INTERNATIONAL STANDARD

ISO 10545-6

Second edition
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Ceramic tiles —

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

Carreaux et dalles céramiques —

Partie 6: Détermination de la résistance à l'abrasion profonde pour les carreaux non émaillés

Reference number
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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 10545-6 was prepared by Technical Committee ISO/TC 189, *Ceramic tile*.

This second edition cancels and replaces the first edition (ISO 10545-6:1995), of which subclause 4.3 has been technically revised.

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*

— *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*

Ceramic tiles —

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

1 Scope

This part of ISO 10545 specifies a test method for determining the resistance to deep abrasion of all unglazed ceramic tiles used for floor coverings.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 630, *Structural steels — Plates, wide flats, bars, sections and profiles*

ISO 8486-1, *Bonded abrasives — Determination and designation of grain size distribution — Part 1: Macrogrits F4 to F220*

3 Principle

Determination of the abrasion resistance of unglazed tiles by measuring the length of the groove produced in the proper surface by means of a rotating steel disc, under given conditions and with the use of abrasive material.

4 Apparatus

4.1 Abrasion apparatus, consisting essentially of a rotating disc, a storage hopper with a dispensing device for the abrasive material, a test specimen support and a counterweight (see Figure 1).

The disc shall be made of E 235 A (Fe 360 A) conforming to ISO 630, with a diameter of (200 ± 0,2) mm and a thickness at the edge of (10 ± 0,1) mm, and with a revolution rate of 75 r/min.

The pressure with which the test specimens are held against the steel disc shall be determined by calibrating the apparatus against transparent fused silica. The pressure shall be adjusted such that, after 150 revolutions using F80 abrasive, which shall be in accordance with ISO 8486-1, a chord of (24 ± 0,5) mm shall be produced. Transparent fused silica shall be used as a primary standard. A secondary standard of float glass or other products may be used.

When the diameter has worn by 0,5 % of the initial diameter, the steel disc shall be replaced.

4.2 Measuring gauge, accurate to 0,1 mm.

4.3 Abrasive material, of white fused aluminium oxide with a grain size of F80, in accordance with ISO 8486-1.

An equivalent abrasive material may be used if it can be shown to lead to the same results.

5 Test specimens

5.1 Types of test specimen

Tests shall be carried out using whole tiles or test specimens of suitable dimensions. Before testing, small specimens shall be fixed with an adhesive on to a larger background, avoiding joints.

5.2 Preparation of test specimens

Clean, dry test specimens shall be used.

5.3 Number of test specimens

A minimum of five test specimens shall be tested.

6 Procedure

Place a test specimen in the apparatus (4.1) so that it is tangential against the rotating disc. Ensure that abrasive material (4.3) is fed uniformly into the grinding zone at a rate of (100 ± 10) g/100 revolutions.

Rotate the steel disc for 150 revolutions. Remove the test specimen from the apparatus and measure the chord length, L, of the groove to the nearest 0,5 mm (see Figure 2). Test each test specimen on its proper surface, in at least two places at right angles to each other.

In the case of relief surfaces interfering with the determination of the abrasion resistance, the projections may be ground off, but the results of the test would not be the same as for similar tiles having plane surfaces.

Do not re-use the abrasive material.

7 Expression of results

The resistance to deep abrasion is expressed as the volume, V, in cubic millimetres, of material removed, and is calculated from the chord length, L, of the groove using the following equation:

$$V = \left(\frac{\pi\alpha}{180} - \sin\alpha\right) \times \left(\frac{h \times d^2}{8}\right)$$

with

$$\sin(0{,}5\alpha) = \frac{L}{d}$$

where

α is the angle, in degrees, subtended at the centre of the rotating disc by the chord (see Figure 2);

h is the thickness, in millimetres, of the rotating disc;

d is the diameter, in millimetres, of the rotating disc;

L is the maximum length, in millimetres, of the chord.

Some equivalent values of L and V are given in Table 1.

