

# Ceramic tiles — Definitions, classification, characteristics and marking

The European Standard EN 14411:2006 has the status of a  
British Standard

ICS 91.100.25

## National foreword

This British Standard was published by BSI. It is the UK implementation of EN 14411:2006. It supersedes BS EN 14411:2003 which is withdrawn.

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A list of organizations represented on B/539 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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## Ceramic tiles - Definitions, classification, characteristics and marking

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

Keramische Fliesen und Platten - Begriffe, Klassifizierung, Güteermale 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.

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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## EN 14411:2006 (E)

### 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of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.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.

## 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

#### 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

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 mm<sup>2</sup>

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

**EN 14411:2006 (E)****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 <sub>a</sub> $3 \% < E \leq 6 \%$	Group II <sub>b</sub> $6 \% < E \leq 10 \%$	Group III $E > 10 \%$
<b>A</b> Extruded	Group AI <sub>a</sub> $E \leq 0,5 \%$ (see Annex M)	Group AII <sub>a-1</sub> <sup>a</sup> (see Annex B)	Group AII <sub>b-1</sub> <sup>a</sup> (see Annex D)	Group AIII (see Annex F)
	Group AI <sub>b</sub> $0,5 \% < E \leq 3 \%$ (see Annex A)	Group AII <sub>a-2</sub> <sup>a</sup> (see Annex C)	Group AII <sub>b-2</sub> <sup>a</sup> (see Annex E)	
<b>B</b> Dry pressed	Group BI <sub>a</sub> $E \leq 0,5 \%$ (see Annex G)	Group BII <sub>a</sub> (see Annex J)	Group BII <sub>b</sub> (see Annex K)	Group BIII <sup>b</sup> (see Annex L)
	Group BI <sub>b</sub> $0,5 \% < E \leq 3 \%$ (see Annex H)			

<sup>a</sup> Groups AII<sub>a</sub> and AII<sub>b</sub> are divided into two parts (Parts 1 and 2) with different product specifications.

<sup>b</sup> 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<sub>a</sub>),
- 2)  $0,5 \% < E \leq 3 \%$  (Group AI<sub>b</sub>).

a2) for dry-pressed tiles:

- 3)  $E \leq 0,5 \%$  ( Group BI<sub>a</sub>),
- 4)  $0,5 \% < E \leq 3 \%$  ( Group BI<sub>b</sub>).

#### 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<sub>a</sub>, Parts 1 and 2),
- 2)  $6 \% < E \leq 10 \%$  (Group AII<sub>b</sub>, Parts 1 and 2);

b2) for dry-pressed tiles:

- 3)  $3 \% < E \leq 6 \%$  Group BII<sub>a</sub>,
- 4)  $6 \% < E \leq 10\%$  Group BII<sub>b</sub>.

#### 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.

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Table 2 — Characteristics required for different applications

Characteristics	Floors		Walls		Test
Dimensions and surface quality	Interior	Exterior	Interior	Exterior	Reference
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	Interior	Exterior	Interior	Exterior	Reference
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 <sup>a</sup>	X	X	X	X	EN ISO 10545-8
Resistance to thermal shock <sup>a</sup>	X	X	X	X	EN ISO 10545-9
Resistance to crazing – glazed tiles	X	X	X	X	EN ISO 10545-11
Frost resistance <sup>b</sup>		X		X	EN ISO 10545-12
Coefficient of friction	X	X			Declare test method used
Moisture expansion <sup>a</sup>	X	X	X	X	EN ISO 10545-10
Small colour differences <sup>a</sup>	X	X	X	X	EN ISO 10545-16
Impact resistance <sup>a</sup>	X	X			EN ISO 10545-5
Chemical properties	Interior	Exterior	Interior	Exterior	Reference
Resistance to staining					EN ISO 10545-14
— glazed tiles	X	X	X	X	EN ISO 10545-14
— unglazed tiles <sup>a</sup>	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 <sup>a</sup>	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 <sup>a</sup>	X	X	X	X	EN ISO 10545-15
<sup>a</sup> Test method available, but this standard does not specify values.					
<sup>b</sup> 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).

### 6.2 Initial type testing

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.

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### 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/A1 <sub>fl</sub> without testing	--	--
Breaking strength, flexural tensile strength <sup>b</sup>	EN ISO 10545-4	See Tables A.1 to L.1 and R.1	7	Once a year
Slipperiness <sup>c</sup>		Declared value	As required by test method used	Once a year
Skid resistance <sup>c</sup>		Declared value	As required by test method used	Once a year
Thermal shock resistance <sup>a</sup>	EN ISO 10545-9	See Tables A.1 to L.1 and R.1	5	Once a year
Frost resistance, freeze/thaw <sup>a</sup>	EN ISO 10545-12	See Tables A.1 to L.1 and R.1	10	Once a year
Bond strength/adhesion <sup>a</sup>		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 <sup>c</sup>	EN ISO 10545-15	See Annex Q		Once a year
<sup>a</sup> Testing for a product group. <sup>b</sup> Testing for a family in a group of products (group of absorption, dimensions and thickness). <sup>c</sup> 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).

