
Low modulus adhesives for exterior tile finishing

*Adhésifs à faible module d'élasticité pour le collage extérieur des
carreaux céramiques*

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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).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

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Low modulus adhesives for exterior tile finishing

1 Scope

This International Standard specifies a quality standard and test methods for a low modulus adhesive composed of chemical reaction resins and used for the installation of tiles to exterior walls.

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 37:2011, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 188:2011, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 679:2009, *Cement — Test methods — Determination of strength*

ISO 2811-1, *Paints and varnishes — Determination of density — Part 1: Pycnometer method*

ISO 6344-2, *Coated abrasives — Grain size analysis — Part 2: Determination of grain size distribution of macrogrits P12 to P220*

ISO 8336, *Fibre-cement flat sheets — Product specification and test methods*

ISO 10364:2007, *Structural adhesives — Determination of the pot life (working life) of multi-component adhesives*

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

ISO 21948, *Coated abrasives — Plain sheets*

3 Terms and definitions

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

3.1

pot-life

time interval during which the adhesive can be used after mixing

3.2

open time

maximum time interval after application at which tiles can be embedded in the applied adhesive and meet the specified tensile adhesion strength requirement

3.3

shelf life

time of storage under stated conditions during which an adhesive may be expected to maintain its working properties

3.4

slip

downward movement of a tile applied to a combed adhesive layer on a vertical surface

3.5

reaction resin adhesive

single- or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction

3.6

notched trowel

toothed tool, which makes it possible to apply the adhesive as a series of ribs of a uniform thickness onto the fixing surface and/or the reverse face of the tile

3.7

cohesive failure ratio

percentage of total cohesive failure area of adhesive, substrate or tile, over total adhesion area

3.8

low modulus adhesive

adhesives curing to elastomeric rubbery film which has minimum 35 % of elongation at tensile testing break point

3.9

cement

finely ground inorganic material that, when mixed with water, forms a paste that sets by means of hydration reactions and processes, and that, after hardening, retains its strength and stability, even under water

Note 1 to entry: Cement for mortar substrate shall be Portland cement which is specified in ASTM C150 type 1.

[SOURCE: ISO 6707-1:2014, 6.4.16, modified]

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4 Classification and designation [ISO 14448:2016](https://standards.iteh.ai/catalog/standards/sist/db367423-f474-4d0a-be7a-)

Adhesives shall be sorted into four groups as shown in [Table 1](https://standards.iteh.ai/catalog/standards/sist/db367423-f474-4d0a-be7a-), based on the principal components and the reaction modes.

Table 1 — Grouping of tile adhesive

	Sort	Remarks
Polyurethane resin	1 component reaction-cure	Urethane resin based 1 component adhesive
	2 component reaction-cure	Urethane resin based 2 component adhesive
Silyl terminated polymers (exclude silicone)	1 component reaction-cure	Silyl terminated polymers based 1 component adhesive
	2 component reaction-cure	Silyl terminated polymers based 2 component adhesive

5 Requirement

The adhesives shall meet the requirements of [Table 2](#).

Table 2 — Product requirements

Property		Requirement		Test method	
Shelf life		Homogeneous with no gelling, Less than 5 % weight change,		7.1	
Mixing homogeneity inspection (2 component adhesives)		Homogeneous after mixing		7.2	
Adhesive strength	Standard curing	0,60 N/mm ² or higher and 75 % or more cohesive failure ratio		7.3	
	Low temperature curing	0,40 N/mm ² or higher and 50 % or more cohesive failure ratio			
	Alkaline warm water immersion	0,40 N/mm ² or higher and 50 % or more cohesive failure ratio			
	Freeze-thaw cycles	0,40 N/mm ² or higher and 50 % or more cohesive failure ratio			
	Heat aging	0,40 N/mm ² or higher and 50 % or more cohesive failure ratio			
Cured film property	Tensile property	Tensile strength		7.4	
		Elongation at break			
	Cold and hot resistance	Tensile strength	Test temp: 80 °C		0,60 N/mm ² or higher
			Test temp: -20 °C		0,60 N/mm ² or higher
		Elongation at break	Test temp: 80 °C		35 % or more
			Test temp: -20 °C		35 % or more
	Tensile property after treatment	Tensile strength	Immersion in alkaline water		0,40 N/mm ² or higher
			Heat aging		0,40 N/mm ² or higher
		Elongation at break	Immersion in alkaline water		25 % or more
			Heat aging		25 % or more
Heat stability		4 weeks of stable tile maintenance at 80 °C , under 1 kg load		7.5	
Slip		No slip		7.6	
Pot-life (2 component adhesives)		Time indicated on the label		7.7	
Open time (1 component adhesives)		Time indicated on the label		7.8	
Density		Density indicated on the label		7.9	

6 General test conditions and procedures

6.1 Testing conditions

Standard conditions shall be (23 ± 2) °C and (50 ± 5) % relative humidity (RH). Other test conditions may be specified in [Clause 7](#).

