



SLOVENSKI STANDARD SIST EN 14411:2007

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Ceramic tiles - Definitions, classification, characteristics and marking

Keramische Fliesen und Platten - Begriffe, Klassifizierung, Gütemerkmale und Kennzeichnung

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Carreaux céramiques - Définitions, classification, caractéristiques et marquage

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Ta slovenski standard je istoveten z: EN 14411:2006

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ICS:

91.100.23 S^|æ ã}^Á || z æ^ Ceramic tiles

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English Version

Ceramic tiles - Definitions, classification, characteristics and marking

Carreaux et dalles céramiques - Définitions, classification, caractéristiques et marquage

Keramische Fliesen und Platten - Begriffe, Klassifizierung, Güteermkmale und Kennzeichnung

This European Standard was approved by CEN on 13 November 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 14411:2006) has been prepared by 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of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Test methods for determination of Impact resistance, release of lead and cadmium and small colour differences are now listed but no requirements are specified.

This document supersedes EN 14411:2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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1 Scope

This European Standard defines and gives terms, specifies requirements and marking criteria for ceramic tiles (produced by extrusion and dry-pressing techniques) of the best commercial quality (first quality).

Tiles not of first commercial quality are also covered following the provisions of Annex Q.

This European Standard does not cover tiles made by other than the normal processes of extrusion or dry-pressing nor decorative accessories or trim (such as edges, corners, skirting, capping, coves, beads, steps, curved tiles and other accessory pieces) or mosaics (i.e. any piece that can fit into a 7 cm × 7 cm area, see custom nomenclature).

NOTE EN ISO 10545 describes the test procedures required to determine the product characteristics listed in this European Standard. EN ISO 10545 is divided into parts, each describing a specific test procedure or related matter.

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.

EN 12004, *Adhesives for tiles — Definitions and specifications*

EN ISO 10545-1, *Ceramic tiles — Part 1: Sampling and basis for acceptance (ISO 10545-1:1995)*

EN ISO 10545-2, *Ceramic tiles — Part 2: Determination of dimensions and surface quality (ISO 10545-2:1995, including Technical Corrigendum 1:1997)*

EN ISO 10545-3, *Ceramic tiles — Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density (ISO 10545-3:1995, including Technical Corrigendum 1:1997)*

EN ISO 10545-4, *Ceramic tiles — Part 4: Determination of modulus of rupture and breaking strength (ISO 10545-4:1995)*

EN ISO 10545-5, *Ceramic tiles — Part 5: Determination of impact resistance by measurement of coefficient of restitution (ISO 10545-5:1996, including Technical Corrigendum 1:1996)*

EN ISO 10545-6, *Ceramic tiles — Part 6: Determination of resistance to deep abrasion for unglazed tiles (ISO 10545-6:1995)*

EN ISO 10545-7, *Ceramic tiles — Part 7: Determination of resistance to surface abrasion for glazed tiles (ISO 10545-7:1996)*

EN ISO 10545-8, *Ceramic tiles — Part 8: Determination of linear thermal expansion (ISO 10545-8:1994)*

EN ISO 10545-9, *Ceramic tiles — Part 9: Determination of resistance to thermal shock (ISO 10545-9:1994)*

EN ISO 10545-10, *Ceramic tiles — Part 10: Determination of moisture expansion (ISO 10545-10:1995)*

EN ISO 10545-11, *Ceramic tiles — Part 11: Determination of crazing resistance for glazed tiles (ISO 10545-11:1994)*

EN ISO 10545-12, *Ceramic tiles — Part 12: Determination of frost resistance (ISO 10545-12:1995, including Technical Corrigendum 1:1997)*

EN ISO 10545-13, *Ceramic tiles — Part 13: Determination of chemical resistance (ISO 10545-13:1995)*

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EN ISO 10545-14, *Ceramic tiles — Part 14: Determination of resistance to stains (ISO 10545-14:1995, including Technical Corrigendum 1:1997)*

EN ISO 10545-15, *Ceramic tiles — Part 15: Determination of lead and cadmium given off by glazed tiles (ISO 10545-15:1995)*

EN ISO 10545-16, *Ceramic tiles — Part 16: Determination of small colour differences (ISO 10545-16:1999)*

ISO 1006:1983, *Building construction — Modular coordination — Basic module*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1006:1983 and the following apply.

