BS ISO 13007-5:2015

BSI Standards Publication

Ceramic tiles — Grouts and adhesives

Part 5: Requirements, test methods, evaluation of conformity, classification and designation of liquid-applied waterproofing membranes for use beneath ceramic tiling bonded with adhesives

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National foreword

This British Standard is the UK implementation of ISO 13007-5:2015.

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 5: Requirements, test methods, evaluation of conformity, classification and designation of liquid-applied waterproofing membranes for use beneath ceramic tiling bonded with adhesives

Carreaux céramiques — Mortiers de joints et colles —

Partie 5: Exigences, méthodes d'essai, évaluation de conformité, classification et la désignation des membranes liquides étanches à l'eau appliquées pour la pose de carreaux céramiques

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Contents

Page

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*.

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*

— *Part 5: Requirements, test methods, evaluation of conformity, classification and designation of liquid-applied waterproofing products for use beneath ceramic tiling bonded with adhesives*

INTERNATIONAL STANDARD ISO 13007-5:2015(E)

Ceramic tiles — Grouts and adhesives —

Part 5: Requirements, test methods, evaluation of conformity, classification and designation of liquid-applied waterproofing membranes for use beneath ceramic tiling bonded with adhesives

1 Scope

This part of ISO 13007 gives terminology concerning the products, and specifies test methods (see Annex A) and values of performance requirements, for liquid-applied waterproofing products associated with tile adhesives. It specifies the evaluation of conformity and the classification and designation of liquid-applied waterproofing products beneath ceramic tiling.

It is applicable to all liquid-applied waterproofing membranes — including polymer modified cementitious coatings, dispersions and reaction resin coatings — used beneath ceramic tiling for internal and external tile installations on walls and floors.

NOTE Liquid-applied waterproofing products can also be used beneath other types of tiles (natural and agglomerated stones, etc.), as long as an adverse reaction does not occur between the membrane and the alternative tile.

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*

ISO 13007-2, *Ceramic tiles — Grouts and adhesives — Part 2: Test methods for adhesives*

ISO 15605, *Adhesives — Sampling*

EN 196-1, *Methods of testing cement — Part 1: Determination of strength*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 480-1:2006, *Admixture for concrete, mortar and grout — Test methods — Part 1: Reference concrete and mortar for testing*

EN 1008, *Mixing water for concrete — Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 1067, *Adhesives — Examination and preparation of samples for testing*

EN 12390-2, *Testing hardened concrete — Making and curing specimens for strength tests*

EN 12620, *Aggregates for concrete*

3 Terms and definitions

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

3.1
liquid-applied waterproofing membrane
single- or multi component waterproofing material applied in a uniform layer or layers, beneath ceramic tiling

Note 1 to entry: The final waterproofing membrane can include a reinforcing cloth or mesh.

3.2
polymer modified cementitious liquid-applied waterproofing membrane
CM
mixture of hydraulic binding agents, aggregates and organic additives that has only to be mixed with water or liquid admixture just before use

3.3
dispersion liquid-applied waterproofing membrane
DM
mixture of organic binding agent(s) in the form of an aqueous polymer dispersion, organic additives and mineral fillers

Note 1 to entry: The mixture is ready for use.

3.4
reaction resin liquid-applied waterproofing membrane
RM
mixture of synthetic resin, mineral fillers and organic additives in which hardening occurs by chemical reaction

Note 1 to entry: They are available in one or more component forms.

3.5
crack bridging ability
ability of the cured waterproofing material to withstand propagation of cracks without deterioration

3.6
primer
liquid coating applied to the surface, prior to the application of a liquid waterproofing product, to improve adhesion and durability of the bond between the substrate and the membrane

3.7
fundamental characteristics
characteristics that a liquid-applied waterproofing membrane product always needs to have

3.8
optional characteristics
characteristics for specific service conditions where enhanced levels of performance are required or which provide further information about its general performance

4 Requirements

The liquid-applied waterproofing membrane products shall comply with the characteristics specified in Table 1.

Table 2 gives the additional characteristics that might be required for special service conditions.

The amount of water and/or liquid admixture required for preparing the cementitious liquid-applied water waterproofing membrane shall be the same for all tests of that product.

Table 1 — Product requirements — Fundamental characteristics

Characteristic	Requirement	Test method
Initial tensile adhesion strength	≥ 0,5 N/mm²	A.6.2
Tensile adhesion strength after water contact	≥ 0,5 N/mm²	A.6.3 or A.6.4
Tensile adhesion strength after heat ageing	≥ 0,5 N/mm²	A.6.5
Tensile adhesion strength after freeze–thaw cycles	≥ 0,5 N/mm²	A.6.6
Tensile adhesion strength after contact with lime water	≥ 0,5 N/mm²	A.6.9
Waterproofing	No visual penetration below membrane and ≤ 20 g weight gain	A.7
Crack bridging ability under standard conditions	≥ 0,75 mm	A.8.2

Table 2 — Product requirements — Optional characteristics

Characteristic	Requirement	Test method
Tensile adhesion strength after contact with chlorinated water	≥ 0,5 N/mm²	A.6.7 or A.6.8
Crack bridging ability at low temperature (- 5°C)	≥ 0,75 mm	A.8.3
Crack bridging ability at very low temperature (- 20°C)	≥ 0,75 mm	A.8.3

5 Evaluation of conformity

5.1 General

The liquid-applied waterproofing membrane shall be considered conformant if test results indicate compliance with all of the fundamental characteristics listed in Table 1. For those products claiming the optional classifications in Clause 5, test results must also indicate compliance with the optional characteristics listed in Table 2.