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### 9 Marking and specifications

Tiles and/or their packaging shall bear the following marking:

- 1) manufacturer's mark and/or trademark and the country of origin;
- 2) mark to indicate first quality;
- 3) reference to the appropriate annex of this European Standard, i.e. EN 14411:2006 and classification ("Precision" or "Natural"), where applicable;
- 4) nominal and work sizes;
- 5) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

#### EXAMPLES

Ceramic tile 1<sup>ST</sup> quality EN 14411, Annex A, Precision

25 cm x 12,5 cm (W 240 mm x 115 mm x 10 mm) GL

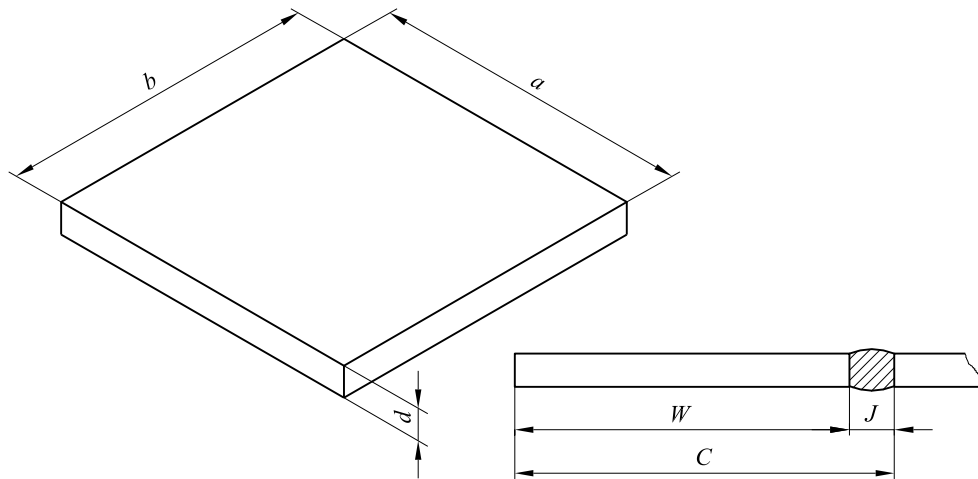
Ceramic tile 1<sup>ST</sup> quality EN 14411, Annex A, Natural

15 cm x 15 cm (W 150 mm x 150 mm x 12 mm) UGL

### 10 Ordering

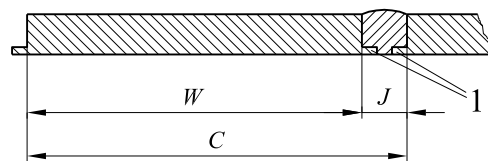
When an order is placed, items such as size, thickness, type of surface, colour, profile, abrasion class for glazed tiles and other properties shall be agreed by the parties concerned.



**Key**

coordinating size ( $C$ ) = work size ( $W$ ) + joint ( $J$ )

work size ( $W$ ) dimension of the visible face ( $a$ ), ( $b$ ) and thickness ( $d$ )

**Figure 1 — Tile****Key**

1 spacer lugs

coordinating size ( $C$ ) = work size ( $W$ ) + joint ( $J$ )

work size ( $W$ ) dimension of the visible face ( $a$ ), ( $b$ ) and thickness ( $d$ )

**Figure 2 — Tile with spacer lug**

## Annex A (normative)

### Extruded ceramic tiles $0,5 < E \leq 3 \%$ Group AI<sub>b</sub>

#### A.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table A.1.

**Table A.1 — Requirements for extruded ceramic tiles, Group AI<sub>b</sub>,  $0,5 < E \leq 3 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm<sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 1,0 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides<sup>b</sup></b> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,5 \%$	$\pm 0,6 \%$	EN ISO 10545-2

Table A.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 0,8 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass	$0,5 < E \leq 3,0 \%$ Individual maximum 3,3 %	$0,5 < E \leq 3,0 \%$ Individual maximum 3,3 %	EN ISO 10545-3
<b>Breaking strength, in N</b>			
a) Thickness $\geq 7,5$ mm.	Not less than 1 100	Not less than 1 100	EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 600	Not less than 600	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 23 Individual minimum 18	Minimum 23 Individual minimum 18	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 275	Maximum 275	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion</b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance</b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required	Required	EN ISO 10545-11
<b>Frost resistance</b>	Required	Required	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

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Table A.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles.	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis:			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .			
Resistance to high concentrations of acids and alkalis <sup>e</sup>	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts:			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .			
<b>Lead and cadmium release</b>	Test method available	Test method available	EN ISO 10545-15

<sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.

<sup>b</sup> Not applicable for tiles having curved shapes.

<sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.

<sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.

<sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".

<sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.

<sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.

