small amount of their larger aggregate particles during a short period after the treatment. This period may vary from a few days to a few weeks depending on the extent of the trafficking. On the public road system a routine highway sweeping arrangement will usually suffice for the removal of these particles since their size is such that windscreen damage does not occur and nuisance to pedestrians is minimal.

On airfields, depending on the nature of aircraft and their movements, sometimes it may be desirable to increase the frequency of sweeping.

Restrictions Due to Weather

(a) When using emulsion classes C60 B4 (K3) and A4 (Rapid Set):

Spreading C or less should not take place when air or ground temperatures are 2 and falling, or during heavy rain. When treating trafficked surfaces caution must be exercised in laying during cold, damp spells unless drying conditions can be expected reasonably soon afterwards, since full strength is not achieved until the film has dried once, even with rapid-setting slurry surfacings.

(b) When using emulsion class A4 (Slow Set) or pre-packed slurry surfacing:-

Spreading should not take place unless an immediate 6 hour period of good weather is forecast; nor should it take C in the shade. Observe place if the air temperature is below 8 manufacturer's advice.

In all cases the surface to be treated must be free from frost, ice, snow or standing water. After long periods of dry, sunny weather it may be beneficial to dampen the surface before spreading the slurry.

Materials Testing (Not normally applicable to pre-packed slurry surfacings)

All slurry surfacings are now designed to achieve an end performance, consequently the requirement for material testing is at the design stage, and to ensure consistency of the materials being used in the process. Constituent materials will normally be supplied under ISO 9001 quality assurance schemes, and further testing should not be necessary.

Aggregate:

It is essential that aggregates are laboratory tested to determine their suitability for the process both as regards compatibility with the emulsion to be employed and compliance with the Wet Track Abrasion Test (BS EN 12274-5) during the design process (see BS 434 Part 2 – 2006?). Aggregate grading should comply with, and be tested with the frequency required by the specification in use.

Emulsion:

Emulsion should comply with the appropriate requirements of BS EN 13808 (BS434 Pt1)

Additives:

These should comply with the relevant British Standard e.g. Portland Cement to BS EN 197-1. Testing is not required in normal circumstances.

Mixed Slurry Surfacing:

Samples may be subjected to the Wet Track Abrasion Test (BS EN 12274-5) and analysed for binder content and grading for design purposes, but these are not suitable tests for specification purposes or for the acceptance of slurry surfacing. The test method used for acceptance is the visual assessment test (EN 12274-8) (see BS434 Pt2 - 2006)

Notes

1. If binder content is to be determined via sieving extractor, it is not sufficient to rely on silica gel to extract the water from the system i.e. the sample should be dried first.
2. Difficulty sometimes may be experienced in obtaining a representative sample from continuous machinery for the determination of binder content.

Note: Descriptions of grades in accordance with BS EN 13808 may change when UK Guidance document PD6690 is finalised. During the transition period in changing from BS434 Pt1 to BS EN 13808, typical BS EN 13808 grade descriptions are used in the text of this data sheet, followed by the BS434 Pt1 description in brackets. Technical Data Sheet No1 gives a basic interpretation of grade descriptions from BS EN 13808, but for a full understanding of the specification and variations in grade descriptions, reference should be made to PD 6690 when it is available.

For further information see Summary and Reference Sheets on the Association's website
www.rea.org.uk

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