SLOVENSKI STANDARD
SIST ISO 10545-3:1996

01-januar-1996

Keramične ploščice - 3. del: Določanje vpijanja vode, navidezne poroznosti, navidezne relativne gostote in prostorninske mase

Ceramic tiles -- Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density

Carreaux et dalles céramiques -- Partie 3: Détermination de l'absorption d'eau, de la porosité ouverte, de la densité relative apparente et de la masse volumique globale

Ta slovenski standard je istoveten z: ISO 10545-3:1995

ICS:

91.100.23	Keramične ploščice	Ceramic tiles

SIST ISO 10545-3:1996 **en**

INTERNATIONAL STANDARD

ISO 10545-3

First edition
1995-11-15

Ceramic tiles —

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

Carreaux et dalles céramiques —
Partie 3: Détermination de l'absorption d'eau, de la porosité ouverte, de la densité relative apparente et de la masse volumique globale

Reference number
ISO 10545-3:1995(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 10545-3 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*

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

— *Part 8: Determination of linear thermal expansion*

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Printed in Switzerland

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

1 Scope

This part of ISO 10545 specifies methods for determining water absorption, apparent porosity, apparent relative density and bulk density of ceramic tiles.

There are two methods of obtaining impregnation with water of the samples' open pores: boiling and immersion under vacuum. Boiling will impregnate open pores that are easily fillable, the vacuum method fills almost all the open pores.

The boiling method shall be used for classification of tiles and product specifications. The vacuum method shall be used for apparent porosity, apparent relative density and water absorption for purposes other than classification.

2 Principle

Impregnation of dry tiles with water and then suspension in water. Calculation of the listed properties using the relationships between the dry, saturated and suspended masses.

3 Apparatus

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

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

3.2 Heating apparatus, constructed of suitable inert material, in which boiling takes place.

3.3 Source of heat.

3.4 Balance, accurate to 0,01 % of the mass of a test specimen.

3.5 Deionized or **distilled water**.

3.6 Desiccator.

3.7 Chamois leather.

3.8 Wire loop, halter or **basket**, capable of supporting specimens under water for making suspended mass measurements.

3.9 Glass beaker, or similar container of size and shape such that the sample, when suspended from the balance (3.4) by the wire loop (3.8), is completely immersed in water, with the test specimen and the wire loop being completely free of contact with any part of the container.

3.10 Vacuum chamber and **vacuum system**, of sufficient capacity to accommodate the required number of test specimens and achieve and hold a vacuum of (100 ± 1) kPa for 30 min.

4 Test specimens

4.1 A sample of each type of tile under test shall consist of 10 whole tiles.

4.2 If the proper surface area of each individual tile is greater than 0,04 m^2, only five whole tiles shall be used for the test.

4.3 When the mass of each individual tile is below 50 g, a sufficient number of tiles shall be taken so that each test specimen reaches a mass of 50 g to 100 g.

4.4 Tiles with sides longer than 200 mm may be cut into smaller pieces, but all such pieces shall be included in the measurement. With polygonal and other non-rectangular tiles, the lengths and widths shall be those of the enclosing rectangles.

5 Procedure

Dry the tiles in the oven (3.1) adjusted to (110 ± 5) °C, until constant mass is reached, i.e. until the difference between two successive weighings at intervals of 24 h is less than 0,1 %. Cool the tiles in the desiccator (3.6) over silica gel or another suitable desiccant, but not an acid.

Weigh each tile and record the results to the corresponding accuracy shown in table 1.

Table 1 — Tile mass and accuracy of measurement

Values in grams

Mass of tile	Accuracy of measurement
50 to 100	0,02
> 100 to 500	0,05
> 500 to 1 000	0,25
> 1 000 to 3 000	0,50
> 3 000	1,00

5.1 Impregnation with water

5.1.1 Boiling method

Place the tiles vertically, with no contact between them, in the heating apparatus (3.2) so that there is a depth of 5 cm of water (3.5) above and below the tiles. Maintain the water level at 5 cm above the tiles throughout the test. Heat the water until it boils and continue to boil for 2 h. Then remove the source of heat (3.3) and allow the tiles to cool to room temperature, still completely immersed, in 4 h ± 15 min. Water at ambient temperature or refrigerating coils may be used to cool the test specimens to room temperature. Prepare the chamois leather (3.7) by wetting and wringing out by hand. Place it on a flat surface and lightly dry each side of each tile in turn. Dab any relief surfaces with the chamois leather.

Immediately after this procedure, weigh each tile and record the results to the same accuracy as for the dry state (see table 1).

5.1.2 Vacuum method

Place the tiles vertically, with no contact between them, in the vacuum chamber (3.10). Evacuate to a pressure of (100 ± 1) kPa and maintain it for 30 min. Then, while maintaining the vacuum, slowly admit sufficient water to cover the tiles by 5 cm. Release the vacuum and allow the tiles to remain submerged for 15 min. Prepare the chamois leather (3.7) by wetting and wringing out by hand. Place it on a flat surface and lightly dry each side of each tile in turn. Dab any relief surfaces with the chamois leather.

Immediately after this procedure, weigh each tile and record the results to the same accuracy as for the dry state (see table 1).

5.2 Suspended weight

After impregnation under vacuum of the test specimens, determine, to the nearest 0,01 g, the mass m_3 of each specimen while suspended in water. Carry out weighing by placing the specimen in a wire loop, halter, or basket (3.8) that is suspended from one arm of the balance (3.4). Before actually weighing, counterbalance the scale with the wire loop, halter, or basket in place and immerse in water to the same depth as is used when the specimens are in place.

6 Expression of results

m_1 is the mass of the dry tile;

m_{2b} is the mass of the tile impregnated with boiling water;

m_{2v} is the mass of the tile impregnated by immersion under vacuum;

m_3 is the mass of the suspended tile impregnated by immersion under vacuum.

In the following calculations, the assumption is made that 1 cm^3 of water weighs 1 g. This is true within about 3 ‰ for water at room temperature.