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STANDARD

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Ceramic tiles —

Part 10:
Determination of moisture expansion

Carreaux et dalles céramiques —

Partie 10: Détermination de la dilatation à l'humidité



Reference number
ISO 10545-10:1995(E)

ISO 10545-10:1995(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 10545-10 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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- *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*

Annex A of this part of ISO 10545 is for information only.

Ceramic tiles —

Part 10: Determination of moisture expansion

1 Scope

This part of ISO 10545 specifies a method for determining the moisture expansion of ceramic tiles.

2 Definition

For the purposes of this part of ISO 10545, the following definition applies.

2.1 Moisture expansion: Proportional accelerated expansion that results from subjecting reheated tiles to extended immersion in boiling water.

3 Principle

Determination of accelerated moisture expansion by subjecting a reheated tile to boiling water and measuring the proportional change in length.

4 Apparatus

4.1 A suitable type of measuring frame, fitted with a micrometer, dial gauge, transducer or similar device, with an accuracy of at least 0,01 mm.

4.2 Reference bars of nickel steel (Invar), of approximately the same length as the test specimens, fitted with an insulated grip.

4.3 Kiln, capable of firing up to 600 °C, at a rate of temperature rise of 150 °C/h and with a control over the temperature of ± 15 °C.

4.4 Vernier calipers, or other suitable apparatus for linear measurement to the nearest 0,5 mm.

4.5 Boiling apparatus, for maintaining the test specimens in boiling deionized or distilled water for 24 h.

5 Test specimens

A sample consists of five whole tiles. If the size of the measuring frame is such that whole tiles do not fit, a test specimen shall be cut from the centre of each tile with a minimum length of 100 mm, a minimum width of 35 mm and the thickness of the tile.

In the case of extruded tiles, the length of the test specimens shall be in the direction of the extrusion.

The test specimens shall be prepared as required for the chosen measuring device (4.1).

6 Procedure

6.1 Refiring

Refire the test specimens in a kiln (4.3) with a rate of temperature rise of 150 °C/h and a 2 h step at (550 ± 15) °C. Allow the test specimens to cool inside the kiln. Remove them when the temperature falls to (70 ± 10) °C and then keep them at room temperature for 24 h to 32 h in a dry desiccator. Should any of the tiles crack on refiring, carry out a further refiring on a fresh tile with slower heating and cooling rates.

Determine the initial length of each test specimen, to the nearest 0,5 mm, by comparing with a reference bar of nickel steel (4.2). Measure the test specimen twice, with 3 h between measurements.

6.2 Treatment in boiling water

Bring the deionized or distilled water to the boil in the boiling apparatus (4.5). Immerse the test specimens in the boiling water for 24 h consecutively, ensuring that there is at least 5 cm of water above the specimens, and that they do not touch each other or touch the base or sides of the container.

Remove the test specimens from the boiling water. Allow them to cool to room temperature, ensuring that the test specimens do not touch each other. Measure them 1 h after removal from the boiling apparatus, and again after a further 3 h. Record the measurements as in 6.1.

For each test specimen, determine the mean of the two measurements prior to treatment in boiling water, the mean of the two measurements after treatment in boiling water, and then determine the difference between the two mean values.

7 Expression of results

The moisture expansion, expressed in millimetres per metre, is calculated using the formula

$$\frac{\Delta l}{L} \times 1\,000$$

where

Δl is the difference between the two mean values, in millimetres;

L is the mean initial length, in millimetres, of the test specimen.

The moisture expansion, expressed as a percentage, may be calculated using the formula

$$\frac{\Delta l}{L} \times 100$$

8 Test report

The test report shall include the following information:

- a) reference to this part of ISO 10545;
- b) a description of the tiles and the size of the specimens;
- c) the moisture expansion of each test specimen, underlining the maximum value obtained;
- d) the average moisture expansion of the tiles.

Annex A

(informative)

Remarks on the moisture expansion of ceramic tiles

The majority of glazed and unglazed tiles have negligible natural moisture expansion that does not contribute to tiling problems when tiles are correctly fixed.

However, with unsatisfactory fixing practices and in certain climatic conditions, natural moisture expansion may aggravate problems, especially when tiles are directly fixed to inadequately aged concrete substrates. In these cases, a maximum limit of 0,06 % moisture expansion is recommended when the test is used.

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