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Keramične ploščice - 13. del: Določanje odpornosti proti kemikalijam

Ceramic tiles -- Part 13: Determination of chemical resistance

Carreaux et dalles céramiques -- Partie 13: Détermination de la résistance chimique

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ISO 10545-13

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Ceramic tiles —

Part 13:
Determination of chemical resistance

Carreaux et dalles céramiques —
Partie 13: Détermination de la résistance chimique

Reference number
ISO 10545-13:1995(E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10545-13 was prepared by Technical Committee ISO/TC 189, *Ceramic tile*.

ISO 10545 consists of the following parts, under the general title *Ceramic tiles*:

— *Part 1: Sampling and basis for acceptance*

— *Part 2: Determination of dimensions and surface quality*

— *Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density*

— *Part 4: Determination of modulus of rupture and breaking strength*

— *Part 5: Determination of impact resistance by measurement of coefficient of restitution*

— *Part 6: Determination of resistance to deep abrasion for unglazed tiles*

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— *Part 7: Determination of resistance to surface abrasion for glazed tiles*

— *Part 8: Determination of linear thermal expansion*

— *Part 9: Determination of resistance to thermal shock*

— *Part 10: Determination of moisture expansion*

— *Part 11: Determination of crazing resistance for glazed tiles*

— *Part 12: Determination of frost resistance*

— *Part 13: Determination of chemical resistance*

— *Part 14: Determination of resistance to stains*

— *Part 15: Determination of lead and cadmium given off by glazed tiles*

— *Part 16: Determination of small colour differences*

— *Part 17: Determination of coefficient of friction*

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Ceramic tiles —

Part 13:
Determination of chemical resistance

1 Scope

This part of ISO 10545 specifies a test method for determining the chemical resistance of ceramic tiles at room temperature. The method is applicable to all types of ceramic tiles.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 10545. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 10545 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3585:1991, *Borosilicate glass 3.3 — Properties.*

3 Principle

Subjection of the test specimens to the action of the test solutions and visual determination of attack after a defined period.

4 Aqueous test solutions

4.1 Household chemicals

Ammonium chloride solution, 100 g/l.

4.2 Swimming pool salts

Sodium hypochlorite solution, 20 mg/l, prepared from technical grade sodium hypochlorite with about 13 % (*m*/*m*) of active chloride.

4.3 Acids and alkalis

4.3.1 Low concentrations (L)

a) Hydrochloric acid solution, 3 % (*V*/*V*), prepared from concentrated hydrochloric acid (ρ = 1,19 g/ml).

b) Citric acid solution, 100 g/l.

c) Potassium hydroxide solution, 30 g/l.

4.3.2 High concentrations (H)

a) Hydrochloric acid solution, 18 % (*V*/*V*), prepared from concentrated hydrochloric acid (ρ = 1,19 g/ml).

b) Lactic acid solution, 5 % (*V*/*V*).

c) Potassium hydroxide solution, 100 g/l.

5 Apparatus

5.1 Vessel with a lid, made of borosilicate glass 3.3 (ISO 3585), or any other suitable material.

5.2 Cylinder of borosilicate glass 3.3 (ISO 3585), or any other suitable material having a lid or an opening for filling.

5.3 Drying oven, capable of being operated at (110 ± 5) °C

Microwave, infrared or other drying systems allowing shorter drying times may be used provided that it has been determined that the same results are obtained.

5.4 Chamois lather.

5.5 White cloth, made of cotton or flax.

5.6 Sealing material, (for example plasticine).

5.7 Balance, accurate to 0,05 g.

5.8 Pencil, of HB hardness (or equivalent).

5.9 Electric lamp, of 40 W, white inside (for example siliconized).

6 Test specimens

6.1 Number of test specimens

Five test specimens shall be used with each test solution. Test specimens shall be representative of the sample; where tiles have different colours or decorative effects on parts of the surface, care should be taken to include all distinctive parts.

6.2 Size of test specimens

6.2.1 Unglazed tiles

Cut a square test specimen (50 mm × 50 mm) from each tile under test so that one side of each test specimen is not a cut side.

6.2.2 Glazed tiles

Use undamaged test specimens which may be either whole tiles or parts of tiles.

6.3 Preparation of test specimens

Thoroughly clean the surface with a suitable solvent, for example methanol. Do not use test specimens with surface defects.

7 Procedure for unglazed tiles

7.1 Application of test solutions

Dry the test specimens in the drying oven (5.3) adjusted to (110 ± 5) °C, until they reach constant mass, i.e. until the difference between two successive weighings is less than 0,1 g. Then cool the tiles to room temperature.

Use the test solutions listed in 4.1, 4.2, 4.3.1 and 4.3.2.