6.2 Test materials

6.2.1 General

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.

6.2.2 Cement mortar substrate

Mold a block in a 70 mm × 70 mm × 20 mm metal frame by pouring mortar specified in ISO 679:2009, Clause 6 and cure it at (20 ± 3) °C and at least 80 % RH for 24 h before taking it out. Then, cure the block in water at (20 ± 3) °C for 7 d. Then, condition for two weeks at (23 ± 2) °C and (50 ± 10) % RH. Polish the surface well using sandpaper as specified in ISO 21948 with a P150 grain size specified in ISO 6344-2, to remove any efflorescence or release agents from the surface.

6.2.3 Ceramic tiles

The tiles used for this test shall be Group Bla tiles complying with ISO 13006 with water absorption less than 0,5 % by mass. The tiles shall be checked prior to conditioning to ensure that they are unused, clean and dry.

6.2.4 Fibre cement flat sheets

The fibre cement flat sheets shall be category C as defined in ISO 8336 with a thickness of 8 mm.

6.3 Notched trowel

The adhesive spreading tool for the test shall be a common comb trowel of which the blade is made of steel or similar and of dimensions as shown in Figure 1. A different comb trowel may be used if specified in the instruction of the adhesive manufacturer.

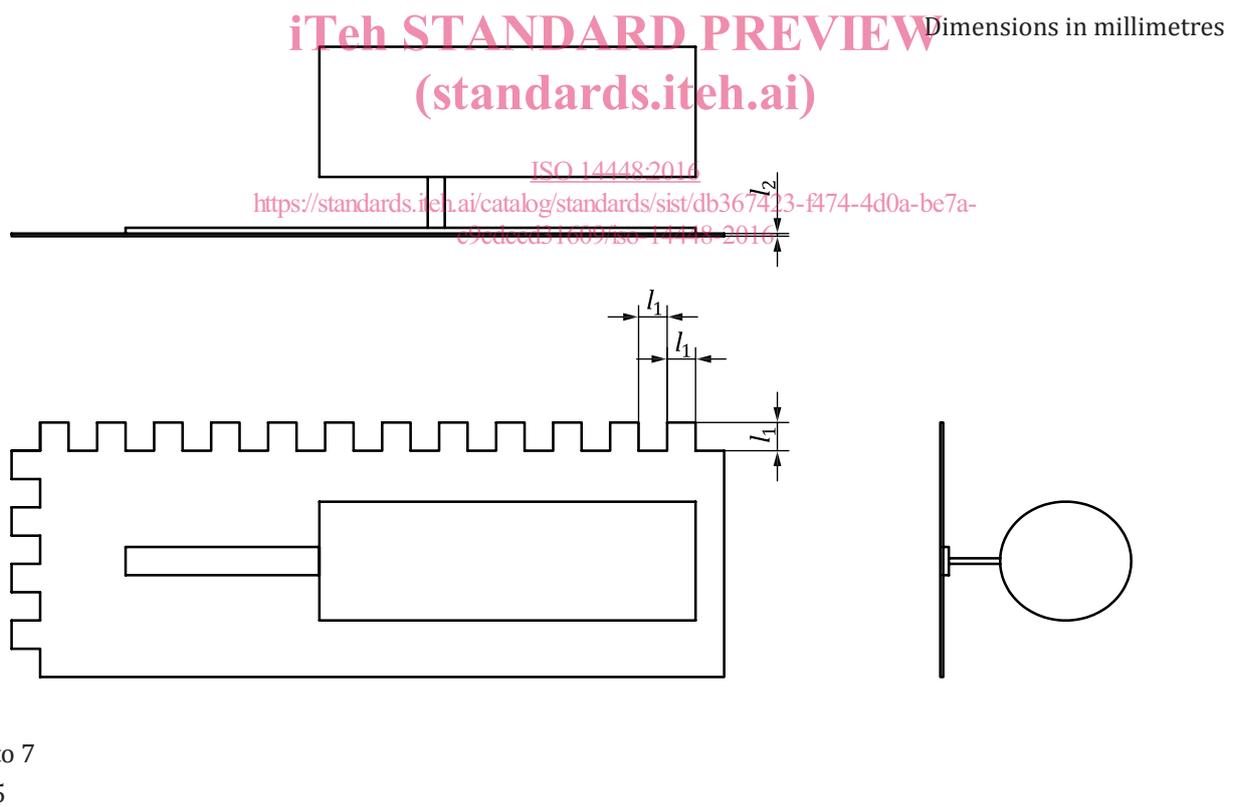
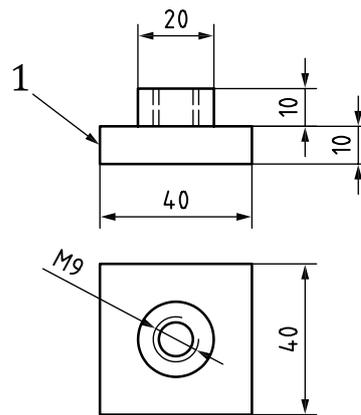