## Annex B (normative)

### Extruded ceramic tiles $3 \% < E \leq 6 \%$ Group AII<sub>a</sub> — Part 1

#### B.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table B.1.

**Table B.1 — Requirements for extruded ceramic tiles, Group AII<sub>a-1</sub>,  $3 \% < E \leq 6 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm <sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 1,25 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides <sup>b</sup></b> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,5 \%$	$\pm 0,6 \%$	EN ISO 10545-2

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Table B.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 0,8 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	EN ISO 10545-3
<b>Breaking strength, in N</b>			
a) Thickness $\geq 7,5$ mm.	Not less than 950	Not less than 950	EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 600	Not less than 600	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 20 Individual minimum 18	Minimum 20 Individual minimum 18	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 393	Maximum 393	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required	Required	EN ISO 10545-11
<b>Frost resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

Table B.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis:			
a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts:			
a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release <sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-15
<p><sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.</p> <p><sup>b</sup> Not applicable for tiles having curved shapes.</p> <p><sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.</p> <p><sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.</p> <p><sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".</p> <p><sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.</p> <p><sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.</p>			

## Annex C (normative)

### Extruded ceramic tiles $3 \% < E \leq 6 \%$ Group AII<sub>a</sub> — Part 2

#### C.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table C.1.

**Table C.1 — Requirements for extruded ceramic tiles, Group AII<sub>a-2</sub>,  $3 \% < E \leq 6 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm <sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 1,5 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides</b> <sup>b</sup> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2



Table C.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	EN ISO 10545-3
<b>Breaking strength, in N</b>			
a) Thickness $\geq 7,5$ mm.	Not less than 800	Not less than 800	EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 600	Not less than 600	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 13 Individual minimum 11	Minimum 13 Individual minimum 11	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 541	Maximum 541	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance: glazed tiles<sup>f</sup></b>	Required	Required	EN ISO 10545-11
<b>Frost resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

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Table C.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup>	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release <sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-15
<sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes. <sup>b</sup> Not applicable for tiles having curved shapes. <sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect. <sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. <sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available". <sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable. <sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.			

## Annex D (normative)

### Extruded ceramic tiles $6 \% < E \leq 10 \%$ Group AII<sub>b</sub> — Part 1

#### D.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table D.1.

**Table D.1 — Requirements for extruded ceramic tiles, Group AII<sub>b-1</sub>,  $6 \% < E \leq 10 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm<sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 2,0 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides</b> <sup>b</sup> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2

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Table D.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass	$6 \% < E \leq 10 \%$ Individual maximum 11 %	$6 \% < E \leq 10 \%$ Individual maximum 11 %	EN ISO 10545-3
<b>Breaking strength, in N</b>	Not less than 900	Not less than 900	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 17,5 Individual minimum 15	Minimum 17,5 Individual minimum 15	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 649	Maximum 649	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required	Required	EN ISO 10545-11
<b>Frost resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

Table D.1 (concluded)

Dimensions and surface quality	Precision	Natural	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release <sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-15
<sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes. <sup>b</sup> Not applicable for tiles having curved shapes. <sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect. <sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. <sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available". <sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable. <sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.			

## Annex E (normative)

### Extruded ceramic tiles $6 \% < E \leq 10 \%$ Group AII<sub>b</sub> — Part 2

#### E.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table E.1.

**Table E.1 — Requirements for extruded ceramic tiles, Group AII<sub>b-2</sub>,  $6 \% < E \leq 10 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm<sup>a</sup>;</p> <p>b) or non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 2,0 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides</b> <sup>b</sup> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2

Table E.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass	$6 \% < E \leq 10 \%$ Individual maximum 11 %	$6 \% < E \leq 10 \%$ Individual maximum 11 %	EN ISO 10545-3
<b>Breaking strength, in N</b>	Not less than 750	Not less than 750	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 9 Individual minimum 8	Minimum 9 Individual minimum 8	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 1 062	Maximum 1 062	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance: glazed tiles<sup>f</sup></b>	Required	Required	EN ISO 10545-11
<b>Frost resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

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Table E.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release <sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-15
<sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes. <sup>b</sup> Not applicable for tiles having curved shapes. <sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect. <sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. <sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available". <sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable. <sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.			



## Annex F (normative)

### Extruded ceramic tiles $E > 10 \%$ Group AIII

#### F.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table F.1.

**Table F.1 — Requirements for extruded ceramic tiles, Group AIII,  $E > 10 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm <sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 2,0 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides</b> <sup>b</sup> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2

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Table F.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass	$E > 10 \%$	$E > 10 \%$	EN ISO 10545-3
<b>Breaking strength, in N</b>	Not less than 600	Not less than 600	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 8 Individual minimum 7	Minimum 8 Individual minimum 7	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 2 365	Maximum 2 365	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance: glazed tiles<sup>f</sup></b>	Required	Required	EN ISO 10545-11
<b>Frost resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

Table F.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release <sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-15
<p><sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.</p> <p><sup>b</sup> Not applicable for tiles having curved shapes.</p> <p><sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.</p> <p><sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.</p> <p><sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".</p> <p><sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.</p> <p><sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.</p>			