3.1

ceramic tile

slab made from clays and/or other inorganic raw materials

NOTE 1 Tiles are generally used as coverings for floors and walls. They are usually shaped by extruding (Method A) or dry-pressing (Method B) at room temperature followed by drying and firing at temperatures sufficient to develop the required properties, but can be formed by other processes. Tiles can be glazed (GL) or unglazed (UGL) and are incombustible and unaffected by light

NOTE 2 A fully vitrified (or porcelain) tile is a tile with water absorption lower than 0,5 %.

3.2

glaze

vitrified covering

3.3

engobed surface

clay-based covering with a matt finish which can be permeable or impermeable

NOTE A tile with an engobed surface is regarded as an unglazed tile.

3.4

polished surface

surface of a glazed or unglazed tile which has been given a glossy finish by mechanical polishing carried out after firing

3.5

extruded tile

tile whose body is shaped in the plastic state in an extruder, the column obtained being cut into tiles of pre-determined dimension

NOTE 1 This European Standard classifies extruded tiles as “precision” or “natural”. The classification is dependent upon the different technical characteristics as listed in the normative Annexes A to F and R.

NOTE 2 Traditional terms used for extruded products are “split tiles” and “quarry tiles”. They commonly indicate double-extruded and single-extruded tiles respectively. The term “quarry tiles” only refers to extruded tiles with a water absorption not exceeding 6 %.

NOTE 3 Extruded tiles include the letter ‘A’ in their designation (see Table 1).

3.6

dry-pressed tile

tile formed from a finely milled body mixture and shaped by pressing

NOTE Dry-pressed tiles include the letter 'B' in their designation (see Table 1)

3.7

spacer lug

projection which is located along certain edges of tiles so that when two tiles are placed together, in line, the lugs on adjacent edges separate the tiles by a distance not less than the specified width of the joint

NOTE 1 Lugs are positioned so that the joint between the tiles may be filled with grout without the lugs remaining exposed.

NOTE 2 Dry-pressed tiles may be made with other spacer lug systems and, in such cases, the manufacturer's work size applies.

NOTE 3 The use of spacer lugs are illustrated in Figure 2.

3.8

water absorption (symbol *E*)

percentage of water by mass, measured in accordance with EN ISO 10545-3

3.9

description of sizes

see Figures 1 and 2

NOTE These are only defined for rectangular tiles. If the sizes of non-rectangular tiles are required, they are defined by the smallest rectangle into which they will fit.

3.9.1

nominal size

size used to describe the product (standards.iteh.ai)

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3.9.2

work size (symbol *W*)

size of a tile specified for manufacturing to which the actual size has to conform within specified permissible deviations

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NOTE This is specified by the dimensions length, width and thickness.

3.9.3

actual size

size obtained by measuring the face of the tile in accordance with EN ISO 10545-2

3.9.4

coordinating size (symbol *C*)

work size plus the joint width

3.9.5

modular size

dimensions based on the modules M, and also their multiples or subdivisions, except for tiles with a surface area of less than 9 000 mm²

NOTE See ISO 1006 where 1 M = 100 mm.

3.9.6

non-modular size

size not based on module M

NOTE See ISO 1006 where 1 M = 100 mm.

3.9.7

tolerance

difference between the permissible limits

3.10 product group

ceramic tiles manufactured through a defined process (extrusion or dry pressing) and featuring a specific porosity or water absorption

3.11 family in a product group

ceramic tiles manufactured for which the test results of any one product within the family are valid for all other products within the family

NOTE Families can be defined in terms of body characteristics (same size and thickness) or surface finish characteristics (same glaze and/or decoration composition and properties).

4 Classification

4.1 Basis of classification

Ceramic tiles are divided into groups according to their method of manufacture and their water absorption (see 3.8 and Table 1). The groups do not presuppose the usage of the products.

Table 1 — Classification of ceramic tiles with respect to water absorption and shaping

Shaping	Group I $E \leq 3\%$	Group II _a $3\% < E \leq 6\%$	Group II _b $6\% < E \leq 10\%$	Group III $E > 10\%$
A Extruded	Group AI _a $E \leq 0,5\%$ (see Annex M)	Group AII _{a-1} ^a (see Annex B)	Group AII _{b-1} ^a (see Annex D)	Group AIII (see Annex F)
	Group AI _b $0,5\% < E \leq 3\%$ (see Annex A)	Group AII _{a-2} ^a (see Annex C)	Group AII _{b-2} ^a (see Annex E)	
B Dry pressed	Group BI _a $E \leq 0,5\%$ (see Annex G)	Group BII _a (see Annex J)	Group BII _b (see Annex K)	Group BIII ^b (see Annex L)
	Group BI _b $0,5\% < E \leq 3\%$ (see Annex H)			

^a Groups AII_a and AII_b are divided into two parts (Parts 1 and 2) with different product specifications.

