

BS 434-1:2011+A1:2016



BSI Standards Publication

Bitumen road emulsions –

Part 1: Specification for anionic bitumen road emulsions



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Summary of pages

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Foreword

Publishing information

This part of BS 434 is published by BSI Limited, under licence from The British Standards Institution and came into effect on 31 January 2011. It was prepared by Technical Committee B/510, *Road materials*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

BS 434-1:2011+A1:2016 supersedes BS 434-1:2011, which is withdrawn.

Relationship with other publications

The requirements for specifying cationic bitumen road emulsions are given in BS EN 13808. Recommendations for the use of these emulsions for roads and other surfaces are covered by BS 434-2.

Information about this document

BS 434-1:2011 was a full revision of the standard, and incorporated the following principal changes:

- the requirements for cationic bitumen road emulsions have been removed;
- Appendix C, Appendix D and Appendix F have been replaced by references to relevant test method standards. Appendix E has been partially replaced;
- the relevant requirements of new European standards have been incorporated, where appropriate.

Text introduced or altered by Amendment No.1 is indicated in the text by tags  . Minor editorial changes are not tagged.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 434 specifies requirements for anionic bitumen emulsions used for the preparation and treatment of road and other surfaces carrying wheeled and foot traffic.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 410-1, *Test sieves – Technical requirements and testing – Part 1: Test sieves of metal wire cloth*

BS 507, *Specification for ethanol for industrial use*

BS 509-1, *Acetone for industrial use – Part 1: Specification for acetone*

BS 615:1953+A2:1963, *Specification for Kohlrausch flasks*

BS 2000-0.1, *Methods of test for petroleum and its products – General introduction – Specifications – IP Standard thermometers – Section 0.1: Specifications – IP standard for thermometers (Identical with IP Annex A)*

BS 2000-0.2, *Methods of test for petroleum and its products – Part 0 – Section 0.2: Specifications for IP standard reference liquids (Identical with IP Appendix B)*

BS 2000-15, *Methods of test for petroleum and its products – Part 15: Petroleum products – Determination of pour point*

BS 6376-3, *Reagents for chemical analysis – Part 3: Specifications (second series)*

BS EN 1428, BS 2000-291, *Methods of test for petroleum and its products – BS 2000-291: Bitumen and bituminous binders – Determination of water content in bituminous emulsions – Azeotropic distillation method (Identical with IP 291-2000)*

BS EN 1429, *Bitumen and bituminous binders – Determination of residue on sieving of bituminous emulsions, and determination of storage stability of sieving*

BS EN 1430, *Bitumen and bituminous binders – Determination of particle polarity of bituminous emulsions*

BS EN 12591:2009, *Bitumen and bituminous binders – Specifications for paving grade bitumens*

BS EN 12597, *Bitumen and bituminous binders – Terminology* 

BS EN 12848, *Bitumen and bituminous binders – Determination of mixing stability with cement of bituminous emulsions*

BS EN ISO 3170:2004, BS 2000-475:2004, *Methods of test for petroleum and its products – BS 2000-475: Petroleum liquids – Manual sampling (Identical with IP 475-2005)*

3 Terms and definitions

For the purposes of this part of BS 434, the following terms and definitions apply.

3.1 bitumen

virtually involatile, adhesive and waterproofing material derived from crude petroleum, or present in natural asphalt, which is completely or nearly completely soluble in toluene, and very viscous or nearly solid at ambient temperatures

[BS EN 12597]

3.2 bitumen road emulsion

liquid product in which a substantial amount of bitumen is suspended in a finely divided condition in an aqueous medium by means of one or more suitable emulsifying agents

NOTE There are two types of bitumen road emulsions: anionic and cationic.

3.3 anionic emulsion

emulsion in which the anion of the emulsifier is at the interface with the bitumen particle that is negatively charged and in which the aqueous phase is normally alkaline

3.4 cationic emulsion

emulsion in which the cation of the emulsifier is at the interface with the bitumen particle that is positively charged and in which the aqueous phase is normally acid

3.5 binder content (including emulsifier)

difference between 100% and the percentage water content determined in accordance with BS EN 1428

4 Classification of anionic road emulsions

Anionic road emulsions shall be classified in order of stability as follows.

- a) *Class A1: labile*. An emulsion characterized by rapid breakdown on application and normally unsuitable for mixing with aggregate; used cold.
- b) *Class A2: semi-stable*. An emulsion with sufficient stability to permit mixing with certain grades of aggregate before breakdown occurs; used cold.
- c) *Class A3: stable*. An emulsion with sufficient mechanical and chemical stability for all purposes involving mixing with aggregates including those containing large proportions of fines or chemically active materials such as cement or hydrated lime; used cold.
- d) *Class A4: slurry surfacing*. An emulsion formulated for slurry surfacing; used cold.

NOTE 1 Additives may be used at the time of laying if required to adjust the setting time or viscosity of the mix.