## Annex G (normative)

### Dry-pressed ceramic tiles with low water absorption

$$E \leq 0,5 \%$$

**Group BI<sub>a</sub>**

#### G.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table G.1.

**Table G.1 — Requirements for dry-pressed ceramic tiles with low water absorption, Group BI<sub>a</sub>,  
 $E \leq 0,5 \%$**

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Length and width</b> The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 2 mm and 5 mm <sup>a</sup> ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. $\pm 5$ mm). The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size ( $W$ ).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Thickness</b>					
a) The thickness shall be specified by the manufacturer.					
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	EN ISO 10545-2
<b>Straightness of sides <sup>b</sup></b> (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2

Table G.1 (continued)

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Rectangularity<sup>b</sup></b>					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	EN ISO 10545-2
<b>Surface flatness</b>					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				EN ISO 10545-2
<b>Physical properties</b>	<b>Requirements</b>				<b>Test</b>
<b>Water absorption</b> Percent by mass <sup>h</sup>	$\leq 0,5 \%$ Individual maximum 0,6 %				EN ISO 10545-3
<b>Breaking strength, in N</b>					
a) Thickness $\geq 7,5$ mm.	Not less than 1 300				EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 700				EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 35 Individual minimum 32				EN ISO 10545-4
<b>Abrasion resistance</b>					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 175				EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed				EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>					
From ambient temperature to 100 °C.	Test method available				EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available				EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required				EN ISO 10545-11

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Table G.1 (concluded)

Physical properties	Requirements	Test
<b>Frost resistance</b>	Required	EN ISO 10545-12
<b>Coefficient of friction</b>		
Tiles intended for use on floors.	Where required	Declare test method(s)
<b>Moisture expansion, in mm/m<sup>e</sup></b>	Test method available	EN ISO 10545-10
<b>Small colour differences<sup>e</sup></b>	Test method available	EN ISO 10545-16
<b>Impact resistance<sup>e</sup></b>	Test method available	EN ISO 10545-5
Chemical properties		Test
<b>Resistance to staining</b>		
a) Glazed tiles	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup>	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>		
Resistance to low concentrations of acids and alkalis:		
a) glazed tiles;	Manufacturer to state classification	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts:		
a) glazed tiles;	Minimum GB	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .	Minimum UB	
<b>Lead and cadmium release<sup>e</sup></b>	Test method available	EN ISO 10545-15

<sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.

<sup>b</sup> Not applicable for tiles having curved shapes.

<sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.

<sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.

<sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".

<sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.

<sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.

<sup>h</sup> A fully vitrified tile is a tile with water absorption of a maximum individual value of 0,5 % (sometimes described as impervious).

## Annex H (normative)

### Dry-pressed ceramic tiles with low water absorption $0,5 \% < E \leq 3 \%$ Group BI<sub>b</sub>

#### H.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table H.1.

**Table H.1 — Requirements for dry-pressed ceramic tiles with low water absorption,  
Group BI<sub>b</sub>,  $0,5 \% < E \leq 3 \%$**

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Length and width</b>					
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 2 mm and 5 mm <sup>a</sup> ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. $\pm 5$ mm).  The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size ( $W$ ).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Thickness</b>					
a) The thickness shall be specified by the manufacturer.					
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	EN ISO 10545-2
<b>Straightness of sides</b> <sup>b</sup> (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2

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Table H.1 (continued)

Dimensions and surface quality	Surface $S$ of the product ( $\text{cm}^2$ )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Rectangularity<sup>b</sup></b>					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	EN ISO 10545-2
<b>Surface flatness</b>					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				EN ISO 10545-2
<b>Physical properties</b>	<b>Requirements</b>				<b>Test</b>
<b>Water absorption</b> Percent by mass	$0,5 \% < E \leq 3 \%$ Individual maximum 3,3 %				EN ISO 10545-3
<b>Breaking strength, in N</b>					
a) Thickness $\geq 7,5$ mm.	Not less than 1 100				EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 700				EN ISO 10545-4
<b>Modulus of rupture, in <math>\text{N/mm}^2</math></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 30 Individual minimum 27				EN ISO 10545-4
<b>Abrasion resistance</b>					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 175				EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed				EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>					
From ambient temperature to $100\text{ }^\circ\text{C}$ .	Test method available				EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available				EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required				EN ISO 10545-11



Table H.1 (concluded)

Physical properties	Requirements	Test
<b>Frost resistance</b>	Required	EN ISO 10545-12
<b>Coefficient of friction</b>		
Tiles intended for use on floors.	Where required	Declare test method(s)
<b>Moisture expansion, in mm/m <sup>e</sup></b>	Test method available	EN ISO 10545-10
<b>Small colour differences <sup>e</sup></b>	Test method available	EN ISO 10545-16
<b>Impact resistance <sup>e</sup></b>	Test method available	EN ISO 10545-5
Chemical properties	Requirements	Test
<b>Resistance to staining</b>		
a) Glazed tiles.	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>		
Resistance to low concentrations of acids and alkalis: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification Manufacturer to state classification	EN ISO 10545-13 EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release <sup>e</sup></b>	Test method available	EN ISO 10545-15
<p><sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.</p> <p><sup>b</sup> Not applicable for tiles having curved shapes.</p> <p><sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.</p> <p><sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.</p> <p><sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".</p> <p><sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.</p> <p><sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.</p>		