5.2 Reaction to fire

Reaction to fire may be of concern in individual countries, and may need to be considered in light of local standards or regulatory requirements

6 Classification and designation

The liquid-applied waterproofing membranes are classified into one of the three types, according to the definitions given in Clause 3:

CM cementitious liquid-applied waterproofing membrane;

DM dispersion liquid-applied waterproofing membrane;

RM reaction resin liquid-applied waterproofing membrane.

For each type it is possible to have different classes, related to the different optional characteristics given in Table 2. These classes are designated by the following abbreviations:

O1 with improved crack bridging ability at −5°C;

O2 with improved crack bridging ability at −20°C;

P resistant to contact with chlorinated water (i.e. for use in swimming pools).

The product is designated by the symbol for the type (CM, DM or RM), followed by the abbreviation of the class or classes it belongs to. Table 3 describes the designation of the products types and classes which shall be used.

Table 3 — Classification and designation of liquid-applied waterproofing membranes

Symbol		Description
Type	Class	
CM		Normal cementitious liquid-applied waterproofing membrane
DM		Normal dispersion liquid-applied waterproofing membrane
RM		Normal reaction resin liquid-applied waterproofing membrane
CM	O1	Cementitious liquid-applied waterproofing membrane with crack bridging ability at low temperature (–5°C)
CM	O2	Cementitious liquid-applied waterproofing membrane with crack bridging ability at low temperature (–20°C)
DM	O1	Dispersion liquid-applied waterproofing membrane with crack bridging ability at low temperature (–5°C)
DM	O2	Dispersion liquid-applied waterproofing membrane with crack bridging ability at low temperature (–20°C)
RM	O1	Reaction resin liquid-applied waterproofing membrane with crack bridging ability at low temperature (–5°C)
RM	O2	Reaction resin liquid-applied waterproofing membrane with crack bridging ability at low temperature (–20°C)
CM	P	Cementitious liquid-applied waterproofing membrane resistant to contact with chlorinated water
DM	P	Dispersion liquid-applied waterproofing membrane resistant to contact with chlorinated water
RM	P	Reaction resin liquid-applied waterproofing membrane resistant to contact with chlorinated water
CM	O1P	Cementitious liquid-applied waterproofing membrane with crack bridging ability at low temperature (–5°C) and resistant to contact with chlorinated water
CM	O2P	Cementitious liquid-applied waterproofing membrane with crack bridging ability at low temperature (–20°C) and resistant to contact with chlorinated water
DM	O1P	Dispersion liquid-applied waterproofing membrane with crack bridging ability at low temperature (–5°C) and resistant to contact with chlorinated water
DM	O2P	Dispersion liquid-applied waterproofing membrane with crack bridging ability at low temperature (–20°C) and resistant to contact with chlorinated water
RM	O1P	Reaction resin liquid-applied waterproofing membrane with crack bridging ability at low temperature (–5°C) and resistant to contact with chlorinated water
RM	O2P	Reaction resin liquid-applied waterproofing membrane with crack bridging ability at low temperature (–20°C) and resistant to contact with chlorinated water

7 Marking and labelling

Products complying with the requirements of this part of ISO 13007 shall be clearly marked with the following information:

a) name of the product;

b) manufacturer's mark and place of origin;

c) date or code of production, shelf life and conditions of storage;

d) dated reference to this part of ISO 13007, i.e. ISO 13007-5:2015;

e) type of product according to Clause 6 and using symbols given in Clause 6;

f) instructions for use:

- mix proportions (where applicable);
- maturing time (where applicable);
- pot life;
- mode of application (including recommended primer and/or reinforcement mesh);
- minimum quantity or thickness of the product as applied wet as well as the final cured film thickness;
- delay for installing ceramic tiles;
- suitable adhesive(s), type and class in accordance with ISO 13007-1;
- field of application (internal, external, wall, floor etc.)

In the designation of a liquid-applied waterproofing membrane, information about special properties may also be included when the product is intended for use in specific applications.

This information shall be marked on the packaging and/or on the product's technical data sheet.

NOTE This does not remove the requirement that all manufacturers claiming compliance with this part of ISO 13007 state declared values for the properties of their products, when required.

Annex A
(normative)

Test methods

A.1 Sampling

Take a sample of at least 2 kg of the product to be tested in accordance with ISO 15605 *and* EN 1067.

A.2 Test conditions

Standard conditions shall be (23 ± 2) °C and (50 ± 5) % relative humidity (RH) and a circulation of air in the working area less than 0,2 m/s.

