Road Emulsion Association Limited

Technical Data Sheet No.9

Slurry & Micro Surfacing

Revised by the Association's Technical Committee - March 2015

1. 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 'Micro-surfacing', 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 9mm with micro-surfacing. Micro-surfacing is 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 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 surfacing has a maximum aggregate size of about 4mm, while micro-surfacing uses 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 surfacing 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, micro-surfacing is 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. Micro-surfacing 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 re-profile existing surfaces.

2. Composition

Slurry surfacing are now designed to achieve an end performance rather than the original recipe formulations; in accordance with the move towards European Standards – EN12273 [1] and EN12274 [2] – 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 envelope, a bitumen emulsion to Class C60 B5 of BS EN 13808 [3], water and additives. The aggregate grading depends on the end 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 time to mix and apply the slurry surfacing.

For 'mix-on-site' slurry surfacing, it is generally necessary to add water and additives 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 micro-surfacing is more complex each formulation being unique to an individual contractor, and involving different combinations of polymer modified emulsions, aggregate grading and sources, and possibly the use of cellulose or glass fibre.

3. 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, micro-surfacing, of suitable design may be used in more demanding situations where texture depth and/or PSV of aggregate become important factors. A polymer modified binder is normally used under these conditions.

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 micro-surfacing is an alternative treatment providing single pass regulating. Typical uses include the following:

Housing estate roads - Slurry surfacing offers the clean, dense surface desirable in these areas where loose chippings may create a nuisance.

Fretted surfaces - Slurry surfacing may be used to restore mechanical stability to surfaces which are deteriorating due to fretting.

Sealing base-courses - Slurry surfacing is ideal for filling the voids of, and thus sealing, a base-course construction. Slurry surfacing can provide a big advantage over other sealing methods for what is often an 'out of season', i.e. a winter, problem.

Trenched or patched surfaces - Slurry surfacing may be used to provide a uniform sealing coat over the whole surface provided the reinstatements are sound and reasonably level.

Polished surfaces - Slurry surfacing is a means of restoring skid-resistance to general areas.

Surface dressing failures - Slurry surfacing offers a means of treating surface dressings which have partially stripped.

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 long term cure cannot be guaranteed.

Motorways - Slurry surfacing 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, micro-surfacing should be considered and further advice should be sought. Coloured slurry surfacing is widely used for central reservations.

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

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

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.

Footways, Cycle Tracks and Pedestrian Areas - Coloured slurry surfacing are used widely.

4. Application

The majority of areas are treated with 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 surfacing incorporating emulsion class C60 B5 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 reactivity before use in a slurry surfacing.
Pre-packed slurry surfacing may require on-site agitation, sometimes with a small addition of water, before spreading by means of soft brooms, squeegees or mechanical applicators.

4.1 Preparation of Existing Surfaces

The surface to be treated must be free from all dust and loose material by cleaning thoroughly with a mechanical broom and/or suction sweeper, supplemented if necessary by hand sweeping. Open cracks must be cleared of vegetation and other loose material; 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 applied in accordance with REAL Technical Data Sheet No 5 -Bond Coats.

4.2 Compaction

This is not normally required. However, for slurry surfacings which are virtually un-trafficked, one or two passes of a pneumatic tyre roller may be given as soon as the material has set sufficiently to ensure that rutting will not occur.

4.3 After Care

It is usual for slurry surfacing 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, it may be desirable to increase the frequency of sweeping.

5. Restrictions Due to Weather

(a) When using emulsion classes C60 B5 and A3 (Rapid-set) application should only be carried out when average road surface and air temperatures are 4°C and rising, however application should not be carried out during rain. Caution must be exercised in applying during cold, damp weather unless dry conditions can be expected reasonably soon afterwards. Full strength is only achieved when the material has completely dried once, even with rapid-setting slurry surfacing.

(b) When using emulsion class A4 (Slow-set) or pre-packed slurry surfacing: application should not take place unless an immediate 6 hour period of good weather is forecast; nor should it take place if the temperature is below 8°C in the shade.

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. Observe manufacturer's advice.

6. Materials Testing (Not normally applicable to pre-packed slurry surfacing)
All slurry and micro surfacing is now designed to achieve an end use 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 CE marked.

7. Aggregate
It is essential that aggregates are laboratory tested to determine their suitability for the process as regards chemical and physical compatibility with the emulsion system to be employed. The Wet Track Abrasion (BS EN 12274-5) and Determination of the cohesion of the mix (BS EN 12274-4 [2]) test methods should be utilized during the design process to ensure compliance Aggregate grading should comply with, and be tested with the frequency required by the specification in use.

8. Emulsion
Emulsion should comply with the appropriate requirements of BS EN13808 [3]

9. Additives
Additives used should comply with the relevant British Standard e.g. Portland Cement to BS EN197-1 [4]. Testing of CE Marked additives is not required in normal circumstances.

10. Mixed Slurry Surfacing
Samples may be subjected to the Wet Track Abrasion Test (BS EN 12274-5 [2]) 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 [2])

11 CE marking
At the end of June 2013 the Construction Products Regulation (CPR) was fully implemented in all EU member states. Since that time for construction products covered by a harmonised EN standard, including slurry surfacing products, there has been a legal requirement for CE-marking of those products in order to place them on the market.

References

[1] EN12273:2008 Slurry surfacing. Requirements
[2] EN12274:2002-2005 Slurry surfacing Test Methods
[3] BSEN13808:2013 Bitumen and bituminous binders - Framework for specifying cationic bituminous emulsions
[4] BS EN197-1:2000 Cement. Composition, specifications and conformity criteria for common cements

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