Road Emulsion Association Limited

Technical Data Sheet No.5

Bond Coating

Revised by the Association's Technical Committee - August 2025

1. Introduction

Tack and bond coating is an established technique of providing a thin adhesive film of bituminous binder between an existing road surface and an overlay or between courses in road construction. This both seals the layer to prevent the ingress of water and produces a fully bonded composite pavement structure, both of which enhance the durability of the pavement. Traditionally, overlay materials have included hot rolled asphalt surfacing courses, macadams, slurry surfacings etc. Modern road courses such as SMA, Thin Surfacings, and Porous Asphalts tend to be laid much thinner than traditional surfacings and place greater reliance on the inter-surface bonding layer to reduce the risk of slippage between the two courses and allow traffic stresses to be distributed uniformly. Although the problems caused by surface dust on the road are minimised by the application of a bond coat it is still fundamentally important to sweep the surface prior to application of the bond coat. A further advantage of a bond coat is that during the paving or rolling of the new overlay, pushing and sliding are reduced, thereby allowing for improved compaction with a resultant increased life expectancy of the surfacing. Many of the modern surfacing layers tend to be more open in texture and consequently more porous. The bond coat therefore has an important contribution to waterproofing and inhibiting water ingress to the structural layers.

2. Emulsions for Tack and Bond Coating

Traditionally, the majority of tack coats were applied as thin films of C40B3 [1] or A1-40 [2] bitumen emulsion containing penetration grade bitumen in constructions involving hot rolled asphalt or macadam. Such application was sufficient to ensure good adhesion between the existing substrate and various layers of construction material. However, during the 1990's a significant change in construction and maintenance practices occurred in the U.K., notably involving a decline in the use of hot rolled asphalt and a considerable growth in the use of thin surfacings. The shear force exerted by traffic at the surfacing/binder course interface increases with decreasing surface course thickness and with increasing traffic. Hence a thin surfacing is more demanding and BS 594987 [3] states that "while tack coats have traditionally been used, they are no longer regarded as best practice". To accommodate these shearing forces in thin and ultra-thin surfacings an enhanced adhesive and cohesive strength is required of the binder, and hence a bond coat contains polymer modified binder with a minimum peak cohesion by pendulum test of 1.0 J/cm^2 (EN 13808:2013, Table 4, Class 4). Examples of typical bond coats are C50BP3 and C65BP3, but other alternatives are possible, and users should consult their supplier for assistance in choosing an appropriate grade. Tests such as the Leutner test [5] or the Torque Bond Test [6] may be specified and used to determine the bond strength between the layers.

BS 594987 [3] specifies that the rate of spread of bond coat shall be at least 0.35 kg/m^2 of residual binder for planed, milled surfaces, and at least 0.20 kg/m^2 of residual binder for application to newly laid or overlaying existing asphalt. For situations where tack coats are still used the residual binder should be 0.15 kg/m^2 for application to newly laid asphalt, and

0.20 kg/m^2 on planed, milled surfaces. However, over application is to be avoided as this may lead to slippage of the newly applied asphalt.

In the case of a BBA/HAPAS approved system additional requirements on rates of spread may be included. The bitumen emulsion should be applied, preferably by a calibrated spraying machine wherever practicable, as evenly as possible to achieve complete, uniform coverage of the existing surface. Tack and bond coat emulsions are formulated to provide a rapid break once sprayed onto the road; and some emulsions are designed for hot application which normally enhances the speed of break. Chemical breaking systems are also available to increase the speed of break.

Recognising the need for the more demanding requirements of bond coats, REA member companies can offer a range of emulsions to suit particular requirements.