When the test specimens have to be conditioned according to the test method, the tolerances in the time of conditioning for all test specimens shall be as follows:

Conditioning	**Tolerance**
24 h	±0,5 h
7 days	±3 h
14 days	±6 h
21 days	±9 h
28 days	±12 h

A.3 Test materials

A.3.1 General

Condition all test materials for at least 24 h under standard conditions. The materials to be tested shall be within their shelf life.

A.3.2 Ceramic tiles

The tiles shall be clean and dry.

The tiles used for this method shall be of

> **Type Bia**, fully vitrified tile complying with ISO 13006, with a water absorption ≤ 0,5 % by mass, unglazed and with a plain adhering surface, with facial dimensions of (50 ± 1) mm × (50 ± 1) mm.

A.3.3 Test substrate

A.3.3.1 Concrete slab

The concrete slab shall comply with ISO 13007-2.

A.3.3.2 Other substrates (optional)

Other substrates may be used upon agreement if the substrate is recommended for the ceramic tile application by the manufacturer. To demonstrate compatibility with other optional substrates, the product shall be applied to the selected substrate in accordance with the initial adhesion test method (A.6.2). When a result of ≥0,5 N/mm^2 is achieved or cohesive failure occurs in the substrate, the requirement is considered satisfied.

A.3.4 Ceramic tile adhesive

The ceramic tile adhesive shall comply with ISO 13007-1.

A.3.5 Sodium hypochlorite

Analytical grade sodium hypochlorite.

A.4 Apparatus

A.4.1 Weight

A weight of less than 50 mm × 50 mm cross-sectional area, capable of exerting a force of (20 ± 0,05) N.

A.4.2 Pull head plates

Square metallic plates, with dimensions of 50 mm × 50 mm and a minimum thickness of 10 mm with a suitable fitting for connection to the test machine.

A.4.3 Machine for pull testing

A test machine for direct pull tensile force test and with suitable capacity and sensitivity for the test. 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.

A.4.4 Air-circulating oven

An air-circulating oven capable of controlling the temperature to within ± 3 °C.

A.4.5 Mould

The mould shall consist of six horizontal compartments so that six prismatic specimens (12 ± 0,1) mm × (40 ± 1) mm × (160 ± 1) mm, with a square hole, with (4 ± 0,1) mm side, in the middle of the narrowest face, can be prepared simultaneously. In order to avoid the sliding of the sample in the dynamometer, the ends of the specimen shall be greater than the middle (see Figure A.1) and a clamp as shown in Figure A.2 shall be used.