## Annex J (normative)

### Dry-pressed ceramic tiles $3 \% < E \leq 6 \%$ Group BII<sub>a</sub>

#### J.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table J.1.

**Table J.1 — Requirements for dry-pressed ceramic tiles, Group BII<sub>a</sub>,  $3 \% < E \leq 6 \%$**

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Length and width</b> The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 2 mm and 5 mm <sup>a</sup> ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. $\pm 5$ mm). The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size ( $W$ ).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Thickness</b>					
a) The thickness shall be specified by the manufacturer.					
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	EN ISO 10545-2
<b>Straightness of sides<sup>b</sup></b> (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2

Table J.1 (continued)

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Rectangularity<sup>b</sup></b>					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	EN ISO 10545-2
<b>Surface flatness</b>					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				EN ISO 10545-2
<b>Physical properties</b>	<b>Requirements</b>				<b>Test</b>
<b>Water absorption</b> Percent by mass <sup>d</sup>	$3 \% < E \leq 6 \%$ Individual maximum 6,5 %				EN ISO 10545-3
<b>Breaking strength, in N</b>					
a) Thickness $\geq 7,5$ mm.	Not less than 1 000				EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 600				EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 22 Individual minimum 20				EN ISO 10545-4
<b>Abrasion resistance</b>					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 345				EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed				EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>					
From ambient temperature to 100 °C.	Test method available				EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available				EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required				EN ISO 10545-11

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Table J.1 (concluded)

Physical properties	Requirements	Test
<b>Frost resistance</b> <sup>e</sup>	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>		
Tiles intended for use on floors.	Where required	Declare test method(s)
<b>Moisture expansion, in mm/m</b> <sup>e</sup>	Test method available	EN ISO 10545-10
<b>Small colour differences</b> <sup>e</sup>	Test method available	EN ISO 10545-16
<b>Impact resistance</b> <sup>e</sup>	Test method available	EN ISO 10545-5
Chemical properties		Test
<b>Resistance to staining</b>		
a) Glazed tiles.	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>		
Resistance to low concentrations of acids and alkalis:		
a) glazed tiles;	Manufacturer to state classification	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts:		
a) glazed tiles;	Minimum GB	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .	Minimum UB	
<b>Lead and cadmium release</b> <sup>e</sup>	Test method available	EN ISO 10545-15
<sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes. <sup>b</sup> Not applicable for tiles having curved shapes. <sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect. <sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. <sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available". <sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable. <sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.		

## Annex K (normative)

### Dry-pressed ceramic tiles $6 \% < E \leq 10 \%$ Group BII<sub>b</sub>

#### K.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table K.1.

**Table K.1 — Requirements for dry-pressed ceramic tiles, Group BII<sub>b</sub>,  $6 \% < E \leq 10 \%$**

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
<b>Length and width</b>					
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 2 mm and 5 mm <sup>a</sup> ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. $\pm 5$ mm).  The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size ( $W$ ).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Thickness</b>					
a) The thickness shall be specified by the manufacturer.					
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	EN ISO 10545-2
<b>Straightness of sides <sup>b</sup></b> (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2

## EN 14411:2006 (E)

Table K.1 (continued)

Dimensions and surface quality	Surface $S$ of the product (cm <sup>2</sup> )				Test
	$S \leq 90$	$90 < S \leq 90$	$190 < S \leq 410$	$S > 410$	
<b>Rectangularity<sup>b</sup></b>					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	EN ISO 10545-2
<b>Surface flatness</b>					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				EN ISO 10545-2
<b>Physical properties</b>	<b>Requirements</b>				<b>Test</b>
<b>Water absorption</b> Percent by mass	$6 \% < E \leq 10 \%$ Individual maximum 11 %				EN ISO 10545-3
<b>Breaking strength, in N</b>					
a) Thickness $\geq 7,5$ mm.	Not less than 800				EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 500				EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 18 Individual minimum 16				EN ISO 10545-4
<b>Abrasion resistance</b>					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 540				EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed				EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>					
From ambient temperature to 100 °C.	Test method available				EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available				EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required				EN ISO 10545-11

Table K.1 (concluded)

Physical properties		Test
<b>Frost resistance</b> <sup>e</sup>	Test method available	EN ISO 10545-12
<b>Coefficient of friction</b>		
Tiles intended for use on floors.	Where required	Declare test method(s)
<b>Moisture expansion, in mm/m</b> <sup>e</sup>	Test method available	EN ISO 10545-10
<b>Small colour differences</b> <sup>e</sup>	Test method available	EN ISO 10545-16
<b>Impact resistance</b> <sup>e</sup>	Test method available	EN ISO 10545-5
Chemical properties		Test
<b>Resistance to staining</b>		
a) Glazed tiles.	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles <sup>e</sup> .	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>		
Resistance to low concentrations of acids and alkalis:		
a) glazed tiles;	Manufacturer to state classification	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts:		
a) glazed tiles;	Minimum GB	EN ISO 10545-13
b) unglazed tiles <sup>g</sup> .	Minimum UB	
<b>Lead and cadmium release</b> <sup>e</sup>	Test method available	EN ISO 10545-15
<p><sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.</p> <p><sup>b</sup> Not applicable for tiles having curved shapes.</p> <p><sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.</p> <p><sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.</p> <p><sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".</p> <p><sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.</p> <p><sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.</p>		