Figure 1 — Common comb trowel

6.4 Pull head plate

Square metallic plates, with dimensions of (40 ± 1) mm × (40 ± 1) mm with a suitable fitting for connection to the test machine. The dimensions of the block are shown in Figure 2.

Dimension in millimetres

**Key**

1 metallic plates

Figure 2 — Pull head plate**7 Test methods****7.1 Shelf life**

Store the adhesive for four weeks in the original unopened package at (23 ± 2) °C and (50 ± 10) % RH for the first two weeks and at (50 ± 2) °C and (85 ± 5) % RH for the next two weeks. After the storage period, place approximately 100 g adhesive on the glass plate with dimensions 100 mm × 100 mm × 5 mm and immediately spread the adhesive to about 1 mm layer using a suitable paddle. Inspect the layer for any gel and foreign matters. This test is applicable only to the 1 component adhesives.

7.2 Mixing homogeneity inspection

Take base resin and hardener in an approximate volume to gain 200 g to 300 g blend and in the ratio that the manufacturer specifies. Place it on the glass plate with dimensions 300 mm × 300 mm × 5 mm and immediately mix well for about 3 min. After mixing, confirm homogeneity by a visual check. This test is applicable only to the 2 component adhesives.

7.3 Adhesive strength**7.3.1 Materials for the testing****7.3.1.1 Substrate**

The substrate is the cement mortar substrate defined in 6.2.2 with dimensions of approximately 70 mm × 70 mm × 20 mm. The surface should be free of dust, dirt, etc.

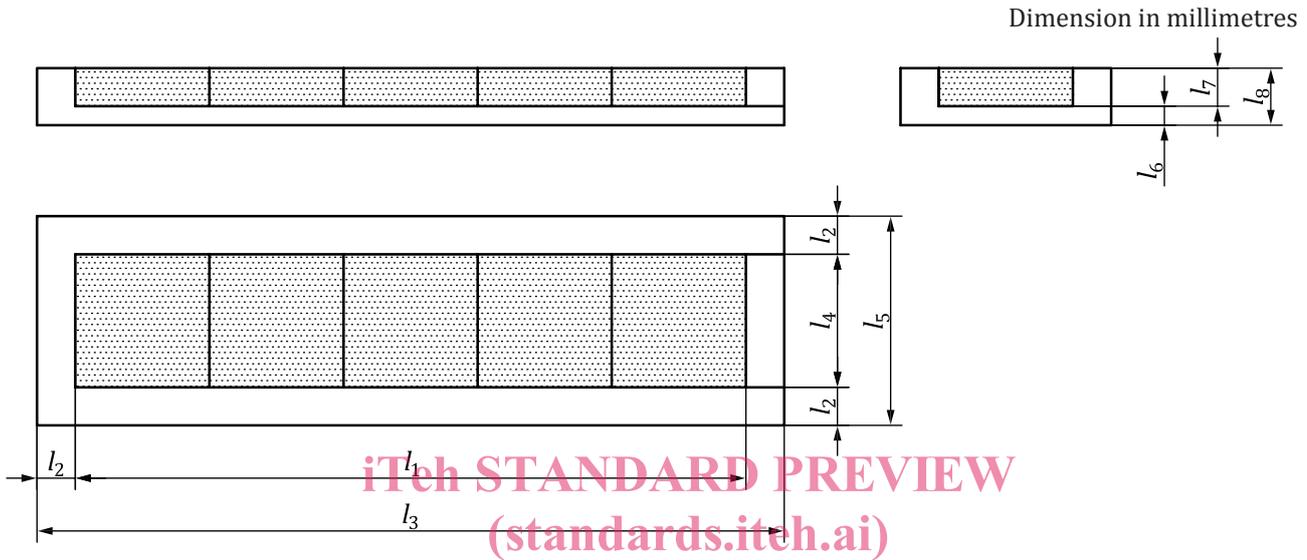
7.3.1.2 Ceramic tiles

The ceramic tiles are the ones defined in 6.2.3 with dimensions of approximately 45 mm × 45 mm × 7 mm.