^b Group BIII covers glazed tiles only. There is a low quantity of dry-pressed unglazed tiles produced with water absorption greater than 10 % that is not covered by this product group.

4.2 Methods of manufacture

There are two methods of manufacture as follows:

- method A, extruded tiles (see 3.5),
- method B, dry-pressed tiles (see 3.6).

4.3 Water absorption (E) groups

There are three water absorption groups as follows:

a) Tiles of low water absorption (Group I), $E \leq 3 \%$

Group I is further divided as follows:

a1) for extruded tiles:

- 1) $E \leq 0,5 \%$ (Group AI_a),
- 2) $0,5 \% < E \leq 3 \%$ (Group AI_b).

a2) for dry-pressed tiles:

- 3) $E \leq 0,5 \%$ (Group BI_a),
- 4) $0,5 \% < E \leq 3 \%$ (Group BI_b).

b) Tiles of medium water absorption (Group II), $3 \% < E \leq 10 \%$

Group II is further divided as follows:

b1) for extruded tiles:

- 1) $3 \% < E \leq 6 \%$ (Group AII_a, Parts 1 and 2);
- 2) $6 \% < E \leq 10 \%$ (Group AII_b, Parts 1 and 2);

b2) for dry-pressed tiles:

- 3) $3 \% < E \leq 6 \%$ Group BII_a,
- 4) $6 \% < E \leq 10\%$ Group BII_b.

c) Tiles of high water absorption (Group III), $E > 10 \%$

5 Characteristics

The characteristics for different applications of ceramic tiles are given in Table 2.

Table 2 — Characteristics required for different applications

Characteristics	Floors		Walls		Test
	Interior	Exterior	Interior	Exterior	Reference
Dimensions and surface quality					
Length and width	X	X	X	X	EN ISO 10545-2
Thickness	X	X	X	X	EN ISO 10545-2
Straightness of sides	X	X	X	X	EN ISO 10545-2
Rectangularity	X	X	X	X	EN ISO 10545-2
Surface flatness (curvature and warpage)	X	X	X	X	EN ISO 10545-2
Surface quality	X	X	X	X	EN ISO 10545-2
Physical properties					
Water absorption	X	X	X	X	EN ISO 10545-3
Breaking strength	X	X	X	X	EN ISO 10545-4
Modulus of rupture	X	X	X	X	EN ISO 10545-4
Resistance to deep abrasion – unglazed tiles	X	X			EN ISO 10545-6
Resistance to surface abrasion – glazed tiles	X	X			EN ISO 10545-7
Linear thermal expansion ^a	X	X	X	X	EN ISO 10545-8
Resistance to thermal shock ^a	X	X	X	X	EN ISO 10545-9
Resistance to crazing – glazed tiles	X	X	X	X	EN ISO 10545-11
Frost resistance ^b	X	X	X	X	EN ISO 10545-12
Coefficient of friction	X	X			Declare test method used
Moisture expansion ^a	X	X	X	X	EN ISO 10545-10
Small colour differences ^a	X	X	X	X	EN ISO 10545-16
Impact resistance ^a	X	X			EN ISO 10545-5
Chemical properties					
Resistance to staining					EN ISO 10545-14
— glazed tiles	X	X	X	X	EN ISO 10545-14
— unglazed tiles ^a	X	X	X	X	EN ISO 10545-14
Resistance to acids and alkalis of low concentration	X	X	X	X	EN ISO 10545-13
Resistance to acids and alkalis of high concentration ^a	X	X	X	X	EN ISO 10545-13
Resistance to household cleaning agents and swimming pool chemicals	X	X	X	X	EN ISO 10545-13
Lead and cadmium release – glazed tiles ^a	X	X	X	X	EN ISO 10545-15
^a Test method available, but this standard does not specify values.					
^b For tiles intended to be used in situations where frost conditions apply.					

6 Evaluation of conformity

6.1 General

For the purposes of testing (including FPC testing), ceramic tiles may be grouped into families where it is considered that the results for one or more characteristics from any one item in the family are representative for all items within that family of testing (a product may be in different families for different characteristics).

