



BSI Standards Publication

**Bituminous binders —
Determination of breaking
behaviour and immediate
adhesivity of cationic
bituminous emulsions
with 2/4 mm aggregate**

National foreword

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English Version

Bituminous binders - Determination of breaking behaviour and immediate adhesivity of cationic bituminous emulsions with 2/4 mm aggregate

Bitumes et liants bitumineux - Détermination du comportement à la rupture et de l'adhésivité immédiate des émulsions cationiques de bitume avec un granulats de 2/4 mm

Bitumen und bitumenhaltige Bindemittel - Bestimmung der Brechzeit und des kurzfristigen Haftverhaltens von kationischen Bitumenemulsionen mit Gesteinskörnung 2/4 mm

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Foreword

This document (CEN/TS 16346:2012) has been prepared by Technical Committee CEN/TC 336 “Bituminous Binders”, the secretariat of which is held by AFNOR/BN Pétrole.

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1 Scope

This Technical Specification specifies a method for the determination of the breaking and immediate adhesivity behaviour of cationic bituminous emulsions in contact with an aggregate. The method applies to emulsions used for surface dressing applications and can be used for formulation and production control purposes.

WARNING — The use of this Technical Specification may involve hazardous materials, operations and equipment. This Technical Specification does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this Technical Specification to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

2 Normative references

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

EN 58, *Bitumen and bituminous binders – Sampling bituminous binders*

EN 12594, *Bitumen and bituminous binders – Preparation of test samples*

EN 13043, *Aggregates for bituminous mixtures and surface treatments of roads, airfields and other trafficked areas*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1
full breaking**
stage at which, during the mixing process between aggregate particles and emulsion conducted as specified in 8.2, all aggregate particles have agglomerated into a single compact mass

**3.2
breaking time**
time in seconds, counted from the start of the mixing process, until full breaking (3.1) is reached

**3.3
breaking behaviour**
appreciation of the actual degree of breaking of the emulsion after the mixture has reached the full breaking stage

Note 1 to entry The breaking behaviour is measured by the number of successive washings of the final mixtures which are necessary until the water runs clear.

**3.4
immediate adhesivity**
qualitative assessment of the ability of the binder from a bituminous emulsion to resist the action of water just after the aggregate coating

4 Principle

Prescribed quantities of emulsion and 2/4 mm aggregate are mixed under specified conditions. The time it takes to obtain a single agglomerated mass is a measure of the breaking time of the emulsion. After $5 \text{ min} \pm 15 \text{ s}$, the final mixture is washed with water and the percentage of the aggregate surface covered with binder is assessed visually under specified conditions. This percentage is a measure of the immediate adhesivity of the emulsion with the considered aggregate.

5 Reagents and material

5.1 Aggregate, being either a reference aggregate or an aggregate to be used on a specific job site, which passes through a sieve having a mesh size of 4 mm and is retained on a sieve having a mesh size of 2 mm (sieve sizes belonging to the « basic set » specified in EN 13043).

5.2 Water, clean, ideally potable.

5.3 Cleaning agents, conventionally used in a laboratory.

6 Apparatus

6.1 Mixing bowls (at least 2), semi-spherical, acid resistant metal, diameter $(150 \pm 5) \text{ mm}$.

6.2 Rigid, metal spatula.

6.3 Timer, accurate to at least 0,5 s over 60 s.

6.4 Beakers (at least 2), approximately 500 ml capacity.

6.5 Balance, of sufficient capacity, accurate to $\pm 0,1 \text{ g}$.

6.6 Ventilated oven, capable of maintaining a temperature of $(110 \pm 5) ^\circ\text{C}$.

7 Sampling

Sample the emulsion to be tested in accordance with EN 58. Prepare the test samples in accordance with EN 12594.

8 Procedure

8.1 General

Carry out the procedure under normal laboratory conditions $(23 \pm 5) ^\circ\text{C}$.

Wash the aggregate with water (5.2) and dry it in the ventilated oven (6.6) at $(110 \pm 5) ^\circ\text{C}$ for about 2 h. Let the aggregate cool down to ambient temperature.

The test procedures described in 8.2 and 8.3 shall be performed in immediate succession and repeated with a new mixing bowl and beaker on a second sample of the same emulsion and aggregate.

8.2 Determination of breaking time

8.2.1 Weigh (200 ± 2) g of aggregate (5.1) into the clean and dry mixing bowl (6.1). Dig a conical shaped cavity in the centre of the aggregate heap.