## Annex L (normative)

### Dry-pressed ceramic tiles $E > 10 \%$ Group BIII

#### L.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table L.1.

**Table L.1 — Requirements for dry-pressed ceramic tiles, Group BIII,  $E > 10 \%$**

Dimensions and surface quality	Non-spacer	Spacer	Test
<b>Length (<math>l</math>) and width (<math>w</math>)</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 1,5 mm and 5 mm <sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 2</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>) <sup>g</sup>.</p>	$l \leq 12$ cm: $\pm 0,75 \%$ $l > 12$ cm: $\pm 0,50 \%$	$+ 0,6 \%$ $- 0,3 \%$	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides) <sup>g</sup> .	$l \leq 12$ cm: $\pm 0,5 \%$ $l > 12$ cm: $\pm 0,3 \%$	$\pm 0,25 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides</b> <sup>b</sup> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,3 \%$	$\pm 0,3 \%$	EN ISO 10545-2



Table L.1 (continued)

Dimensions and surface quality	Non-spacer	Spacer	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	± 0,5 %	± 0,3 %	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	+ 0,5 % - 0,3 %	+ 0,8 mm - 0,2 mm	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	+0,5 % - 0,3 %	+ 0,8 mm - 0,2 mm	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	± 0,5 %	0,5 mm for sizes ≤ 250 cm <sup>2</sup> 0,75 mm for sizes > 250 cm <sup>2</sup>	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Requirements		Test
<b>Water absorption</b> Percent by mass	Average > 10 %. When the average exceeds 20 %, this shall be indicated by the manufacturer Individual minimum value 9 %		EN ISO 10545-3
<b>Breaking strength, in N<sup>h</sup></b>			
a) Thickness ≥ 7,5 mm.	Not less than 600		EN ISO 10545-4
b) Thickness < 7,5 mm.	Not less than 200		EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength ≥ 3 000 N.			
a) Thickness ≥ 7,5 mm.	Minimum 12		EN ISO 10545-4
b) Thickness < 7,5 mm.	Minimum 15		EN ISO 10545-4
<b>Abrasion resistance</b>			
Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed		EN ISO 10545-7
<b>Coefficient of linear thermal expansion<sup>e</sup></b>			
From ambient temperature to 100 °C.	Test method available		EN ISO 10545-8
<b>Thermal shock resistance<sup>e</sup></b>	Test method available		EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required		EN ISO 10545-11
<b>Frost resistance</b>	Test method available		EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required		Declare test method(s)

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Table L.1 (concluded)

Physical properties	Requirements	Test
Moisture expansion, in mm/m <sup>e</sup>	Test method available	EN ISO 10545-10
Small colour differences <sup>e</sup>	Test method available	EN ISO 10545-16
Impact resistance <sup>e</sup>	Test method available	EN ISO 10545-5
Chemical properties	Requirements	Test
Resistance to staining		
a) Glazed tiles.	Minimum Class 3	EN ISO 10545-14
Resistance to chemicals		
Resistance to low concentrations of acids and alkalis.	Test method available	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup> .	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: glazed tiles.	Minimum GB	EN ISO 10545-13
Lead and cadmium release <sup>e</sup>	Test method available	EN ISO 10545-15
<p>a Similar joint widths may be used to apply to traditional systems based on non-metric sizes.</p> <p>b Not applicable for tiles having curved shapes.</p> <p>c Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.</p> <p>d Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.</p> <p>e Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".</p> <p>f Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.</p> <p>g Tiles with breaking strength less than 400 N are intended for use on walls only and this must be indicated by the manufacturer.</p>		

## Annex M (normative)

### Extruded ceramic tiles with low water absorption

$$E \leq 0,5 \%$$

**Group AI<sub>a</sub>**

#### M.1 Requirements

Dimensional and surface quality requirements and physical and chemical properties shall be in accordance with Table R.1.

