BRITISH STANDARD

BS EN
1367-3:2001

Tests for thermal and weathering properties of aggregates —

Part 3: Boiling test for "Sonnenbrand" basalt

The European Standard EN 1367-3:2001 has the status of a British Standard

ICS 91.100.15

National foreword

This British Standard is the official English language version of EN 1367-3:2001, which is included in a package of new European Standards being prepared by CEN/TC 154 relating to aggregates. Although the English text versions of these European Standards will be adopted as British Standards as they become available, the existing British Standards for aggregates will be retained, but only until such time that the completed package of European Standards becomes available. The original group of British Standards will then be withdrawn and this will be noted in *Update Standards*.

The UK participation in its preparation was entrusted by Technical Committee B/502, Aggregates, to Subcommittee B/502/6, Test methods, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 May 2001

Summary of pages

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English version

Tests for thermal and weathering properties of aggregates — Part 3: Boiling test for "Sonnenbrand" basalt

Essais pour déterminer les propriétés thermiques et l'altérabilité des granulats — Partie 3: Essai d'ébullition pour les basaltes coup de soleil

Prüfverfahren für thermische Eigenschaften und Verwitterungsbeständigkeit von Gesteinskörnungen — Teil 3: Kochversuch für Sonnenbrand-Basalt

This European Standard was approved by CEN on 19 January 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 154, Aggregates, the Secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2001, and conflicting national standards shall be withdrawn at the latest by December 2003.

This European Standard forms part of a series of tests for thermal and weathering properties of aggregates. Test methods for other properties of aggregates will be covered by parts of the following European Standards:

EN 932, *Tests for general properties of aggregates.*
EN 933, *Tests for geometrical properties of aggregates.*
EN 1097, *Tests for mechanical and physical properties of aggregates.*
EN 1744, *Tests for chemical properties of aggregates.*
EN 13179, *Tests for filler aggregate used in bituminous mixtures.*

The other parts of EN 1367 will be:

Part 1: Determination of resistance to freezing and thawing.
Part 2: Magnesium sulfate test.
Part 4: Determination of drying shrinkage.
Part 5: Determination of resistance to thermal shock.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies methods for the determination of the presence of signs of "Sonnenbrand" in basalt and the disintegration of aggregate produced from basalt showing such signs.

The test is applicable to pieces of rock, and graded basalt coarse aggregates.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 932-1 *Tests for general properties of aggregates — Part 1: Methods for sampling.*

EN 932-2 *Tests for general properties of aggregates — Part 2: Methods for reducing laboratory samples.*

EN 932-5 *Tests for general properties of aggregates — Part 5: Common equipment and calibration.*

EN 933-1 *Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method.*

EN 933-2 *Tests for geometrical properties of aggregates — Part 2: Determination of particle size distribution — Test sieves, nominal size of apertures.*

EN 1097-2 *Tests for mechanical and physical properties of aggregates — Part 2: Methods for the determination of resistance to fragmentation.*

3 Terms and definitions

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

3.1
Sonnenbrand
type of rock decay that may be present in some basalts and which manifests itself under the influence of atmospheric conditions

NOTE "Sonnenbrand" starts with the appearance of grey/white star-shaped spots. Usually hairline cracks are generated radiating out from the spots and interconnecting them. This reduces the strength of the mineral fabric, and as a result the rock decays to small particles.

Depending on the source this process may take place within months of extraction or extend over several decades. In exceptional cases a rapid decay results in the formation of large cracks and the breaking of aggregate particles.

3.2
laboratory sample
sample intended for laboratory testing

3.3
test portion
sample used as a whole in a single test

3.4
test specimen
sample used in a single determination when a test method requires more than one determination of a property

3.5
constant mass
successive weighings after drying at least 1 h apart not differing by more than 0,1%

NOTE In many cases, constant mass can be achieved after a test portion has been dried for a pre-determined period in a specified oven at (110 ± 5) °C. Test laboratories can determine the time required to achieve constant mass for specific types and sizes dependent upon the drying capacity of the oven used.

4 Principle

Individual pieces of basalt rock are examined for signs of "Sonnenbrand" and samples of graded basalt are tested for percentage loss in mass and loss in strength after boiling.

The strength is determined in accordance with EN 1097-2.

5 Apparatus

5.1 All apparatus, unless otherwise stated, shall conform to the general requirements of EN 932-5.

5.2 Ventilated drying oven, with forced circulation of adequate capacity. The oven shall be capable of being controlled at (110 ± 5) °C.

5.3 Balance, with an accuracy of ±0,1 % of the mass of the test portion.

5.4 Heat source, capable of boiling the can and contents at 100 °C for (36 ± 1) h.

5.5 Steel cans, with watercooled lids.

5.6 Test sieves, conforming to EN 933-2.

5.7 Water, distilled or demineralized.

5.8 Moist cloth

5.9 Sawing machine

6 Sampling

Sampling shall be carried out in accordance with EN 932-1.

7 Preparation of test portions

7.1 Test portion for the visual examination of a piece of basalt rock for signs of "Sonnenbrand"

For the determination of the presence of signs of "Sonnenbrand" the laboratory sample shall be taken from a quarry stock pile and shall consist of one rock piece, which shall be large enough to give a sawn surface equal to or greater than 0,005 m^2.

NOTE A piece with a minimum dimension of 75 mm should be sufficient.