8.2.2 Pour rapidly $(20 \pm 0,5)$ g of emulsion into the previously formed cavity and start immediately the timing device (6.3) and the mixing process using the spatula (6.2). Mixing shall be done with a circular motion going from bottom to top at an approximate rate of 1 revolution per second, while the bowl is simultaneously rotated around its vertical axis.

8.2.3 Continue mixing without interruption until full breaking (3.1) is obtained. Record immediately the breaking time in seconds (3.2). If the emulsion breaks and coats the aggregate, but without agglomerating it, this has to be mentioned in the test report (Clause 11).

8.3 Determination of breaking behaviour and immediate adhesivity

8.3.1 5 min \pm 15 s after the start of the timing device, fill the mixing bowl by holding it under a slow stream of water. Once full, pour the water out of the mixing bowl. Repeat this procedure until the water runs clear and record the number of times this procedure has to be repeated.

8.3.2 Assess immediately the surface coated with the film of binder and grade it according to the scheme indicated in 9.3.

9 Expression of results

9.1 Breaking time

Express the breaking times as the arithmetic means of the two individual breaking time results to the nearest second. If the individual values differ by more than 10 % of the arithmetic mean, the test has to be repeated.

9.2 Breaking behaviour

Express the numbers of times the mixing bowl was emptied until the water runs clear.

9.3 Immediate adhesivity

The surface coated with the film of binder has to be graded according to the following scheme:

- 100: all the surface is coated;
- 90: more than approximately 90 % of the surface is coated;
- 75: approximately 75 % to 90 % of the surface is coated;
- 50: approximately 50 % to 75 % of the surface is coated;
- < 50: less than approximately 50 % of the surface is coated;
- 0: the binder is separated from the aggregates, except for some faint marks.

The simple coloration of the aggregate surface by adsorbed light binder fractions shall not qualify this surface as a coated surface.

NOTE 1 A guidance for the grading of the surface covered with binder is given, in the form of indicative sketches, in Annex A.

NOTE 2 If necessary, to facilitate the assessment, it can be compared with an untreated and immersed aggregate.

10 Precision

10.1 Breaking time

10.1.1 Repeatability, r

In the long run and in normal and correct operation of the test method, the difference between two successive test results, obtained by the same operator with the same apparatus under constant operating conditions on identical test material, would exceed 10 % of the mean value in only one case in twenty.

10.1.2 Reproducibility, R

The reproducibility for this Technical Specification is not currently available.

10.2 Breaking behaviour

The method is qualitative and it is not possible to quantify the breaking behaviour precision. However, tests carried out by the same operator have shown that the same result is generally achieved for any given bitumen emulsion.

10.3 Immediate adhesivity

The method is qualitative and it is not possible to quantify the immediate adhesivity precision. However, tests carried out by the same operator have shown that the same result is generally achieved for any given bitumen emulsion.

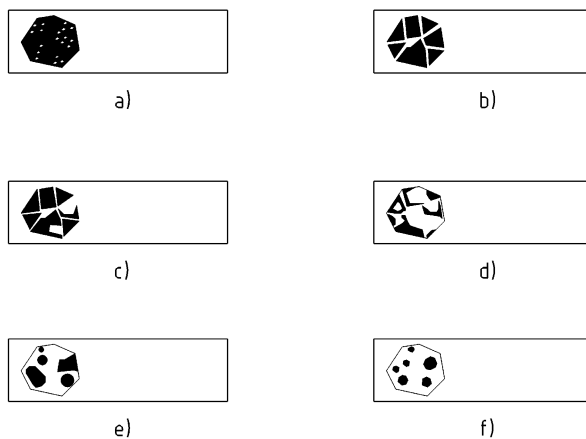
11 Test report

The test report shall contain at least the following information:

- a) reference to this Technical Specification;
- b) type and complete identification of the emulsion sample under test;
- c) type and identification of the aggregate used;
- d) result of the test (see Clause 9), including the observations requested under 8.2.3;
- e) number of tests performed;
- f) any deviation, by agreement or otherwise, from the procedure described;
- g) date of the test.

Annex A (normative)

Guidance for the marking of coated surface area



Key

- a) Mark 100
- b) Mark 90
- c) Mark 75
- d) Mark 50
- e) Mark < 50
- f) Mark 0

Figure A.1 — Typical cases of partially coated aggregates

Bibliography

- [1] EN 13808, *Bitumen and bituminous binders – Framework for specifying cationic bituminous emulsions*

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