

## 1. Introduction

Storage grade bituminous mixtures are produced by coating mixed aggregates with hot bitumen and flux oils. The flux oils modify the binder viscosity and extend the storage life of the finished product.

Storage grade materials are used in temporary or permanent trench reinstatements and emergency patching. The bituminous mixture may be stockpiled for a period of time before it is used. It must remain workable but at the same time provide good stability when it is laid.

The disadvantages of this method are: -

- a) The aggregate has to be heated to a high temperature, to ensure that it is properly coated with bitumen.
- b) The elevated temperature increases the risk of a fire at the mixing plant because the flux oils have a relatively low flash point.
- c) Volatile oils are lost from the flux giving rise to unpredictable workability.

## 2. The Emulsion Approach

The development of coating grade emulsions in recent years has overcome these disadvantages and given additional benefits that include:-

- a) Emulsions may be used at ambient and warm temperatures with aggregates that may not be completely dry.
- b) Lower temperatures reduce the amount (and cost) of fuel used to dry the aggregate, reducing greenhouse gas emissions.
- c) Operating at lower temperatures when coating with emulsion gives a greater margin of safety, even though the emulsion may contain a small proportion of flux oils.
- d) Emulsion coated mixtures can be stockpiled for long periods. They may also be packaged into small containers for convenient storage and transport. This allows small areas to be treated quickly, cleanly and economically.

The now withdrawn standard BS 434-2 [1] partly defined two techniques for using bitumen emulsion to produce storage grade bituminous mixtures. The first method produces a mixture in a single operation. The second lightly coats some of the aggregate constituents separately and then mixes them together with the emulsion.

It is not possible to lay down hard and fast rules as to the method of manufacture or the choice and quantity of emulsion. Consideration has to be given to the chemical nature of the aggregate, the target grading of the mixture and the type of mixing plant. These factors can only be assessed in consultation with the emulsion supplier. Laboratory mixture design using representative samples of the aggregates are usually required.

### **3.The Process**

#### **3.1 Emulsion**

The choice of emulsion will depend on the chemical nature of the aggregate, the target grading of the mixture and the intended use. The choice of emulsion type and grade should be made in consultation with the emulsion supplier. The emulsion formulation may have to be adjusted to suit the characteristics of the aggregate.

#### **3.2 Aggregate**

Whilst most aggregates that are currently used in hot bituminous mixtures are suitable for use with emulsions, some may not be. Aggregates need not be completely dry but excess moisture and fines may prevent coating and cause stripping.

It is not usually necessary to add water, but some highly acidic or alkaline aggregates benefit from pre-wetting.

#### **3.3 Mixing**

Mixtures can be produced in most types and sizes of mixer. The mixing times should be kept to the minimum required to achieve full coating. Excessive mixing can lead to the stripping of the binder from the stone.

#### **3.4 Specifications - grading and binder content**

It is very important that specifications are agreed with the emulsion supplier and reflect the characteristics of the aggregate.

Most storage grade bituminous mixtures use a grading that is based on the routinely used asphalt concrete mixtures in BS EN 13108-1 [2]. Typical mixtures are an AC 20 dense binder course and an AC 6 medium or dense surface course. AC 20 open binder course is often supplied in bags and tubs. A number of storage grade mixtures based on a stone mastic asphalt (SMA) type grading have also been successfully produced.

#### **3.5 Laying**

Storage grade bituminous mixtures should be laid and compacted in accordance with BS 594987 [3]. Good joint preparation and effective use of the correct compaction plant will ensure good performance.

### **4. Summary**

The production of storage grade bituminous mixtures using bitumen emulsion is a proven, safe, and cost effective process. Bitumen emulsions can be used to manufacture most asphalt concrete mixtures, either for immediate use or for storage in a way that meets a range of customer requirements. Close consultation with the emulsion manufacturer can ensure that the mixture is well coated, has the expected grading and can be successfully manufactured.

## 5. 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 434-2:2006 Bitumen road emulsions. Code of practice for the use of cationic bitumen emulsions on roads and other paved area.
- [2] BS EN 13108-1:2016 Bituminous mixtures. Material specifications. Asphalt Concrete
- [3] BS 594987:2024 Asphalt for roads and other trafficked areas. Transport, laying, compaction and product type testing protocols. Specification

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