The conformity of a family of ceramic tiles with the requirements of this European Standard and with the stated values (including classes) shall be demonstrated by:

- initial type testing,
- factory production control by the manufacturer, including product assessment.

For these purposes, tests previously performed in accordance with the provisions of this European Standard (same product, same characteristic(s), test method, sampling procedure, system of attestation of conformity etc.) may be taken into account.

Where a manufacturer produces the same product on more than one production line or unit, or in more than one factory, and provided the production equipment and/or production line or unit, does not influence the performance declarations forming part of the CE marking, there is not need to repeat the ITT for these lines or various factories, the responsibility been of the manufacturer for ensuring that the products are indeed the same (according to Guidance Paper M, clause 4.12, published by the Commission on Conformity Assessment under the CPD).

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6.2 Initial type testing (standards.iteh.ai)

Initial type testing (ITT) shall be carried out to confirm that the characteristics of a family of products meet the requirements of the standard. Only one ITT is required where different manufacturing units are producing the same product, for the same manufacturer, using the same materials and documented production and process control.

All declared characteristics shall be subject to initial type testing, with the exception of reaction to fire (Decision 96/603/EEC).

The results of the ITT shall be recorded and be available for inspection for at least 10 years after the date of last production of the family to which they relate.

6.3 Factory production control

6.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market conform with the stated performance characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

NOTE An FPC system conforming with the requirements of EN ISO 9001, and made specific to the requirements of this standard, is considered to satisfy 6.3.2 to 6.3.4.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

6.3.2 Equipment

The manufacturer shall maintain and apply documented procedures to control, calibrate and maintain inspection, measuring and test equipment, used to demonstrate the conformance of product to the specified requirements. Equipment shall be used in a manner which ensures that measurement uncertainty is known and is consistent with the required measurement capability.

Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

6.3.3 Product testing and evaluation

The manufacturer shall carry out all final inspection and testing in accordance with the quality plan or documented procedures to complete the evidence of conformance of the finished product to the specified requirements.

The tests shall be carried out for each family of products according to the test methods and minimum frequency shown in Table 3. Indirect testing or the use of test methods different from those used for ITT is allowed, if a relationship between the FPC test method and the ITT method (e.g. controls carried out on the production line) is established, which ensures the conformity of the product to the specified requirements.

NOTE Whenever practicable, the repetition of tests on the same item of the family shall be avoided, in order to check as many different products as possible among the items manufactured during the control period.

6.3.4 Inspection and test records

The manufacturer shall maintain records in order to be able to prove that a product or a family in a group of products have been inspected and/or tested. The records shall contain, as a minimum, product description or of the family in a group of products, date of manufacture, test method, test results, date of test and compliance criteria.

These records shall show clearly whether the product has passed or failed the inspections and/or tests according to defined acceptance criteria.

Inspection and test records shall be maintained for a minimum of one year; test records on finished product shall be maintained for ten years.

Table 3 — Test methods and minimum frequency

Property	Test method	Requirement	Number of samples	Min. frequency of tests
Reaction to fire	Decision 96/603/EEC	Class A1/A _{1fl} without testing	--	--
Breaking strength, flexural tensile strength ^b	EN ISO 10545-4	See Tables A.1 to L.1 and R.1	7	Once a year
Slipperiness ^c		Declared value	As required by test method used	Once a year
Skid resistance ^c		Declared value	As required by test method used	Once a year
Thermal shock resistance ^a	EN ISO 10545-9	See Tables A.1 to L.1 and R.1	5	Once a year
Frost resistance, freeze/thaw ^a	EN ISO 10545-12	See Tables A.1 to L.1 and R.1	10	Once a year
Bond strength/adhesion ^a		a) For cementitious adhesives, EN 12004 b) For dispersion adhesives, EN 12004 c) For reaction resin adhesives, EN 12004	See EN 12004	Once per product group
Release of dangerous substances ^c	EN ISO 10545-15	See Annex Q		Once a year

^a Testing for a product group.

^b Testing for a family in a group of products (group of absorption, dimensions and thickness).

^c Testing for a family in a group of products (finish surface characteristics, same composition and properties).

7 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in EN ISO 10545-1. The control frequencies for the evaluation of conformity as regard the characteristics shall be stated and declared by the manufacturer, taking into account the production organisation.

8 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be as given in the specific annex (Annexes A through L and R) for each tile group (see contents).