Immerse the test specimens vertically to a depth of 25 mm in the vessel (5.1) containing the test solution. The non-cut side of each test specimen shall be fully immersed. Cover with the lid (5.1) and maintain at (20 ± 2) °C for 12 d.

After 12 d, subject the test specimens to running water for 5 d and then boil them for 30 min while completely immersed in water. Remove the test specimens from the water, dab with a wet, but wrung-out, chamois leather (5.4) and dry in the oven adjusted to (110 ± 5) °C.

7.2 Determination of class

Examine the test specimens at a distance of 25 to 30 cm, with the naked eye or with spectacles if usually worn, for changes on the proper surface and the non-cut edge. Then examine the parts of the cut edges that were immersed. Daylight or artificial illumination is permitted (approximately 300 lx), but direct sunlight shall be avoided.

Tiles are divided into the following classes:

7.2.1 For test solutions listed in 4.1 and 4.2

Class UA: No visible effect[1)]

Class UB: Visible effects on cut sides

Class UC: Visible effects on cut sides, non-cut sides and on the proper surface

7.2.2 For test solutions listed in 4.3.1

Class ULA: No visible effect[1)]

Class ULB: Visible effects on cut sides

Class ULC: Visible effects on cut sides, non-cut sides and on the proper surface

1) If the hue changes slightly, this is not considered to be chemical attack.

7.2.3 For test solutions listed in 4.3.2

Class UHA: No visible effect[1)]

Class UHB: Visible effects on cut sides

Class UHC: Visible effects on cut sides, non-cut sides and on the proper surface

8 Procedure for glazed tiles

8.1 Application of test solutions

Apply a uniform layer of the sealing material (5.6), 3 mm thick, to the rim of the cylinder (5.2). Turn the cylinder upside down onto a fresh part of the glazed surface, and seal around the rim.

Pour the test solution through the inlet to a height of (20 ± 1) mm. The test solution shall be any of those listed in 4.1, 4.2 and 4.3.1; if required, the test solutions listed in 4.3.2 may be used. Maintain the test assembly at (20 ± 2) °C.

For testing the resistance to household chemicals, swimming pool salts and citric acid, maintain the test solution in contact with the test specimen for 24 h. Remove the cylinder and clean the glazed surface with a suitable solvent to completely remove the sealing material.

For testing the resistance to hydrochloric acid and potassium hydroxide, maintain the test solution in contact with the test specimen for 4 d. Shake the test assembly gently once a day and ensure that the level of the test solution does not change. Replace the test solution after 2 d. After two more days, remove the cylinder and clean the glazed surface with a suitable solvent to completely remove the sealing material.

8.2 Determination of class

8.2.1 General

Completely dry the surface that has been tested before assessment can commence. In order to assess whether the pencil test (described in 8.2.2.2) is applicable, draw several lines with the pencil (5.8) on untreated parts of the glazed surfaces and attempt to remove the marks with a wet cloth (5.5). If the pencil marks cannot be removed, the classification system of figure 1 is not applicable and these tiles shall be reported as "Normal classification not possible". An alternative visual classification is provided for these tiles in 8.2.3.

8.2.2 Normal classification

For tiles passing the pencil test, carry out the operations described in 8.2.2.1, 8.2.2.2 and 8.2.2.3 and apply the classification system indicated in figure 1.

8.2.2.1 Visual examination

Examine the surface that has been tested from all angles from a standard distance of 25 cm, with the naked eye or with spectacles if usually worn, for any difference in appearance from a untreated surface, for example, for change in reflection or the development of brilliance.

Daylight or artificial illumination is permitted (approximately 300 lx), but direct sunlight shall be avoided.

After examination, if there is no visible effect, perform the pencil test described in 8.2.2.2. If there is a visible effect, perform the reflection test described in 8.2.2.3.

8.2.2.2 Pencil test

Draw several lines with the pencil (5.8) both on the surface under test and on the untreated surface.

Attempt to remove the pencil lines with the wet cloth (5.5). If the pencil marks are removed from the treated surface, the surface corresponds to class A. If they are not removed, the surface corresponds to class B.

8.2.2.3 Reflection test

Hold the tile so that the image of the lamp (5.9) is reflected on the untreated surface. The angle of incidence of the light upon the surface shall be approximately 45° and the distance between the tile and the light source shall be (350 ± 100) mm.

The criterion of judgement shall be the sharpness of the reflection and not the brightness of the surface. Position the tile so that the image falls simultaneously on both treated and untreated parts and determine whether it is any less clear on the treated part.

This test cannot be applied to certain glazes, in particular those which are dull. If the reflection is clear, the surface corresponds to class B. If the reflection is blurred, the surface corresponds to class C.

1) If the hue changes slightly, this is not considered to be chemical attack.