BS ISO 13007-2:2013

BSI Standards Publication

Ceramic tiles — Grouts and adhesives

Part 2: Test methods for adhesives

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National foreword

This British Standard is the UK implementation of ISO 13007-2:2013. It supersedes BS ISO 13007-2:2010 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/539, Ceramic tiles and other rigid tiling.

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

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INTERNATIONAL STANDARD

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Ceramic tiles — Grouts and adhesives —

Part 2: Test methods for adhesives

Carreaux céramiques — Mortiers de joints et colles —

Partie 2: Méthodes d'essai pour les colles

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 189, *Ceramic tile*.

This third edition cancels and replaces the second edition (ISO 13007-2:2010), of which it constitutes a minor revision.

ISO 13007 consists of the following parts, under the general title *Ceramic tiles — Grouts and adhesives*:

— *Part 1: Terms, definitions and specifications for adhesives*

— *Part 2: Test methods for adhesives*

— *Part 3: Terms, definitions and specifications for grouts*

— *Part 4: Test methods for grouts*

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INTERNATIONAL STANDARD ISO 13007-2:2013(E)

Ceramic tiles — Grouts and adhesives —

Part 2: Test methods for adhesives

1 Scope

This part of ISO 13007 describes the methods for determining the characteristics for adhesives used in the installation of ceramic tiles. The following test methods are described:

— determination of open time (4.1);

— determination of slip (4.2);

— determination of shear adhesion strength (4.3);

— determination of tensile adhesion strength (4.4);

— determination of transverse deformation (4.5).

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.

ISO 13006, *Ceramic tiles — Definitions, classification, characteristics and marking*

ISO 13007-1, *Ceramic tiles — Grouts and adhesives — Part 1: Terms, definitions and specifications for adhesives*

3 General test conditions and procedures

3.1 Sampling

A representative sample of at least 2 kg shall be used.

3.2 Test conditions

Standard conditions shall be (23 ± 2) °C and (50 ± 5) % relative humidity and the speed of air in the testing area shall be less than 0,2 m/s. Other test conditions may be specified in Clause 4. The tolerance in the time of conditioning for all test specimens shall be as shown in Table 1 below.

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Table 1 — Allowed tolerance in testing time for all samples requiring conditioning

Sample conditioning time	Allowed tolerance for testing
24 h	±0,5 h
7 d	±3 h
14 d	±6 h
21 d	±9 h
28 d	±12 h
NOTE Testing must be performed within the specified time window.	

3.3 Test materials

Condition all test materials, including water, for at least 24 h under standard conditions. The adhesive to be tested shall be within its shelf life, where this is specified.

3.3.1 Ceramic tiles

The tiles shall be checked prior to conditioning to ensure that they are unused, clean, and dry. The type of tile shall be as specified under the specific test procedures found in Clause 4.

3.4 Mixing procedures

3.4.1 Cementitious adhesives (C)

The amount of water and/or liquid admix required for preparing the adhesive shall be as stated by the manufacturer in parts by weight, i.e. liquid to dry powder (in cases where a range of values is given, the average shall be used).

Using a minimum quantity of 2 kg of the powder and the recommended quantity of liquid, prepare the adhesive in a planetary mixer using the following slow speed settings: (140 ± 5) rotations per minute and (62 ± 5) rotations per minute planetary movement. See Figures 1 and 2.

Carry out the following procedure.

1) Pour the liquid into the pan.

2) Scatter the dry powder over the liquid.

3) Mix for 30 s.

4) Take out the mixing paddle.

5) Scrape down the paddle and pan within 1 min.

6) Replace the paddle and mix for 1 min.

If required by the adhesive manufacturer's instructions, let the adhesive mature as specified and then mix for an additional 15 s.

3.4.2 Dispersion adhesive (D) and reaction resin adhesive (R)

Where ready-to-use dispersion adhesives or reaction resin adhesives are to be used, the manufacturer's instructions shall be followed.

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3.5 Test substrate

3.5.1 Concrete test substrate

The mandatory concrete test substrate shall be (40 ± 5) mm thick, have a moisture content of less than 3 % by mass, and have a surface water absorption in the range of 0,5 cm^3 to 1,5 cm^3 after 4 h of testing. The cohesive strength as referenced in A.3.3 shall be at least 1,5 N/mm^2. A method for manufacturing a suitable concrete test slab and the procedures for measuring the cohesive strength and surface water absorption is given in informative Annex A.

3.5.2 Other substrates

Other substrates may be used upon agreement if the substrate is recommended for ceramic tile application by the adhesive manufacturer. To demonstrate compatibility with other optional substrates, the adhesive shall be applied to the selected substrate in accordance with the open time test method (see 4.1). When a result of ≥ 0,5 N/mm^2 is achieved or cohesive failure occurs in the substrate, the requirement is considered satisfied.

