



Road Emulsion Association Limited

## REAL Technical Data Sheet No. 7 - Footway Maintenance and Construction Using Bitumen Emulsions

### Introduction

Footways carry a lighter general loading than carriageways in comparable locations. However appreciable strength of structure and surface properties are required to withstand the stresses generated by pedestrian traffic and the cross over of vehicles to access properties or by parked vehicles.

Walkways in urban areas must have adequate stability to high point loading and severe surface stresses. In rural situations an important requirement is for a sound base proofed against the ingress of moisture. However, whatever the situation the quality of construction and level of maintenance significantly affect the long term durability and serviceable life of a footway. Bitumen emulsions fulfil a vital role in all aspects of footway construction and maintenance from the initial sealing of freshly cut formations to the surface treatment of heavily stressed areas.

General guidance on the use of bitumen emulsions for pavement construction and maintenance is contained in BS 434 Pt2.

### Footway Maintenance

Where the shape is satisfactory but the surface is slippery or in danger of imminent break-up, surface dressing or slurry surfacing may be employed as a remedial treatment.

#### 1. Surface Dressing

Emulsions classes C69 B3 or C69 BF3 (K1-70), or proprietary footway surface dressing binders are recommended for this surface treatment to seal and/or restore surface texture. It is also proven to be a very effective method of restoring uniformity to an otherwise heavily patched surface. Road Note 39 contains a specific design section on surface dressing for footways and cycleways and should be referred to for specific design criteria. As a general rule, however, emulsion application rates vary between 1.3 l/m<sup>2</sup> and 1.8 l/m<sup>2</sup> when 2.8/6.3 or 2/4mm chippings are used.

Over the years, increasing amounts of footway surface dressing has occurred on urban sites, where resistance to bleeding in hot weather and resistance to chippings turning due to surface stresses from traffic cross over points and power steering is imperative. For this reason polymer modified (proprietary) emulsion binders are extensively used in these areas.

The success of these dressings depends not only on the specific design criteria employed, but on control of application. Of particular importance is the application equipment, which must be able to accurately and evenly dispense the binder at the design rate. The need to keep stray binder off fences, walls, kerbstones etc, by use of appropriate masking or specialised application techniques is very importance to the success of the job.

## 2. **Slurry Surfacing**

Slurry surfacing is composed of fine aggregate and bitumen emulsion in slurry form, which seals cracks, arrests fretting, fills minor depressions and voids and provides a more even and slip-resistant wearing surface. Both slow setting and rapid setting slurries are available to satisfy varying site conditions. These materials are generally unmodified bitumen emulsions for footways such as K3-60 (C59 B7 or C59 BF7), although proprietary polymer modified emulsions are sometimes used.

It should always be remembered that the finished slurry is a specific design mix and individual binders and aggregates will require a specific design. Conformity to the specific design mix is imperative for the success of this process.

Site mixtures are generally batch produced in concrete mixers and the slurries hand applied. In keeping with the mix design, consistency of the mix batch to batch is important for consistency of both appearance and performance of the finished footway surfacing.

## **Footway Construction**

There are a number of ways in which footways may be constructed but whatever method is used it is advisable to follow these basic rules:

### 1. **Base Treatment**

The freshly cut or placed formation and/or freshly laid sub-base should be sealed, with the object of retaining the strength by preserving moisture equilibrium. Bitumen emulsions of class C40B4 or C40BF4 (K1-40), C59B3 or C59BF3 (K1-60), A1-40, A1-55 and A1-60 are used in cold application. Rates of application 0.9 - 1.4 l/m<sup>2</sup> are recommended (note: actual application rate will depend upon local site conditions as well as the binder content of the material being sprayed).

### 2. **Tack Coat**

Where coated macadams or asphalts are employed, a tack coat of emulsion should be used between layers to provide an adhesive and dust free surface. The emulsion used for this work should be either Class C40B4 or C40BF4 (K1-40), C59B3 or C59BF3 (K1-60) or the equivalent anionic grades, at a rate of application between 0.4 l/m<sup>2</sup> and 0.6 l/m<sup>2</sup>.

### 3. **Grouting**

On sites subject to low stress it may be economical to prepare, in situ, a combined base/wearing course by means of application of emulsion into the interstices of the aggregate, after the latter has been spread on the foundation and compacted, i.e. grouting. For a full grouting, the emulsion is used to fully coat the aggregate throughout the depth of the material. The emulsion employed should be selected from classes C59B3 or C59BF3 (K1-60), A1-55, A1-60 or, the former being preferred in situations where the stone layer is open or wet. C69B3 or C69BF3 (K1-70) may be employed by agreement between purchaser and supplier. For footway construction, the semi-grout principle is more generally adopted, whereby the emulsion is only intended to penetrate the upper part of the construction, thus providing a limited depth of cohesion and waterproofing. . Figures applicable to full and semi-grout are given in Table 1.

#### (i) **Rate of Application**

For a full grout, the quantity of emulsion should be sufficient to penetrate to the full depth of the course; it is advantageous to apply the emulsion in two stages. For semi-grouted work, the quantity of emulsion used should be sufficient to coat the aggregate to the full depth of the layer above the slurried or waterbound layer.

**Table 1- TYPICAL RATES OF APPLICATION FOR GROUTING**

Thickness of Course mm	Nominal Size		Full Grout l/m <sup>2</sup>	Semi-grout l/m <sup>2</sup>
	of Aggregate			
50	40 mm down		5.5 - 7.0	3.0 - 5.5
65	50 mm down		7.0 - 9.5	4.0 - 7.0
75	50 mm down		9.5 - 11.0	5.5 - 8.0

**(ii) Procedure**

After initial compaction and subsequent application of emulsion, clean 2.8/6.3 mm or 6.3/10 mm chippings should be spread uniformly over the surface in sufficient quantity to fill up existing surface interstices, but not in excess of this. The surface should then be rolled again.

After an agreed interval, a surface dressing should be applied using 2.8/6.3 mm chippings and emulsion selected from class, C69B3 or C69BF3 (K1-70), or a proprietary footway surface dressing emulsion (e.g.C69 BP3). The purpose of this dressing is to seal the surface and provide rugosity.

**4. Surface Dressing**

In the case of surface sealing on a waterbound construction, it may be necessary to apply a double surface dressing, wherein two binder and chipping applications are carried out in quick succession. Emulsion classes C69B3 or C69BF3 (K1-70) or proprietary footway surface dressing emulsions are recommended and approximate rates of application are as follows:

Single Dressing                      1.6 - 1.9 l/m<sup>2</sup> using 2.8/6.3 mm chippings

Double Dressing                      1st application: 0.9 - 1.4 l/m<sup>2</sup>

using 2.8/6.3 mm chippings              2nd application: 0.9 - 1.4 l/m<sup>2</sup>

More information on design criteria and application rates can be found in Road Note 39 available from TRL

**Footway Reconstruction****Retread**

Where a footway has reached a state of disintegration or needs reshaping, it is possible to employ emulsions as a means of in-situ recycling. The retread process involves scarifying the existing surface, normally to a depth of 75 mm, importing some fresh aggregate if required to adjust grading, and treating with two successive applications of emulsion. Application rates of emulsion will depend on the nature of the scarified material and must be subject to agreement between Supplier and Contractor. Special attention must be given to the final profile achieved as this is critical to the end user and is often complicated by the smaller nature of the plant employed. Reference should also be made to REAL Technical Data Sheet Number 10.

*Revised by the Technical Committee, January 2007.*