Cut the rock piece to give two sawn test portions, and mark each for identification.

Wash each test portion and remove adherent particles by brushing.

7.2 Test portion for the determination of loss in mass of basalt aggregate after boiling

Reduce the laboratory samples in accordance with EN 932-2.

Remove the oversize and undersize by dry sieving in accordance with EN 933-1.

Wash the sample and dry it to constant mass at (110 ± 5) °C and allow to cool.

Weigh and record the test portion mass in grams as m_0.

The minimum mass of the test portion shall be as specified in Table 1.

NOTE If it is intended to carry out strength tests, the test portion should correspond to the test portions needed for the determination of the loss in strength as specified in 7.3, allowing for some waste.

Table 1 — Minimum mass of test portion

Aggregate size mm	Mass of test portion g
4 to 8 8 to 16 16 to 32	1 000 2 000 4 000

7.3 Test portion for the determination of the strength loss of basalt aggregate after boiling

Prepare two test portions from the same laboratory sample as specified in 5.2 of EN 1097-2:1998.

NOTE If the impact test specified in EN 1097-2 is to be used, at least six test specimens from the same laboratory sample as specified in 6.2 of EN 1097-2:1998 should be prepared.

8 Procedure

8.1 Visual determination of signs of "Sonnenbrand" in a piece of basalt

Place one of the two test portions in the steel can and fill with distilled or demineralized water so that the test portion will remain covered during boiling, and cover with a lid. Bring the can and contents to boiling within 0,5 h, and maintain boiling for (36 ± 1) h. During this period check by inspection that the test portion remains covered with water.

Remove the warm test portion from the can and check for signs of "Sonnenbrand" during the drying period.

NOTE At this stage make sure that adequate precautions are taken by personnel to avoid scalding, burns, etc.

Lightly moisten the sawn surface with a moist cloth and as the sawn surface dries again, examine for any of the following and record observations:

a) formation of grey/white star shaped spots or radiating hairline cracks;

b) formation of larger cracks;

c) breakage of the test portion.

NOTE 1 A comparison can be made between the test portion under test and the unboiled test portion.

NOTE 2 Several specimens from a number of pieces of basalt can be boiled in the can at the same time.

8.2 Determination of mass loss of basalt aggregate after boiling

Place the test portion in the steel can and fill with water so that the specimen will remain covered during boiling, and cover with lid.

Bring the can and contents to boiling within 0,5 h and maintain boiling for (36 ± 1) h.

Allow the can and contents to cool to ambient temperature, decant the water and transfer the test portion to suitable trays.

Dry to constant mass at (110 ± 5) °C and allow to cool.

Dry sieve the test portion on a sieve having an aperture of half the lower nominal size.

Weigh the mass retained on the sieve in grams (m_1).

8.3 Determination of strength loss of basalt aggregate after boiling

Boil one test portion and allow to cool and dry at (110 ± 5) °C to constant mass as specified in 8.2.

Test both test portions in accordance with EN 1097-2 and record the strengths obtained on the boiled and unboiled portions as LA_1 and LA_0 respectively.

NOTE If the impact test specified in EN 1097-2 is to be used, at least three test specimens from the same laboratory sample, as specified in 6.2 of EN 1097-2:1998, should be boiled and the mean strength recorded as SZ_1. The mean impact value of the three unboiled test specimens should be recorded as SZ_0.

9 Calculation and expression of results

9.1 Percentage loss in mass of basalt aggregate

Calculate the percentage loss in mass to the nearest 0,1 % in accordance with the following equation:

$$M_1 = \frac{(m_0 - m_1)}{m_0} \times 100$$

where:

M_1 is the percentage loss in mass;
m_0 is the mass of the test portion before boiling, in grams;
m_1 is the mass of the fraction retained on the half size sieve after boiling, in grams.

9.2 Strength loss of basalt aggregate

Calculate the difference, as a percentage, between the strength test results of the boiled and unboiled test portions, following the procedures specified in EN 1097-2.

Calculate the percentage strength loss to the nearest 0,1 % in accordance with the following equation:

$$S_{LA} = \frac{(LA_1 - LA_0)}{LA_0} \times 100$$

where:

S_{LA} is the percentage loss in strength;
LA_0 is the Los Angeles coefficient of the unboiled test portion;
LA_1 is the Los Angeles coefficient of the boiled test portion.

NOTE If the impact test specified in EN 1097-2 is to be used, calculate the loss in strength to the first decimal place in accordance with the following equation:

$$S_{SZ} = SZ_1 - SZ_0$$

where:

S_{SZ} is the loss in strength;
SZ_0 is the impact value of the unboiled test specimens;
SZ_1 is the impact value of the boiled test specimens.

10 Test report

The test report shall contain the following information:

a) reference to this European Standard;
b) sampling method (certificate if available) and marking, type and origin of the laboratory samples;
c) shape, size, gradings and number of laboratory samples;
d) visual observations of the sawn test portion, including any unusual disintegration and in particular, whether any signs of "Sonnenbrand" were found.

If the corresponding tests have been carried out the test report shall also include:

e) result of the boiling test on aggregate, expressed to the nearest 0,1 % by mass;
f) result of the strength loss on aggregate;
g) strength test used (i.e. Los Angeles or impact test).

BS EN 1367-3:2001

BSI — British Standards Institution

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Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

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