3.6 Failure patterns

3.6.1 Adhesion failure (AF-S or AF-T)

Failure occurs at the interface between the adhesive and the substrate (AF-S) [see Figure 3, a)] or between the tile and the adhesive (AF-T) [see Figure 3, b)]. The test value is equal to the adhesive strength. In some cases, failure may occur in the adhesive layer between the tile and the pull-head plate (BF) [see Figure 3, c)]. In this case, the adhesive strength is greater than the test value and the test should be repeated.

3.6.2 Cohesive failure within the adhesive (CF-A)

Failure occurs within the adhesive layer [see Figure 3, d)].

3.6.3 Cohesive failure in the substrate or in the tile (CF-S or CF-T)

Failure occurs within the substrate (CF-S) [see Figure 3, e)] or within the body of the tile (CF-T) [see Figure 3, f)]. In this case, the strength of the adhesive is greater than the test value.

The modes of failure may be a combination of any of the above. An approximate percentage of each shall be recorded.

3.7 Test report

3.7.1 General

The test report shall specify the following:

a) a reference to this part of ISO 13007 (i.e. ISO 13007-2:2013);

b) the date of test;

c) the type of adhesive, commercial designation, and manufacturer's name;

d) the source, date obtained, and complete identification of test sample;

e) the handling and storage of samples before testing;

f) the test conditions;

g) the amount of water or liquid used for preparing the adhesive;

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h) any other factor that could have affected the result;

i) the test results (individual and mean values and mode of failure where required).

3.7.2 Test results of cementitious and dispersion adhesives

The test report shall specify the following:

a) open time;

b) slip;

c) shear adhesion strength;

d) adhesion strength;

e) deformation.

3.7.3 Test results of chemical resistance

The test report shall specify the following:

a) test conditions;

b) change in colour and surface appearance during the test;

c) total duration of the test and exposure periods.

4 Test methods

4.1 Determination of open time

4.1.1 General

Open time shall be tested following the general test conditions and procedures given in Clause 3 and the specific instructions which follow.

4.1.2 Test materials

4.1.2.1 Ceramic tiles, Group BIII porous body tile complying with ISO 13006, with a water absorption of (15 ± 3) % by mass, facial dimensions of (50 ± 1) mm × (50 ± 1) mm, thickness in the range of 7 mm to 10 mm, and a profile back pattern of less than 0,25 mm deep.

4.1.2.2 Test substrate, conforming to the requirements given in 3.5.1.

4.1.3 Apparatus

4.1.3.1 Test mass, less than 50 mm × 50 mm cross-sectional area and capable of exerting a uniform force of (20 ± 0,05) N.

4.1.3.2 Pull-head plates, square metallic plates with a dimension of (50 ± 1) mm, a minimum thickness of 10 mm, and a suitable fitting for connection to the test machine.

4.1.3.3 Test machine, for the direct pull tensile force test, with suitable capacity and sensitivity. The machine shall be capable of applying the load to the pull-head plate at the rate of (250 ± 50) N/s through a suitable fitting that does not exert any bending force.

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4.1.4 Procedure

Apply a thin layer of the adhesive, mixed in accordance with 3.4.1, to the concrete slab using a straight edge trowel. Then, apply a thicker layer and comb using a notched trowel having 6 mm × 6 mm notches at 12 mm centres. The trowel shall be held at an angle of approximately 60° to the substrate at a right angle to one edge of the slab and shall be drawn across the slab parallel to that edge (in a straight line).

After 5 min, 10 min, 20 min, 30 min, or longer, place at least 10 test tiles 50 mm apart on the adhesive within 30 s. Tiles are placed on no more than four ribs for all adhesives. Load each tile with (20 ± 0,05) N for 30 s.

After storing for 27 d under standard conditions, bond the pull-head plates to the tiles with a suitable high-strength adhesive (e.g. epoxy adhesive).

After a further 24 h storage under standard conditions, determine the tensile adhesion strength of the adhesive by applying a force increasing at a constant rate of (250 ± 50) N/s.

4.1.5 Evaluation and expression of results

The individual tensile adhesion strengths are quoted to 0,1 N/mm^2 using Formula (1):

$$A_s = \frac{L}{A} \tag{1}$$

where

A_s is the individual tensile adhesion strength, in N/mm^2;

L is the total tensile load, in N;

A is the bonding area, in mm^2 (2 500 mm^2).

The tensile adhesion strength for each time interval is determined as follows.

1) Determine the mean of the 10 values.

2) Discard the values falling out of the range of ±20 % of the mean value.

3) If five or more values remain, determine the new mean.

4) If less than five values remain, repeat the test.

5) Determine the mode of failure of the test units (see 3.6).

The open time, in minutes, is the maximum time interval at which the adhesive meets the tensile adhesion strength requirement defined in ISO 13007-1 for open time.

4.1.6 Test report

The information listed in 3.7.1, items a) to i), shall be provided as well as 3.7.2, item a) (open time in minutes).

4.2 Determination of slip

4.2.1 General

Slip shall be tested following the general test conditions and procedures given in Clause 3 and the specific instructions which follow.

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