**Table M.1 — Requirements for extruded ceramic tiles, Group AI<sub>a</sub>,  $E < 0,5 \%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
<p>The manufacturer shall choose the work size as follows:</p> <p>a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm<sup>a</sup>;</p> <p>b) for non-modular tiles so that the difference between the work size and the nominal size is not more than <math>\pm 3</math> mm.</p> <p>The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<math>W</math>).</p>	$\pm 1,0 \%$ to a maximum of $\pm 2$ mm	$\pm 2,0 \%$ to a maximum of $\pm 4$ mm	EN ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,0 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10 \%$	$\pm 10 \%$	EN ISO 10545-2
<b>Straightness of sides<sup>b</sup></b> (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,5 \%$	$\pm 0,6 \%$	EN ISO 10545-2

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Table M.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
<b>Rectangularity<sup>b</sup></b>			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	EN ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 0,8 \%$	$\pm 1,5 \%$	EN ISO 10545-2
<b>Surface quality<sup>c</sup></b>	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		EN ISO 10545-2
Physical properties	Precision	Natural	Test
<b>Water absorption</b> Percent by mass <sup>h</sup>	$\leq 0,5 \%$ Individual maximum 0,6 %	$\leq 0,5 \%$ Individual maximum 0,6 %	EN ISO 10545-3
<b>Breaking strength, in N</b>			
a) Thickness $\geq 7,5$ mm.	Not less than 1 300	Not less than 1 300	EN ISO 10545-4
b) Thickness $< 7,5$ mm.	Not less than 600	Not less than 600	EN ISO 10545-4
<b>Modulus of rupture, in N/mm<sup>2</sup></b> Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 28 Individual minimum 21	Minimum 28 Individual minimum 21	EN ISO 10545-4
<b>Abrasion resistance</b>			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 275	Maximum 275	EN ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors <sup>d</sup> .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	EN ISO 10545-7
<b>Coefficient of linear thermal expansion</b>			
From ambient temperature to 100 °C.	Test method available	Test method available	EN ISO 10545-8
<b>Thermal shock resistance</b>	Test method available	Test method available	EN ISO 10545-9
<b>Crazing resistance:</b> glazed tiles <sup>f</sup>	Required	Required	EN ISO 10545-11
<b>Frost resistance</b>	Required	Required	EN ISO 10545-12
<b>Coefficient of friction</b>			
Tiles intended for use on floors.	Where required	Where required	Declare test method(s)

Table M.1 (concluded)

Physical properties	Precision	Natural	Test
<b>Moisture expansion, in mm/m<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-10
<b>Small colour differences<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-16
<b>Impact resistance<sup>e</sup></b>	Test method available	Test method available	EN ISO 10545-5
Chemical properties	Precision	Natural	Test
<b>Resistance to staining</b>			
a) Glazed tiles.	Minimum Class 3	Minimum Class 3	EN ISO 10545-14
b) Unglazed tiles.	Test method available	Test method available	EN ISO 10545-14
<b>Resistance to chemicals</b>			
Resistance to low concentrations of acids and alkalis: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Manufacturer to state classification	Manufacturer to state classification	EN ISO 10545-13
Resistance to high concentrations of acids and alkalis <sup>e</sup>	Test method available	Test method available	EN ISO 10545-13
Resistance to household chemicals and swimming pool salts: a) glazed tiles; b) unglazed tiles <sup>g</sup> .	Minimum GB Minimum UB	Minimum GB Minimum UB	EN ISO 10545-13
<b>Lead and cadmium release</b>	Test method available	Test method available	EN ISO 10545-15
<p><sup>a</sup> Similar joint widths may be used to apply to traditional systems based on non-metric sizes.</p> <p><sup>b</sup> Not applicable for tiles having curved shapes.</p> <p><sup>c</sup> Because of firing, slight variations from the standard colour are unavoidable. This does not apply to intentional irregularities of colour variation of the face of tiles (which can be unglazed, glazed or partly glazed) or to the colour variation over a tile area which is characteristic for this type of tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.</p> <p><sup>d</sup> Reference may be made to Annex N of this European Standard for the abrasion resistance classification for all glazed tiles intended for use on floors.</p> <p><sup>e</sup> Reference may be made to Annex P of this European Standard for information regarding requirements which are non-compulsory but which are listed "test method available".</p> <p><sup>f</sup> Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.</p> <p><sup>g</sup> If the hue becomes slightly different, this is not considered to be chemical attack.</p> <p><sup>h</sup> A fully vitrified tile is a tile with water absorption of a maximum individual value of 0,5 % (sometimes described as impervious).</p>			

## **Annex N**

### **(informative)**

### **Classification of glazed tiles for floors according to their abrasion resistance**

This approximate classification is given for guidance only (see EN ISO 10545-7). It should not be taken to provide accurate product specifications for specific requirements.

- Class 0     Glazed tiles in this class are not recommended for use on floors.
- Class 1     Floor coverings in areas that are walked on essentially with soft soled footwear or bare feet without scratching dirt (for example residential bathrooms and bedrooms without direct access from the outside).
- Class 2     Floor coverings in areas that are walked on by soft soled or normal footwear with, at the most, occasional small amounts of scratching dirt (for example rooms in the living areas of homes but with the exception of kitchens, entrances, and other rooms which may have a lot of traffic). This does not apply to abnormal footwear; for example hobnailed boots.
- Class 3     Floor coverings in areas that, with normal footwear, are walked on more often with small amounts of scratching dirt (for example residential kitchens, halls, corridors, balconies, loggias and terraces). This does not apply to abnormal footwear; for example hobnailed boots.
- Class 4     Floor coverings that are walked on by regular traffic with some scratching dirt so that the conditions are more severe than Class 3 (for example entrances, commercial kitchens, hotel, exhibition and sale rooms).
- Class 5     Floor coverings that are subject to severe pedestrian traffic over sustained periods with some scratching dirt, so that the conditions are the most severe for which glazed floor tiles may be suitable (for example public areas such as shopping centres, airport concourses, hotel foyers, public walkways and industrial applications).

