SLOVENSKI STANDARD
SIST EN 1367-5:2011

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Preskusi lastnosti agregatov zaradi termičnih in vremenskih vplivov - 5. del: Določevanje odpornosti proti temperaturnemu šoku

Tests for thermal and weathering properties of aggregates - Part 5: Determination of resistance to thermal shock

Prüfverfahren für thermische Eigenschaften und Verwitterungsbeständigkeit von Gesteinskörnungen - Teil 5: Bestimmung des Widerstandes gegen Hitzebeanspruchung

Essais pour déterminer les propriétés thermiques et l'altérabilité des granulats - Partie 5: Détermination de la résistance au choc thermique

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ICS:

91.100.15	Mineralni materiali in izdelki	Mineral materials and products

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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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This document (EN 1367-5:2011) 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of an identical text or by endorsement, at the latest by July 2011, and conflicting national standards shall be withdrawn at the latest by July 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document replaces EN 1367-5:2002.

This 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 (all parts), *Tests for general properties of aggregates*;
- EN 933 (all parts), *Tests for geometrical properties of aggregates*;
- EN 1097 (all parts), *Tests for mechanical and physical properties of aggregates*;
- EN 1744 (all parts), *Tests for chemical properties of aggregates*;
- EN 13179 (all parts), *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 3: Boiling test for “Sonnenbrand basalt”*;
- *Part 4: Determination of drying shrinkage*;
- *Part 6: Determination of resistance to freezing and thawing in the presence of salt (NaCl)*.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies methods for the determination of resistance to thermal shock of aggregates, subject to heating and drying in the production of hot bituminous mixtures.

This standard describes the reference method use for type testing and in case of dispute. For the purpose of type testing and in case of dispute only the reference method should be used. For other purposes, in particular factory production control, other methods may be used provided than an appropriate working relationship with the reference method has been established.

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.

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

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

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

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

3 Terms and definitions

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

3.1
thermal shock
change in physical properties of aggregates subjected to 700 °C environment for a 3 min interval

3.2
test specimen
sample used in a single determination when a test method requires more than one determination of a property

3.3
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 specified types and sizes of sample dependent on the drying capacity of the oven used.

4 Principle

The test involves two test specimens with the grading required by EN 1097-2. One test specimen is soaked heated to 700 °C for 3 min. The resistance to fragmentation is then determined in accordance with EN 1097-2 on the first test specimen after heating and the strength loss calculated by comparison with the result of the second test specimen which has not been heated. The increase in undersize passing the 5 mm sieve after thermal shock is also calculated.

5 Apparatus

5.1 General

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

5.2 Apparatus for heat test

5.2.1 Distilled or deionised water.

5.2.2 Furnace or oven, heated by radiation only, capable of maintaining test portions at a temperature of:

(700 ± 100) °C for the specified time period using a suitable control system.

The minimum internal dimensions shall be:

a) width – 260 mm;

b) height – 160 mm;

c) depth – 450 mm.

5.2.3 Test sieves conforming to ISO 3310-2 of 5,0 aperture size will be used.

For Los Angeles or Impact tests, sieves specified in EN 1097-2 will be used.

5.2.4 Balance of adequate capacity, with an accuracy of ± 0,5 g.

5.2.5 Ventilated drying oven, with forced circulation of adequate capacity.

The oven shall be capable of being controlled at (110 ± 5) °C.

5.2.6 Heat resistant metal test plate, thickness (4 ± 0,5) mm, length (440 ± 5) mm, width (240 ± 5) mm and provided with a turned up lip of height (12 ± 1) mm, see Figure 1.

5.2.7 Metal support frame or grid, for the test plate to give a clearance height of at least 10 mm between the base of the test plate and the bottom of the furnace.

NOTE An example is given in Figure 2.

5.2.8 Heat resistant plate, thickness (10 ± 1) mm, length (450 ± 5) mm, width (250 ± 5) mm.

5.2.9 Tongs, to transfer the test plate to and from the furnace.

5.2.10 Scoop, flat based 220 mm wide by 350 mm long, to spread the test portion on the test plate.

5.2.11 Heat resistant metal sieve fabric of approximately 2 mm aperture, size (250 ± 5) mm by (445 ± 5) mm, to cover the test portion.