Dimensions in millimetres

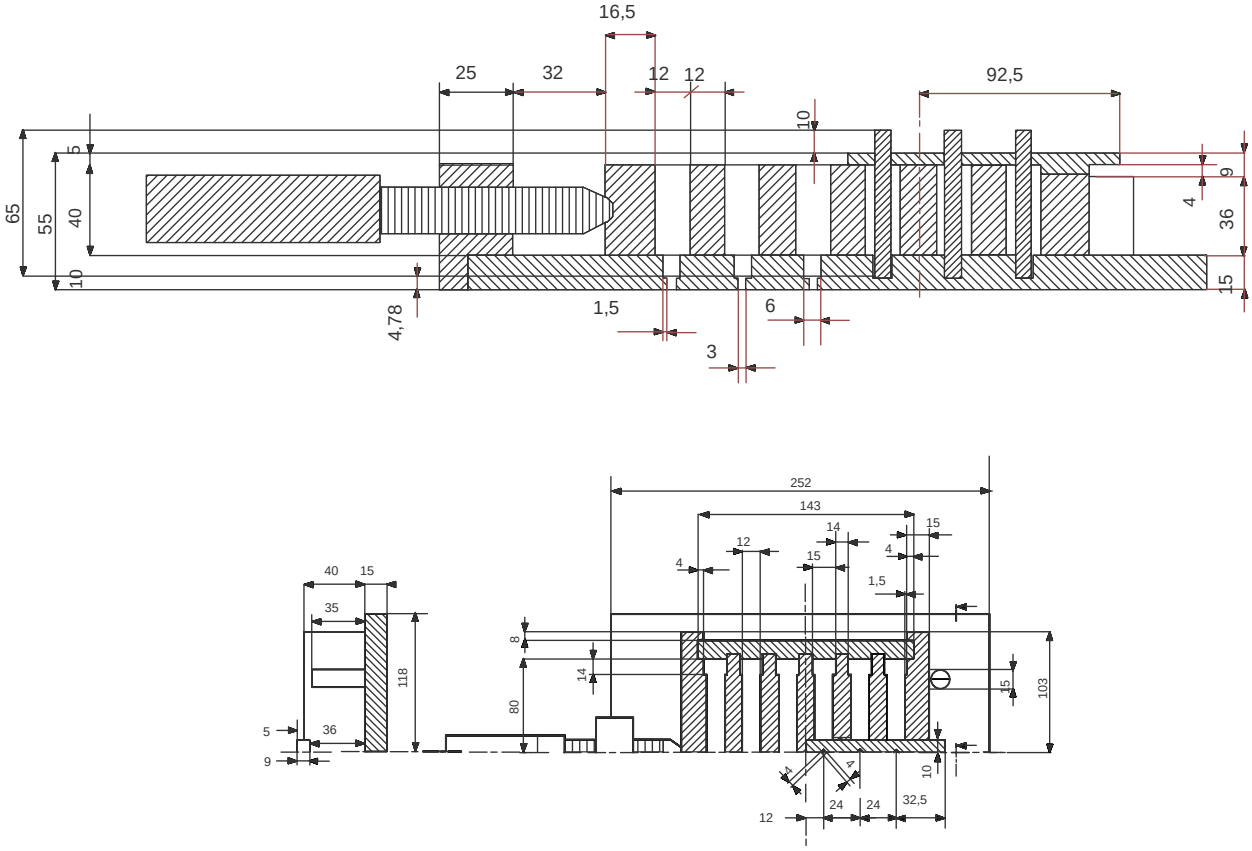


Figure A.1 — Mould

Dimensions in millimetres

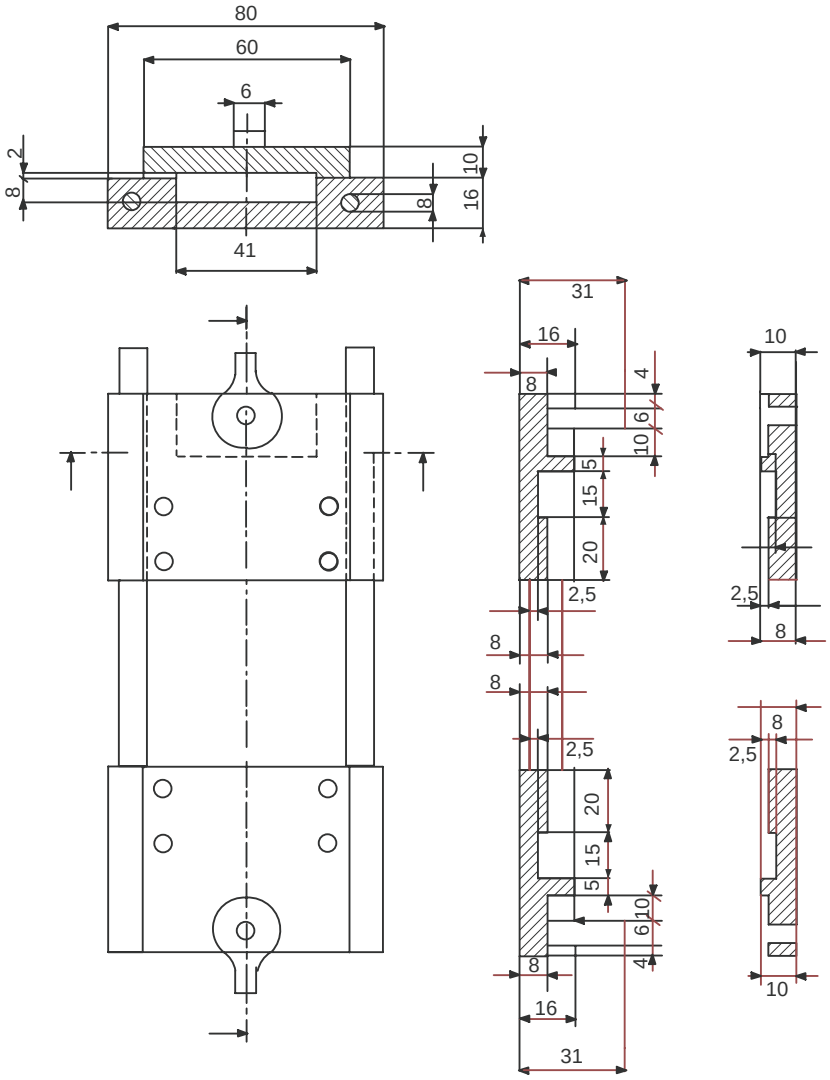


Figure A.2 — Clamp

A.4.6 Jig

Any jig capable of cracking the specimen in a position corresponding to the hole, without damaging the applied waterproofing membrane (see Figure A.3).