7.3.2 Preparation of test pieces

7.3.2.1 Spreading of adhesive

Insert five substrate with their polished surfaces up, into the steel frame of Figure 3 and fix them without leaving gaps. Adhere a flexible masking tape on the steel frame as shown in Figure 4, so that it goes 7 mm over the substrate edges. Apply a sufficient volume of adhesive to the substrate and spread it to a layer of approximately 5 mm. Comb the adhesive layer with a common comb trowel, holding the comb at an angle of approximately 60°, so that the adhesive is evenly spread. Remove the masking tape slowly.

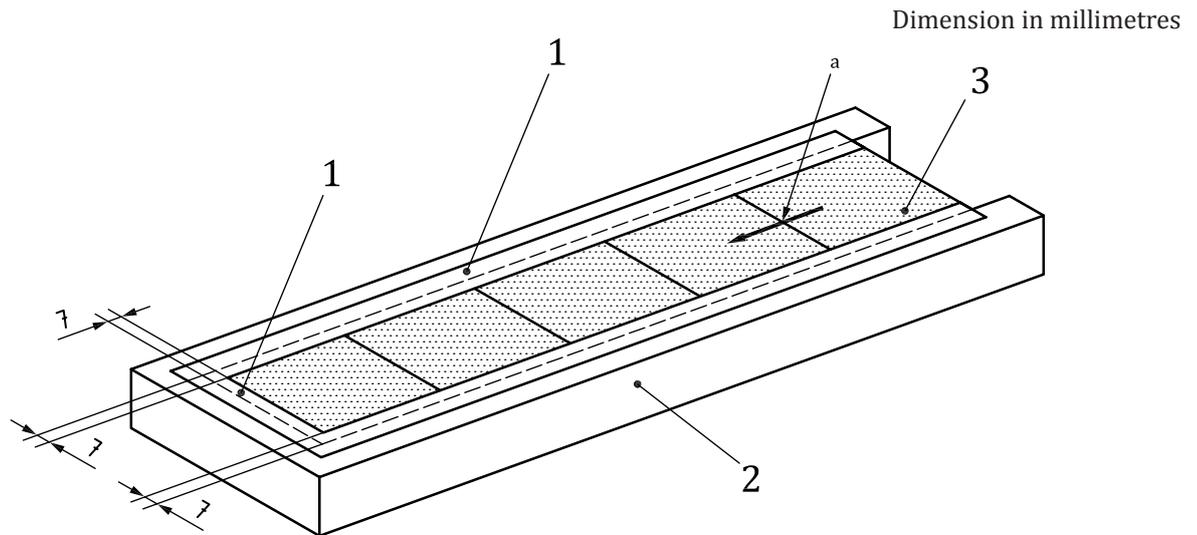


Key

l_1	350 ± 1
l_2	20 ± 1
l_3	390 ± 1
l_4	$70 \pm 0,5$
l_5	110 ± 5
l_6	10 ± 4
l_7	20 ± 1
l_8	30 ± 4

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Figure 3 — Steel frame for adhesive spreading

**Key**

- 1 masking tape
- 2 steel frame for spreading
- 3 substrate to be spread of adhesive
- a Direction of comb trowel stroke.

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Figure 4 — Adhesive spreading
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7.3.2.2 Placing of tile

When the adhesive is spread, place a ceramic tile as defined in 7.3.1.2 on each substrate. Excess adhesive pushed out of the tile should be removed immediately.

7.3.3 Curing of test assembly**7.3.3.1 Standard cure**

Cure the assembly for 672 h in standard conditions.

7.3.3.2 Low temperature curing

Cure the assembly for 672 h under (5 ± 2) °C conditions.

7.3.4 Treating of test assembly**7.3.4.1 Immersion in warm alkaline water**

Cure the assembly according to 7.3.3.1 and then immerse in saturated lime water at 60 °C. After 168 h, remove the test pieces from the lime water, rinse with clean water, wipe lightly with a dry cloth and test immediately.

7.3.4.2 Freeze-thaw cycles

Cure the assembly according to 7.3.3.1 and then immerse in water (conditioned between 15 °C and 25 °C) for 24 h in order to saturate the mortar substrate with water, before carrying out 200 freeze-thaw cycles.