BS EN ISO 10545-14:2015

BSI Standards Publication

Ceramic tiles

Part 14: Determination of resistance to stains

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/539, Ceramic tiles and other rigid tiling.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

Ceramic tiles - Part 14: Determination of resistance to stains (ISO 10545-14:2015)

Carreaux et dalles céramiques - Partie 14 : Détermination de la résistance aux taches (ISO 10545-14:2015)

Keramische Fliesen und Platten - Teil 14: Bestimmung der Beständigkeit gegen Fleckenbildner (ISO 10545-14:2015)

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European foreword

This document (EN ISO 10545-14:2015) has been prepared by Technical Committee ISO/TC 189 “Ceramic tile” in collaboration with Technical Committee CEN/TC 67 “Ceramic tiles” the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2016, and conflicting national standards shall be withdrawn at the latest by April 2016.

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Endorsement notice

The text of ISO 10545-14:2015 has been approved by CEN as EN ISO 10545-14:2015 without any modification.

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

This second edition cancels and replaces the first edition (ISO 10545-14:1995), which has been technically revised. It also incorporates the Technical Corrigendum ISO 10545-14:1995/Cor.1:1997.

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*

INTERNATIONAL STANDARD ISO 10545-14:2015(E)

Ceramic tiles —

Part 14:
Determination of resistance to stains

1 Scope

This part of ISO 10545 specifies a method for determining the resistance to stains of the proper surface of ceramic tiles.

2 Normative reference

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 10545-7, *Ceramic tiles — Part 7: Determination of resistance to surface abrasion for glazed tiles*

3 Principle

Determination of the resistance to stains by maintaining test solutions and materials in contact with the proper surface of the tiles for a suitable length of time; the surfaces are then subjected to defined cleaning methods, and finally inspected for visual changes.

4 Staining agents[1)]

4.1 Stains leaving a trace (pastes)

4.1.1 Green staining agent in light oil, in accordance with the specifications of Annex A.

4.1.2 Red staining agent in light oil (for green coloured tiles only), in accordance with the specifications of Annex B.

4.2 Stains having chemical/oxidizing action

4.2.1 Iodine, 13 g/l solution in alcohol.

4.3 Stains forming a film

4.3.1 Olive oil, according to the definitions of the International Olive Oil Agreement (2005).

1) The stains specified are only examples of basic groups. There are many staining materials which may, upon agreement by the parties concerned, be tested using the procedure specified in this part of ISO 10545.

5 Cleaning

5.1 Cleaning agents

5.1.1 Hot water, at a temperature of (55 ± 5) °C.

5.1.2 Weak cleaning agent (a commercial agent), not containing abrasive, with a pH of 6,5 to 7,5.

5.1.3 Strong cleaning agent (a commercial cleaning agent), containing abrasive, with a pH of 9 to 10. The cleaning agents used shall not contain hydrofluoric acid or its compounds.

5.1.4 Suitable solvents

5.1.4.1 Hydrochloric acid solution, 3 % (v/v), prepared from concentrated hydrochloric acid (ρ = 1,19 g/ml) (see Annex C for preparation of the solution).

5.1.4.2 Potassium hydroxide, 200 g/l solution. (see Annex C for preparation of the solution).

5.1.4.3 Acetone.

If other specific solvents are used, they shall be specified in the test report.

5.2 Cleaning procedures and apparatus

5.2.1 Procedure A

Clean the test specimen with running hot water (5.1.1) for 5 min, then wipe the surface with a damp cloth.

5.2.2 Procedure B

Clean the test specimen manually with the weak cleaning agent (5.1.2), using a natural, non-abrasive sponge or a cloth, then rinse the surface with running water, and finally wipe it with a damp cloth.

5.2.3 Procedure C

Clean the test specimen mechanically with the strong cleaning agent (5.1.3). Example of apparatus includes

— rotating brush, with hard bristles, having an 8 cm diameter, rotational frequency approximately 500 r/min, and

— tank for the cleaning agent, equipped with a suitable feeder and connected to the brush.

Carry out cleaning for 2 min, then rinse the surface with running water and finally wipe it with a damp cloth.

5.2.4 Procedure D

Immerse the test specimen for 24 h in a suitable solvent (5.1.4), then thoroughly rinse the surface with running water and finally wipe it with a damp cloth.

All solvent should be used to remove the stain and should be tested successively. The use of the solvents will not obey a pre-established order.

Cleaning is considered to be accomplished if any one of the solvents (5.1.4) removes the stain.

5.3 Auxiliary apparatus

5.3.1 Drying oven, capable of being operated at (105 ± 5) °C.

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

6 Test specimens

Five unused and undamaged test specimens shall be used, and they shall consist of whole tiles or cut tiles.