5.2.12 Metal receiver, large enough to hold the test portion.

5.2.13 Absorbent cloth or towel of adequate size.

Dimensions in millimetres

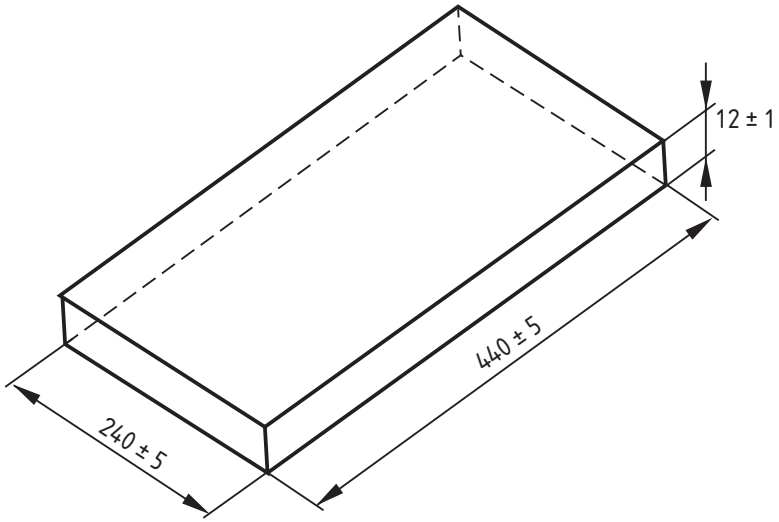
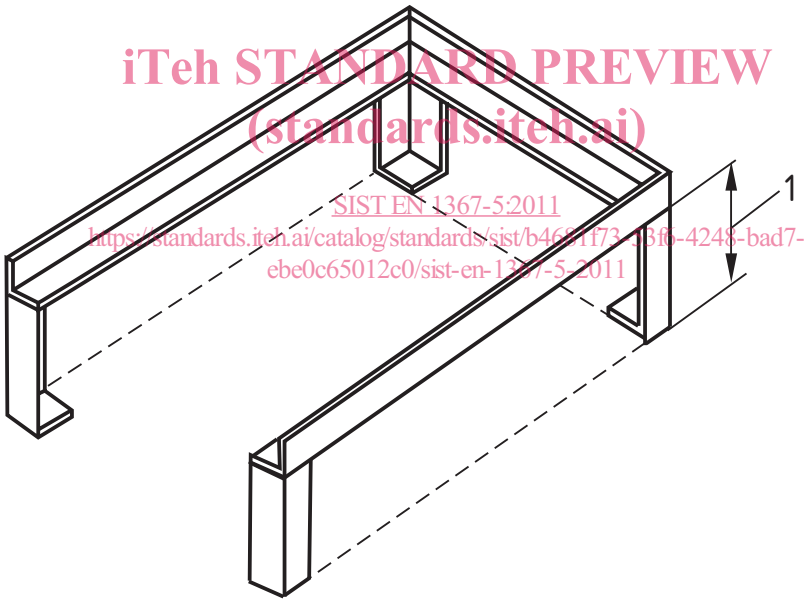


Figure 1 — Metal test plate



Key

1 at least 10 mm

Figure 2 — Example of the support for the metal plate

6 Sampling

Sampling shall be in accordance with EN 932-1. The mass of the laboratory sample shall be large enough to allow two strength tests to be carried out in accordance with EN 1097-2 as appropriate. One test portion shall be tested without heating and one test portion shall be tested after exposure to thermal shock. Each test portion shall be of the appropriate particle size fraction and mass, in accordance with EN 1097-2

NOTE The mass of the test specimen exposed to thermal shock should be larger than that tested without heating, because particles can degrade in the oven.

7 Procedure

7.1 Preparation of test portions

Wash and dry the test specimen to constant mass. Weigh the first test specimen and record the mass in grams as M_1.

7.2 Exposure to thermal shock

Place the first test specimen in a container and cover with deionised water to a depth of 20 mm above the aggregate surface and allow to soak for (2 ± 0,5) h at room temperature.

Gently pour the aggregate and spread it out on the water absorbing cloth. Gently dry the aggregate with the free ends of the cloth, until visibly surface dry.

Raise the furnace temperature to (700 ± 50) °C and maintain for the duration of the test period.

Heat the test plate in the furnace for at least 5 min, and remove and place on the heat resistant plate. Transfer an increment of approximately 1 000 g of the prepared test specimen with the scoop and spread evenly on the pre-heated test plate. Cover the aggregate with the metal sieve fabric and immediately transfer the test plate and contents to the furnace, close the door and allow the test portion to heat for (180 ± 5) s.

Remove the test plate from the furnace and place on the heat resistant plate. Quickly transfer the increment to the receiver and allow to cool.

Repeat this procedure with 1 000 g increments.

The period between transferring the aggregate from the furnace to the receiver, and recharging the test plate with a fresh increment, replacing in the furnace and closing the door, shall not exceed 20 s.

When the whole test specimen has been taken from the furnace and transferred to the receiver, allow to cool to room temperature. Sieve out the size fraction passing the 5,0 mm sieve and record the mass in grams as M_2.

7.3 Determination of resistance to fragmentation

Determine the resistance to fragmentation on the test portion exposed to thermal shock in accordance with EN 1097-2 as appropriate.

Repeat the same fragmentation test on the second test portion which has not been exposed to thermal shock.

8 Calculation and expression of results

Calculate the undersize (I) passing the 5,0 mm sieve due to exposure to thermal shock in accordance with the following equation:

$$I = (M_2/M_1) \times 100 \quad (1)$$

where

I is the percentage of undersize due to thermal shock;