Dimensions in millimetres

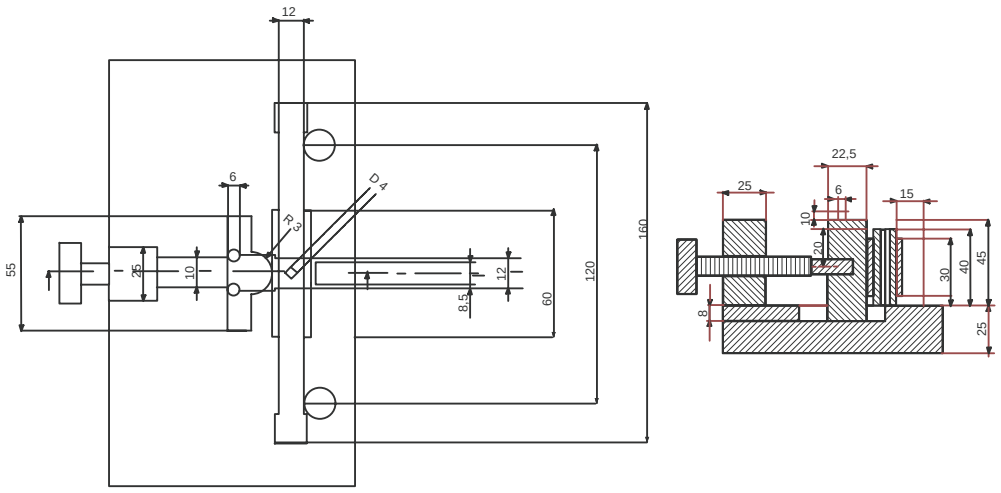
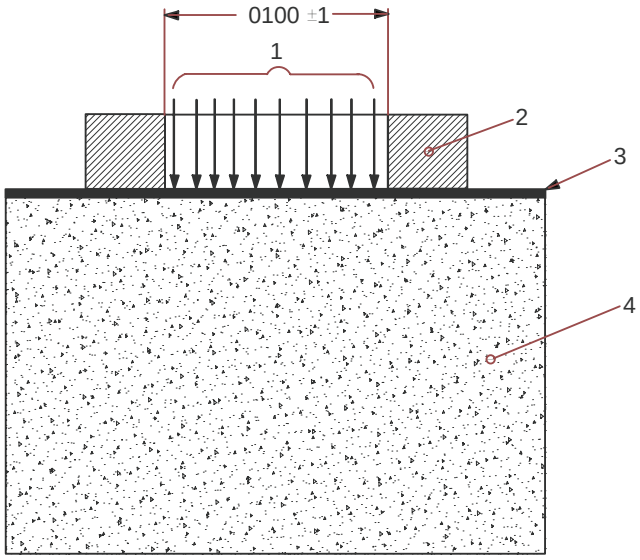


Figure A.3 — Jig

A.4.7 Equipment for permeability test

Any equipment which permits the specified specimen (A.7) to be placed in such a way that the water pressure acts from above the specimen. The machine shall permit the unexposed faces to be observed to detect any possible sign of water permeation (see Figure A.4). The internal diameter of the sealing ring shall be (100 ± 1) mm.



Key

1 water pressure
2 sealing ring
3 liquid-applied waterproofing membrane
4 concrete slab

Figure A.4 — Typical arrangement for determining the waterproofing

A.4.8 Machine for tensile testing

A machine for tensile testing, capable of measuring the elongation with a precision of 0,01 mm and the load with a precision of 1 N.

A.5 Mixing of liquid-applied waterproofing membrane

To prepare the cementitious, dispersion or reaction resin liquid waterproofing membrane: follow the manufacturer's instructions.

The amount of water and/or liquid admixture required for preparing the cementitious waterproofing membrane shall be as stated by the manufacturer in parts by mass, i.e. liquid to dry powder (if a range of values is given, the arithmetic mean shall be used).

The amount of water and/or liquid admixture required for preparing the product shall be the same for all tests of that product.

A.6 Adhesion tests

A.6.1 Preparation of test units

Apply the liquid waterproofing membrane to the surface of the substrate (A.3.3) in accordance with the manufacturer's instructions, including a primer if required. Where recommended, the waterproofing membrane material should be applied in two or more layers, inserting if requested a reinforcing cloth or mesh. With some products, a sprinkling of silica sand into the top layer is required to improve adhesion to the surface.

Before applying the adhesive, allow the coated concrete slabs to dry under standard conditions for at least 24 h, unless the manufacturer gives different instructions.

Apply a thin layer of the adhesive to the waterproofing membrane product with a straight edge trowel. Then apply a thicker layer and comb with a notched trowel having 6 mm × 6 mm notches at 12 mm centres.

After 5 min place nine type BI_a tiles on the adhesive at a distance apart of 50 mm and load each tile with (20 ± 0,05) N for 30 s.

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 drawn across the slab parallel to that edge, in a straight line. The adhesive between the tiles must not be removed.

A.6.2 Initial adhesion

Prepare the test units in accordance with A.6.1.

After 27 days bond the pull head plates to the tiles with a suitable high strength adhesive (e.g. epoxide).

After a total of 28 days storage under standard conditions determine the tensile adhesion strength by applying a force at a constant rate of (250 ± 50) N/s. Before the bond strength is determined, the sample surface shall be cut through to the surface of the concrete slab, around the perimeter of each tile.

Report the results in newtons (N).

A.6.3 Adhesion strength after water contact

Prepare the test units in accordance with A.6.1. Then, form an upstand, approximately 10 mm high, around the perimeter of the upper surface of the coated slab by applying, for example, a bead of silicone sealant. Condition the test units under standard conditions for 7 days.

Fill the reservoir formed by the sealant upstand to about 6 mm depth of water at the standard temperature. After 20 days, during which time the water level should be maintained at about 6 mm, pour away the water and wipe the surface of the test piece tiles dry with a cloth, before bonding the pull head plates to the tiles. After a further 7 h, fill the reservoir with a 6 mm depth of water at the standard temperature once again.