For ceramic tiles that have some surface treatment, it should be tested upon agreement by the parties concerned.

However, a sufficient surface area is required to ensure separation of the stains. If the tiles are too small, additional ones may be used. Do not use test specimens with surface defects. Thoroughly clean the surface with a suitable solvent, for example, ethanol. Dry each test specimens in the drying oven (5.3) maintained over (105 ± 5) °C during at least 2 h, and then, cool them until they reach room temperature. Test specimens shall be tested not later than 3 h after they have reached room temperature.

If it is agreed to test tiles after abrasion (glazed and unglazed tiles), the samples shall be prepared according to the procedure specified in ISO 10545-7.The abrasion stage (cycles or revolutions) should be agreed by the parties concerned.

7 Procedure

7.1 Application of the staining agent

Spread three or four drops of the paste (4.1.1 or 4.1.2) on the proper surface. Allow three or four drops of each of the liquids (4.2.1 and 4.3.1) to cover separate areas of the test surface. Place a convex watch glass with a diameter of approximately 30 mm (convex side down) on the applied drops, in order to spread them to an approximately circular area. Leave staining agents and the watch glass in place for 24 h.

7.2 Attempts to remove stains

Subject the test specimens, treated according to 7.1, successively to the cleaning procedures described in 5.2 (procedures A, B, C, and D).

After each cleaning procedure, dry the test specimens in the oven maintained over (105 ± 5) °C during at least 2 h and subject them to a visual examination. Examine the surface with the naked eye or with spectacles, if usually worn, at a distance of 25 cm to 30 cm in artificial illumination minimum of 300 Ix.

In the case of stains listed in 4.1, staining shall only be reported when the pigment is visible. If there is no visible effect, i.e. if the stain has been removed, record the cleanability class according to Figure 1; if the stain is not removed, proceed to the following cleaning procedure.

8 Classification of results

In consequence of the procedure described in 7.1 and 7.2, ceramic surfaces are divided into five classes given in Figure 1.

Record the result for each test specimen (unabraded and, if agreed, after abrasion) with each staining agent.

Class 5 corresponds to the greatest ease of removing the particular stain; class 1 corresponds to the impossibility of removing the particular stain with any of the test procedures and/or to irreversible damage of the proper surface.

9 Test report

The test report shall include the following information:

a) reference to this part of ISO 10545, i.e. ISO 10545-14;

b) description of the tiles;

c) the staining and cleaning agents;

d) the classification for each test specimen and for each staining agent (unabraded and, if agreed, after abrasion), according to Figure 1.