This class shall be subdivided as follows.

- 1) *Class A4: slow setting*. Suitable for mixing in simple mixers for hand laying, in bulk transit concrete mixers or mobile mixing machines.
- 2) *Class A4: rapid setting*. Suitable for handling in special mobile mixing machines only.

NOTE 2 Classes A1 and A2 are subdivided according to their nominal binder contents (see Table 1).

NOTE 3 Due to the wide variation in chemical activity and physical structure of aggregates from different sources, not all are suitable for slurry surfacing. Each aggregate may be tested in the laboratory with class A4 emulsion and the mixes with class A4 emulsion subjected to the wearing (track abrasion) test in accordance with BS EN 12274-5. The loss in mass of the specimen after abrasion not exceeding 500 g/m² may be an appropriate criterion for most applications.

NOTE 4 Cationic road emulsions are classified in accordance with BS EN 13808. [A1] Text deleted [A1]

5 Composition

5.1 General

Anionic road emulsions shall contain bitumen, modified if necessary as specified in 5.2, emulsifying agents and water. Small amounts of surfactants and additives shall be permitted to modify performance, as in slurry surfacing and other emulsions for special purposes.

5.2 Bitumen

The bitumen used for the manufacture of the emulsion shall conform to BS EN 12591:2009 and shall be selected from the range grade 50/70 to grade 250/300, as defined therein.

NOTE 1 The bitumen may be modified by the addition of fluxing agents ranging from light volatile distillates to heavy oils, the amount of fluxing agent used normally being not more than 5% by mass of the bitumen, or as agreed between the purchaser and the manufacturer of the emulsion.

NOTE 2 If required by the purchaser, the supplier should provide a typical sample of the paving grade bitumen used as the basic ingredient of the emulsion and/or should disclose the nominal viscosity of the bitumen/flux mixture used.

NOTE 3 Attention is drawn to the fact that bitumen originally conforming to BS EN 12591 might not give the same test results on analysis after extraction from the emulsion.

6 Particle charge

When tested in accordance with BS EN 1430, anionic emulsion shall deposit on the anode, indicating that the particles have a negative charge.

NOTE The character and amount of deposit will depend on the class of emulsion under test.

7 Properties of emulsions

7.1 Test procedures

Procedures for sampling and specimen preparation shall be as described in Annex A and Annex B respectively. Emulsions shall be tested in accordance with the annexes or test standards referred to in Table 1.

7.2 Test requirements

The properties of anionic road emulsions shall be as given in Table 1. The test result from one of the 4 L samples tested shall be compared with the appropriate limit(s) given in Table 1. If the test results do not conform to the limit(s) given in Table 1, two further reserved samples shall be tested and the test results of two out of any of the three samples tested shall conform to the limit(s) given in Table 1.

Table 1 Properties of anionic road emulsions

Property	Annex or test standard	Class of anionic road emulsions						
		A1-60	A1-55	A1-40	A2-57	A2-50	A3	A4
Particle charge	BS EN 1430	neg.	neg.	neg.	neg.	neg.	neg.	neg.
Residue on 500 µm BS sieve [% (m/m), maximum]	BS EN 1429	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Residue on 160 µm BS sieve (g per 100 mL, maximum)	BS EN 1429	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Stability to mixing with coarse aggregate (% coagulation)	C	20 to 80	20 to 80	20 to 80	< 40	< 40	< 5	< 5
Stability to mixing with cement (% coagulation)	BS EN 12848	—	—	—	> 2	> 2	< 2	—
Binder content [% (m/m), minimum]	BS EN 1428	58	53	38	55	48	55	56
Viscosity [degrees Engler (°E) at 20 °C] ^{A)}	D.1	6 to 9	5 to 8	≤ 4	≤ 8	≤ 5	≤ 9 ^{B)}	≤ 8 ^{B)}
Coagulation of emulsion at low temperature	E	nil	nil	nil	nil	nil	nil	nil
Storage stability (short period test) (inversions to clear sediment, maximum)	F.1	60	60	60	60	60	60	60
Storage stability (long period test) (% water content difference, maximum)	F.2	2	2	—	2	2	2	2

NOTE In special circumstances, class A1-60 emulsion with a higher viscosity can be used for hand application provided that the emulsion conforms to all the other requirements of this standard.

^{A)} The viscosities given in the table are suitable for use in bulk spreaders conforming to BS 3136-2 or for use in hand operated sprayers conforming to BS 3136-2. As a general guide, a maximum viscosity of 9 °E at the temperature of the spraying is considered to be suitable.

^{B)} These viscosity values are intended to serve as a guide only and other values may be agreed between the purchaser and the supplier.

8 Containers and marking

8.1 Containers

No corrosion or attack shall occur between the emulsion and the container or bung and the emulsion shall not be adversely affected by the container or bung.

NOTE The use of light metals or their alloys can lead to the evolution of hydrogen and the subsequent explosion of the container.