The following day pour away the water and immediately carry out the tensile adhesion test in accordance with A.6.2.

Report the results in newtons (N).

A.6.4 Alternative method for adhesion strength after water contact

Prepare the surface of the test units in accordance with A.6.1.

All remaining faces of the slab, including the underside, shall then be sealed with an impervious, waterproof coating material, such as an epoxide or polyester based product, ensuring complete integrity of the coating on all the edges and at the junction with the liquid-applied waterproofing membrane on the upper face.

Condition the test units under standard conditions for 7 days and immerse them in water at the standard temperature.

After 20 days remove the test units from the water, wipe with a cloth and bond the pull head plates to the tiles. After a further 7 h immerse the test units in water at the standard temperature.

The following day remove the test units from water and immediately carry out the tensile adhesion test in accordance with A.6.2.

A.6.5 Adhesion strength after heat ageing

Prepare the test units in accordance with A.6.1.

Condition the test units under standard conditions for 14 days and then place them in an air-circulating oven at (70 ± 3) °C for a further 14 days. Remove from the oven and bond the pull head plates to the tiles with a suitable high strength adhesive (e.g. epoxide).

Condition the test units for a further 24 h under standard conditions.

Determine the tensile adhesion strength in accordance with A.6.2.

Report the results in newtons (N).

A.6.6 Adhesion after freeze–thaw cycle

Prepare the surface of the test units in accordance with A.6.1. In addition, a layer of the adhesive approximately 1 mm thick, shall be applied with a straight edge trowel to the back face of the type BIa tile before placing.

All remaining faces of the slab, including the underside, shall then be sealed with an impervious, waterproof coating material, such as an epoxide or polyester based product, ensuring complete integrity of the coating on all the edges and at the junction with the liquid-applied waterproofing membrane on the upper face.

Condition the test units for 7 days under standard conditions, followed by immersing in water for 21 days before carrying out 25 freeze–thaw cycles.

For each freeze–thaw cycle:

1. remove the test units from the water and lower the temperature of the test units to (–15 ± 3) °C within 2 h ± 20 min;
2. maintain the test units at (–15 ± 3) °C for 2 h ± 20 min;
3. immerse in water at (20 ± 3) °C and raise the temperature of the test units to (15 ± 3) °C and maintain between this temperature and (20 ± 3) °C for a minimum of 2 h.

Repeat the cycle 25 times. After the last cycle wipe the surface of the tiles with a cloth and bond the pull head plates to the tiles. Allow the test units to reach standard conditions for at least 7 h and then determine the tensile strength in accordance with A.6.2.

Report the results in newtons (N).

A.6.7 Adhesion after contact with chlorinated water

Prepare the test units in accordance with A.6.1 and form the reservoir in accordance with A.6.3.

Condition for 28 days before pouring an approximate 6 mm depth of chlorinated water into the reservoir. After 7 days pour away the chlorine water, rinse with clean tap water, wipe with a cloth and bond the pull head plates to the tiles. After a further 24 h under standard conditions, carry out the tensile adhesion test in accordance with A.6.2.

Report the results in newtons (N).

The testing solution, with a chloride and sulfate content of 200 mg/l each, shall be prepared with the addition of sodium chloride and sodium sulfate to fresh water.

The water shall be chlorinated by addition of technically pure sodium hypochlorite (A.3.5).

The chlorinated water concentration shall be kept constant within the range 0,3 mg/l to 0,6 mg/l checking the active chlorine content in water by titration.

The pH value shall be determined daily and shall be kept in the range 6,5 to 7,8; any correction required should be carried out by increasing pH with the addition of sodium hydroxide, or by decreasing it with the addition of hydrochloric acid, daily.

The immersion time of the test units shall be extended for the time the active chlorine content was below the limit value of 0,3 mg/l (for example, on a day of rest or public holiday).

A.6.8 Alternative method for adhesion after contact with chlorinated water

Prepare the surface of the test units in accordance with A.6.1.

All remaining faces of the slab, including the underside, shall then be sealed with an impervious, waterproof coating material, such as an epoxide or polyester based product, ensuring complete integrity of the coating on all the edges and at the junction with the liquid-applied waterproofing membrane product on the upper face.

Condition the test units under standard conditions for 28 days, and immerse them in chlorinated water at the standard temperature.

After 7 days remove the test units from the chlorinated water, wipe with a cloth and bond the pull head plates to the tiles.

After a further 24 h under standard conditions, carry out the tensile adhesion test in accordance with A.6.2.

The testing solution, with a chloride and sulfate content of 200 mg/l each, shall be prepared with the addition of sodium chloride and sodium sulfate to fresh water.

The water shall be chlorinated by addition of sodium hypochlorite (A.3.5).

The chlorinated water concentration shall be kept constant within the range 0,3 mg/l to 0,6 mg/l checking the active chlorine content in water by titration. Possible change here after data review.

The pH value shall be determined daily and shall be kept in the range 6,5 to 7,8; any correction required should be carried out by increasing pH with the addition of sodium hydroxide, or by decreasing it with the addition of hydrochloric acid, daily.