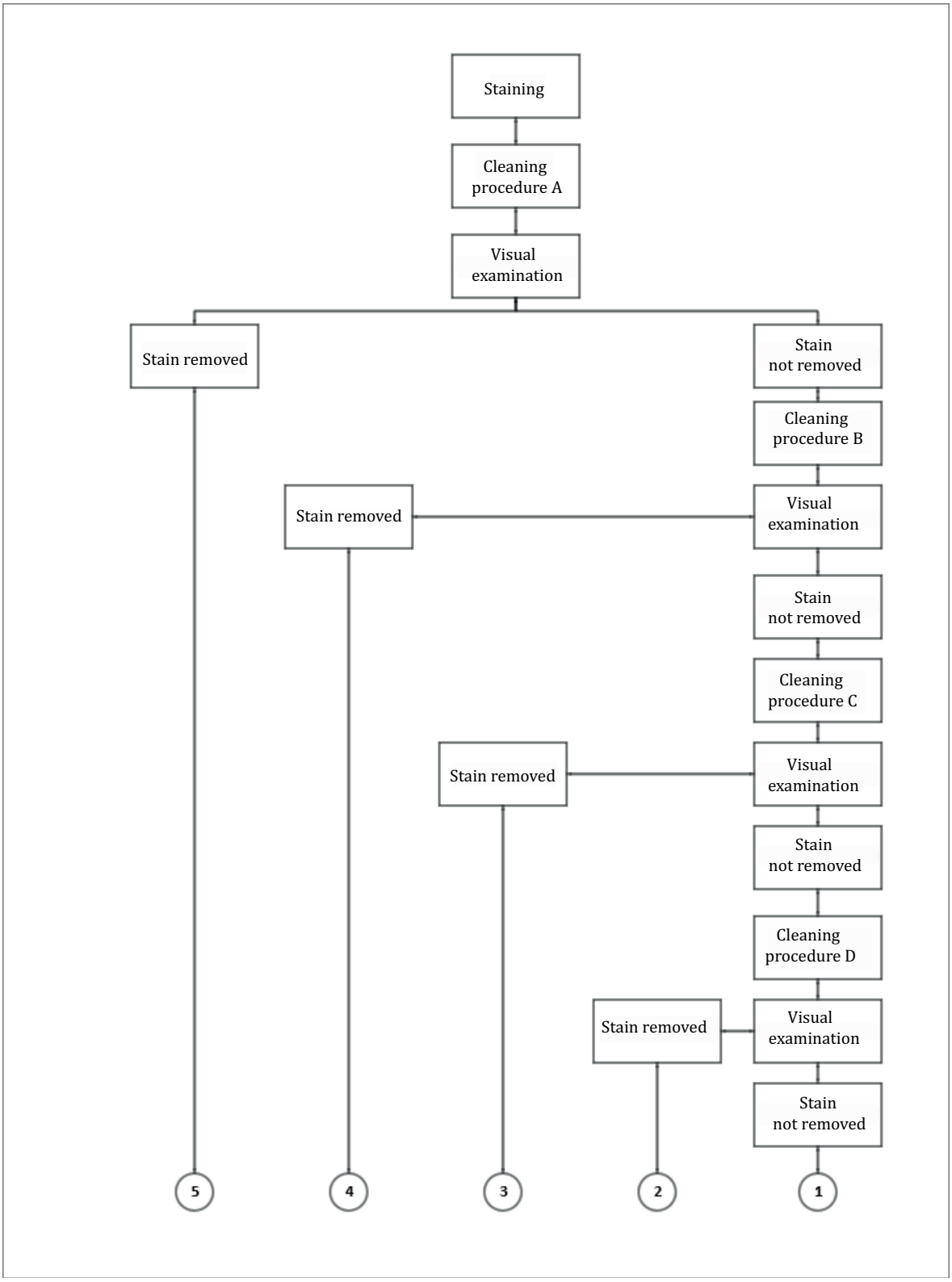

Figure 1 — Classification of the results of the stain resistance test

Annex A
(normative)

Specifications for "green staining agent in light oil"

A.1 Green staining agent (chrome green)

Formula Cr_2O_3

Typical grain size distribution:

% <	µm
10,0	0,5
29,2	1,0
43,7	2,0
50,0	3,0
66,3	5,0
78,8	10,0
89,6	20,0
93,0	32,0
97,4	64,0
100,0	96,0

A.2 Light oil

An oil composed of an ester of glycerol and organic acid(s). The relative molecular mass of the ester is in the range of 300 to 500.

Two examples are as follows:

a) propanetriol monodecanoate dioctanoate (the preferred common name is glyceryl monocaprate dicaprylate). The trade name is Myritol 318[2)], obtainable from Henkel KGaA, D4000 Dusseldorf 1, Germany;

b) propanetriol tributanoate (alternative common names are glyceryl tributyrate and tributyrin, obtainable from chemical laboratory suppliers).

A.3 Test paste

The test paste contains 40 % (*m/m*) of Cr_2O_3. The paste shall be mixed in such a way as to ensure complete dispersion.

2) This information is given for the convenience of users of this part of ISO 10545 and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Annex B
(normative)

Specifications for "red staining agent in light oil"

B.1 Red staining agent

Formula Fe_2O_3

Typical grain size distribution:

% <	µm
51,3	1,0
53,9	2,0
71,0	5,0
82,2	10,0
88,3	15,0
88,8	20,0
96,5	25,0
96,5	41,0
100,0	64,0

B.2 Light oil

An oil composed of an ester of glycerol and organic acid(s). The relative molecular mass of the ester is in the range of 300 to 500.

Two examples are as follows:

a) propanetriol monodecanoate dioctanoate (the preferred common name is glyceryl monocaprate dicaprylate). The trade name is Myritol 318[3)], obtainable from Henkel KGaA, D4000 Dusseldorf 1, Germany;

b) propanetriol tributanoate (alternative common names are glyceryl tributyrate and tributyrin, obtainable from chemical laboratory suppliers).

B.3 Test paste

The test paste contains 40 % (*m/m*) of Fe_2O_3. The paste shall be mixed in such a way as to ensure complete dispersion.

3) This information is given for the convenience of users of this part of ISO 10545 and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Annex C
(normative)

Example of preparation of test solutions

Table C.1 — Example of preparation of test solution

Test solution	Reagent source	Amount of reagent required for test solution	Distilled water required for test solution
Hydrochloric acid solution 3 % (v/v)	38 % hydrochloric acid	30 ml	970 ml
Potassium hydroxide solution, 200 g/l	90 % potassium hydroxide	222 g	Required to prepare 1 l of test solution

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