8 Test report

The test report shall include the following information:

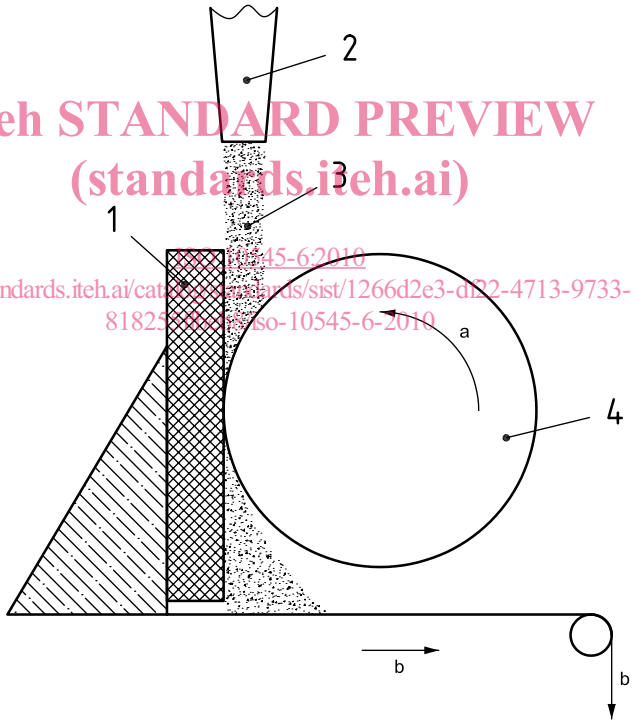
a) reference to this part of ISO 10545, i.e. ISO 10545-6;

b) a description of the tiles;

c) the chord length, L, of each groove, to the nearest 0,5 mm;

d) the volume, V, in cubic millimetres, for each individual groove;

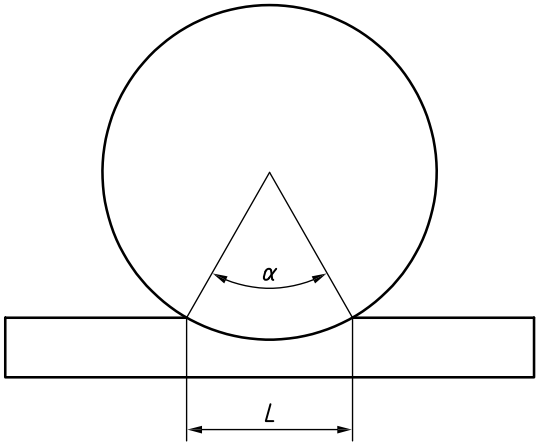
e) the average volume, V_m, in cubic millimetres.



Key

1 tile
2 dispensing device for the abrasive material
3 white fused aluminium oxide of grain size F80
4 rotating steel disc
a Direction of rotation.
b Collection of material which has been removed.

Figure 1 —Schematic diagram of deep abrasion equipment



Key

α angle, in degrees, subtended at the centre of the rotating disc by the chord

L chord length, in millimetres

Figure 2 — Definition of the chord

Table 1 — Equivalent values

L mm	V mm³	L mm	V mm³	L mm	V mm³	L mm	V mm³	L mm	V mm³
20	67	30	227	40	540	50	1 062	60	1 851
20,5	72	30,5	238	40,5	561	50,5	1 094	60,5	1 899
21	77	31	250	41	582	51	1 128	61	1 947
21,5	83	31,5	262	41,5	603	51,5	1 162	61,5	1 996
22	89	32	275	42	626	52	1 196	62	2 046
22,5	95	32,5	288	42,5	649	52,5	1 232	62,5	2 097
23	102	33	302	43	672	53	1 268	63	2 149
23,5	109	33,5	316	43,5	696	53,5	1 305	63,5	2 202
24	116	34	330	44	720	54	1 342	64	2 256
24,5	123	34,5	345	44,5	746	54,5	1 380	64,5	2 310
25	131	35	361	45	771	55	1 419	65	2 365
25,5	139	35,5	376	45,5	798	55,5	1 459	65,5	2 422
26	147	36	393	46	824	56	1 499	66	2 479
26,5	156	36,5	409	46,5	852	56,5	1 541	66,5	2 537
27	165	37	427	47	880	57	1 583	67	2 596
27,5	174	37,5	444	47,5	909	57,5	1 625	67,5	2 656
28	184	38	462	48	938	58	1 689	68	2 717
28,5	194	38,5	481	48,5	968	58,5	1 713	68,5	2 779
29	205	39	500	49	999	59	1 758	69	2 842
29,5	215	39,5	520	49,5	1 030	59,5	1 804	69,5	2 906