The immersion time of the test units shall be extended for the time the active chlorine content was below the limit value of 0,3 mg/l (for example, on a day of rest or public holiday).

A.6.9 Adhesion after contact with lime water

Prepare the test units in accordance with A.6.1. All remaining faces of the slab, including the underside, shall then be sealed with an impervious, waterproof coating material, such as an epoxide or polyester based product, ensuring complete integrity of the coating on all the edges and at the junction with the liquid-applied waterproofing membrane on the upper face.

Condition the test piece under standard conditions for 28 days and then immerse them in saturated lime water (pH ≥ 12) at 40 °C.

After 7 days remove the test units from the lime water, rinse with clean water, wipe with a cloth and bond the pull head plates to the tiles. After a further 24 h under standard conditions, carry out the tensile adhesion test in accordance with A.6.2.

Report the results in newtons (N).

A.6.10 Evaluation and expression of results

The individual tensile adhesion strength is determined to an accuracy of ± 0,1 N/ mm^2 using the following equation:

$$S = L/A$$

where

S is the individual tensile adhesion strength in newtons/square millimetres;

L is the total load in newtons;

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

The tensile adhesion strength for each set of conditions is determined as follows:

— determine the mean of the 10 values;

— discard the values falling out of the range of ± 20 % from the mean value;

— if five or more than five values remain, determine the new mean value;

— if less than five values remain, repeat the test;

— determine the mode of failure of the test units.

A.7 Water impermeability

The test sample is based on a permeable concrete substrate sealed in all faces apart from the test area, covered with the liquid applied, waterproofing membrane, where a water pressure shall be applied.

The substrate is a slab with minimum dimension 150 mm × 150 mm × 100 mm prepared using a water permeable concrete and with a plane surface (Figure A.4). In order to have a permeable concrete it is necessary to use a water/cement ratio ≥ 1. The concrete shall be manufactured according to the following mix-design:

— CEM 32,5 R or 42,5 R type I, II, III and IV according to EN 197-1, 250 kg/m^3

— aggregate with particle size range 0 mm to 16 mm according to EN 12620 750, 1 kg/m^3

— mixing water according to EN 1008, –250 kg/m^3

NOTE In case of bleeding, the addition of WRA (water retention admixture, according to EN 934–2) can be used.

The particle size distribution of the aggregate is in compliance with Table A.1.

Table A.1 — Particle size distribution of the aggregate

Nominal aperture size	Percent passing by mass	
mm	Upper limit	Lower limit
16	100	100
8	76	60
4	56	36
2	42	21
1	32	12
0,5	20	8
0,25	8	3
0,125	4	1,5

The concrete shall be prepared according to EN 480-1:2006, 6.2. The concrete specimens shall be manufactured according EN 12390-2 and cured at 23 ± 2°C, 50 % R. H., for at least 28 days.

The control test blocks, prepared as test sample without liquid applied waterproofing product, shall have a water absorption weight gain of 400 g ± 100 g after 7 d at 1,5 bar, measured by using this test method,. The concrete mix-design shall be adjusted according to the specification if the weight gain is outside this range.

Before applying the liquid waterproofing membrane, one face of the concrete specimen shall be abraded and cleaned, in order to remove any laitance and traces of release agent.

The liquid waterproofing membrane shall be applied to the surface of this face of the concrete slab in accordance with the manufacturer's instructions, using a primer if required. When recommended the waterproofing material shall be applied in two or more layers, inserting if requested a reinforcing cloth or mesh.

Prepare three units for the test.

Condition the three coated concrete slabs under standard conditions for the period required by the manufacturer's instructions .

24 h before the waterproofing test all remaining faces of the slab, including the underside, shall be sealed with an impervious, waterproof coating material, such as an epoxide or polyester based product, ensuring complete integrity of the coating on all the edges and at the junction with the liquid-applied waterproofing membrane on the upper face.

Before starting the waterproofing test the specimens shall be weighed and then placed in the equipment described in A.4.7 and subjected to a water pressure of 150 kPa (1,5 bar) for 7 days. The pressure shall be kept constant throughout the test.

If water penetrates through to the underside of the specimen or if the unexposed faces show signs of water penetration, the test may be terminated.

At the end of the test, the water pressure is released, then the specimen shall be removed blotted dry and weighed for weight gain. Immediately upon completion of the weighing, the test block is broken, in the middle, in the direction of the water penetration using a compressive test machine, in order to evaluate if any water penetration has occurred. The difference of weight between the final and initial waterproofing test is the weight gain.

The test shall be repeated if the test results among the three samples are contradictory.

A.8 Crack bridging ability

A.8.1 General

The test units are mortar prisms, with dimensions (160 ± 1) mm × (40 ± 1) mm × (12 ± 0,1) mm, with a square hole, with (4 ± 0,1) mm side, in the middle of the narrow face as per Figure A.5.