3. Application

It is essential that emulsions are applied uniformly over the surface. They should be allowed to break completely, i.e. turn from brown to black, before site traffic is allowed onto the surface. Excessive application should be avoided such as to cause ponding. This can lead to delayed emulsion break and "pick-up" by the tyres of construction vehicles resulting in subsequent deposition on the finished surface and on exit roads. This is particularly the case for thin surfacings where excessive application can lead to "bleed through" of binder. If the bond coat is to be subjected to temporary trafficking by site vehicles, a light application of coated grit at about 2.5 kg/m^2 will assist in preventing pick-up on tyres. When used, tack coats may be applied by hand lance (from drums), but preferably, to exercise maximum control over the uniformity and rate of coverage, they should be applied by conventional spray tankers or via integral paving machines. The use of integral pavers ensures no direct contact between the bond coat and site vehicles and is recommended wherever possible and particularly for very thin surfacings. Nozzle sizes of spray-bars should be appropriate to the type of emulsion being applied. Recipient surfaces should be clean and free from loose dust; they may be damp but standing water should not be present.

3.1 Working from Drums

Working from drums is not recommended by the REA for situations in which controlled spraybar application could be used. However, for situations in which there is no alternative, the following controls should be exercised. Before use and at prescribed intervals during storage it is important that drums of emulsion are well rolled. They should also be protected from frost during storage (See REA Technical Data Sheet No.2). The emulsion should be sprayed evenly from a hand lance with a circular action rather than with a side to side swing. To assist in the undertaking of work programmes it is convenient to calculate the number of drums required and to position these at intervals along the edge of the carriageway.

3.2 Machine Work

When emulsion is stored in a mobile storage tank or applied from a bulk distributor, it should be circulated thoroughly before use and at intervals during storage (See REA Code of Good Practice) [7]. Spray distributors should initially be calibrated according to BS 1707 [8], BS EN 12272-1 [9] as appropriate. During application the "carpet tile" test may be used to check

the rate of spread of the emulsion from bulk distributors (not from integral pavers) and the overall rate may be checked by comparison of the quantity of emulsion used against the area covered.

4. Cleaning and Maintenance of Equipment

After use, brushes and equipment should be cleaned with suitable cleaning agent (See REA Technical Data Sheet No.3) [10] as recommended by the emulsion supplier. This used cleaning agent must not be disposed of in the tack / bond coat emulsion tank. It is important that emulsion is not allowed to remain in hand sprayer pipe work after the completion of daily work schedules.

5. Health and Safety

During bond coating operations all relevant Health and Safety information and safe working practices should be followed. This information is provided by the REA and can be found in Technical Data Sheet No.2 [4] and in member company's individual Material Safety Data Sheets covering Bitumen Road Emulsions.

6. UKCA/CE Marking

At the end of June 2013, the Construction Products Regulation (CPR) was fully implemented in all EU member states. Since then, Construction products covered by a harmonised European standard (EN) have a legal requirement to be CE marked in order to place them on the European market. The UK withdrew from the European Union in January 2020 and in January 2021 introduced its own UKCA mark. A transition period for implementation of the UKCA mark was introduced but this period has been extended indefinitely meaning that both CE and UKCA Marking can continue to be used.

References

[1] BS EN 13808:2013 Bitumen and bituminous binders – Framework for specifying cationic bituminous emulsions

[2] BS 434-1:2011+A1:2016 Specification for anionic bitumen road emulsions

[3] BS 594987:2024 Asphalt for roads and other trafficked areas. Transport, laying, compaction and product type testing protocols. Specification

[4] Recommendations for the Safe Handling & Storage of Bitumen Road Emulsions

[5] Manual of Contract Documents for Highway Works, Volume 1, Specification for Highway Works Series 900 Road Pavements – Bituminous Bound Materials, Clause 954

[6] British Board of Agrément, Guideline Document for the Assessment and Certification of Thin Surfacing Systems for Highways, Appendix A.3

[7] Road Emulsion Association Code of Good Practice for the use and Safety of Mobile Storage Tanks

[8] BS 1707:2018 - Specification for hot binder distributors for road surface dressing

[9] BS EN 12272-1:2002 - Rate of spread and accuracy of spread of binder and chippings

[10] Recommendations for the Cleaning and Maintenance of Spraying Machines for use with Bitumen Emulsions

For further information on all REA Technical Data sheets please look on the "Technical Datasheets" webpage on www.rea.org.uk