Dimensions in millimetres

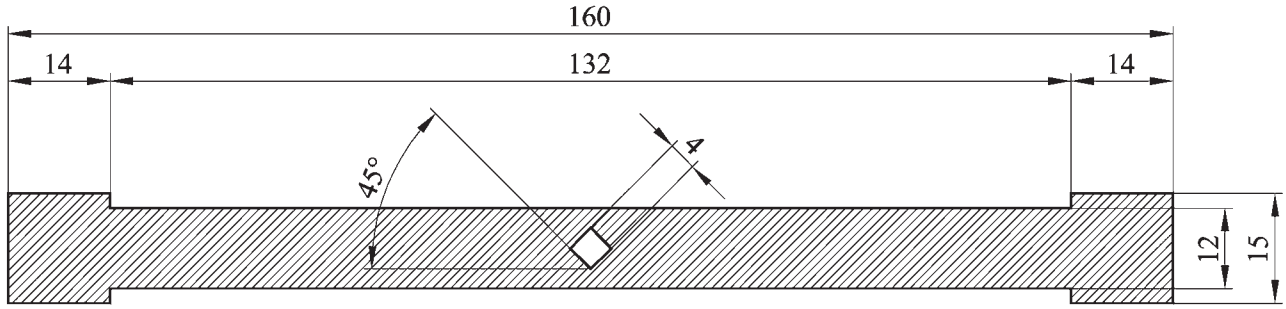


Figure A.5 — Crack-bridging ability test sample

The specimens shall be manufactured using the following mortar:

— CEM I 52,5 R according to EN 197-1: 675 g;

— silica sand according to EN 196-1: 1 g;

— HRWR (high-range water-reduction): 0,5 % to 1,5 % of the cement mass (added to the mixing water);

— mixing water (according to EN 196-1): 303 g.

The dosage of the superplasticizer should be adjusted to get a mortar with high fluidity, without segregation. A fluidity in the range 270 mm to 300 mm according to EN 1015-3 is advisable.

The surface of the mould (A.4.5) shall be treated with a thin layer of an emulsion-based release agent which can be easily removed.

The mortar shall be mixed and conditioned according to EN 196-1. After being prepared, the mortar is poured into the mould and compacted manually, if it's necessary.

After de-moulding the specimens shall be abraded (in the zone where the product shall be applied) to remove all traces of the release agent and then are cured for at least 28 days in water at 20 °C.

Remove the test units from the water and condition for a further 24 h under standard conditions.

By means of a suitable template with 60 mm × 30 mm internal dimensions apply the waterproofing material to the opposing faces of the specimen (A.6) in accordance with the manufacturer's instructions, using a primer if required. When recommended, the waterproofing material should be applied in two or more layers, inserting if requested a reinforcing cloth or mesh.

Prepare three units for the test.

The applied product is cured under standard conditions for 28 days.

At the end of conditioning the prism is cracked, using a suitable jig (A.4.6), without damaging the waterproofing membrane layer. Put the specimen in the jig, as shown in Figure A.3, and slowly turn the screw on, until a crack appears near the square hole. Remove the specimen, in order to test according to A.8.2 or A.8.3.

A.8.2 Crack bridging ability in standard conditions

The crack-bridging at the first failure of the product is evaluated by using a dynamometer (A.4.8) at a speed of 0,15 mm/min.

The specimen prepared according to A.8 is held by a suitable clamp (see Figure A.2). A 20 N pre-tensile load shall be applied, the elongation is set to zero, then the test can be started at 0,15 mm/min rate, without any torsion or flexion of the test specimen.

The test ends when the first failure on the surface of the product is visible.

Report the result in millimetres to the nearest 0,01 mm.

A.8.3 Crack bridging ability at low temperature

The test described in A.8.2 shall be carried out with a device to maintain the temperature at (–20 ± 2) °C and (–5 ± 1) °C.

The specimen prepared according to A.8 is held by a suitable clamp (see Figure A.2) and is conditioned for at least 2 h before testing. A 20 N pre-tensile load shall be applied, the elongation is set to zero, then the test can be started at 0,15 mm/min rate, without any torsion or flexion of the test specimen.

The test ends when the first failure on the surface of the product is visible.

Report the result in millimetres to the nearest 0,01 mm.

A.9 Test report

The test report shall include the following information:

a) dated reference to this part of ISO 13007, i.e. ISO 13007-5:2012;

b) place, date and time of sampling;

c) type of liquid-applied waterproofing material, commercial designation and manufacturer;

d) identification of the test sample;

e) handling and storage of samples before testing;

f) date of testing;

g) test conditions;

h) amount of water and/or liquid admixture required for preparing the cementitious waterproofing membrane;

i) description of the primer and of the reinforcing cloth or mesh used;

j) coverage of primer and product (g/m^2);

k) type and commercial designation of the adhesive used

l) tests results (adhesion, water impermeability, crack bridging ability);

m) any other factor that could have influenced the result.

Bibliography

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[4] ISO 10545-6, *Ceramic tiles — Part 6: Determination of resistance to deep abrasion for unglazed tiles*

[5] ISO 13007-3, *Ceramic tiles — Grouts and adhesives — Part 3: Terms, definitions and specifications for grouts*

[6] ISO 13007-4, *Ceramic tiles — Grouts and adhesives — Part 4: Test methods for grouts*

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