This classification is valid for the given applications under normal conditions. Consideration should be given to the footwear, type of traffic and cleaning methods expected, and the floors should be adequately protected against scratching dirt at the entrances to buildings by interposing footwear cleaning devices. In extreme cases of very heavy traffic and quantities of scratching dirt, unglazed floor tiles and quarries from Group I can be considered.

## Annex P (informative)

### Test methods

A number of test methods that are included in this European Standard are available on request but do not form part of the compulsory test requirements. The purpose of this annex is to provide explanatory comment on the inclusion of these tests and other pertinent information.

- EN ISO 10545-5, *Determination of impact resistance by measurement of the coefficient of restitution*. This test is intended only for testing tiles that are used in areas where impact resistance is considered to be of particular importance. The normal requirement for light duty installations is a coefficient of restitution of 0,55. For heavier duty applications a higher figure would be required.
- EN ISO 10545-8, *Determination of linear thermal expansion*. Most ceramic tiles have low levels of linear thermal expansion. This test is intended for tiles that are installed in conditions of high thermal variation.
- EN ISO 10545-9, *Determination of resistance to thermal shock*. All ceramic tiles withstand high temperatures. This test may be applied to any ceramic tile that may be subjected to localized thermal shock.
- EN ISO 10545-10, *Determination of moisture expansion*. The majority of glazed and unglazed tiles have negligible moisture expansion which does not contribute to tiling problems when tiles are correctly fixed (installed). However, with unsatisfactory fixing practices or in certain climatic conditions, moisture expansion in excess of 0,06 % (0,6 mm/m) may contribute to problems.
- EN ISO 10545-12, *Determination of frost resistance*. This test is compulsory only for products that are intended to be specified for use where frost may apply. The test is not required for product groups that are generally unsuitable for use where frost may be present.
- EN ISO 10545-13, *Determination of chemical resistance*. Ceramic tiles are normally resistant to common chemicals. The test for high concentrations of acids and alkalis listed in 3.3.1 is intended for ceramic tiles which are to be used in potentially corrosive conditions.
- EN ISO 10545-14, *Determination of resistance to stains*. This test is compulsory for glazed tiles. For unglazed tiles, where staining may be a problem, it is recommended that the manufacturer be consulted. This method does not address the temporary colour changes that may occur in certain types of glazed tile due to the absorption of water in the body under the glaze.
- EN ISO 10545-15, *Determination of lead and cadmium given off glazed tiles*. This test is intended for glazed tiles when used on worktops and on wall surfaces where food preparation takes place, and food may be in direct contact with the glazed tile surface. As indicative limits, reference could be made to Directive 2005/31/CE.
- EN ISO 10545-16, *Determination of small colour differences*. This test is only applicable to plain coloured glazed tiles and is considered to be of importance in certain specialized circumstances. It is to be used only where small colour differences between plain coloured glazed tiles are important in a specification.

## **Annex Q**

### **(normative)**

## **Additional European requirements on tiles**

### **Q.1 General**

Annex ZA of this European Standard covers only some of the characteristics given in this European Standard and it is applicable to all ceramic tiles, independent of their commercial quality.

Ceramic tiles of the first commercial quality comply with all the requirements of this European Standard.

Ceramic tiles not of first quality shall comply with:

- a) the characteristics defined in Table ZA.1 to ZA.4;
  - b) any requirements declared by the manufacturer in respect of tiles not of first commercial quality
- or
- any requirements agreed between the manufacturer and the customer for the batch.

The packaging shall bear the appropriate indication for the commercial quality (e.g. 2<sup>nd</sup>).

### **Q.2 Release of cadmium**

Where verification of cadmium release is necessary<sup>1)</sup>, this shall be in accordance with EN ISO 10545-15 and the resulting value stated.

### **Q.3 Release of lead**

Where the end use of the tiles requires the release of lead to be verified<sup>2)</sup>, this shall be in accordance with EN ISO 10545-15 and the resulting value stated.

---

1) This usually applies to contact with food (kitchen tops, part of food industry etc.).

2) This usually applies to contact with food (kitchen tops, part of food industry etc.).



## **Annex R**

(informative)

### **Symbols for intended use**

The use of symbols on packaging and/or literature is not a requirement except where stated, but the symbols shown in Figure R.1 are recommended to indicate intended use:

- a) tile suitable for use on floors;
- b) tile suitable for use on walls;
- c) the numerals, of which this is an example, indicate the classification of a glazed tile intended for use on floors according to its abrasion resistance (see Annex N);
- d) symbol to indicate a frost resistant tile;
- e) reaction to fire;
- f) breaking strength/modulus of rupture;
- g) slip resistance;
- h) thermal shock resistance;
- i) bond strength;
- j) emission of dangerous substances.

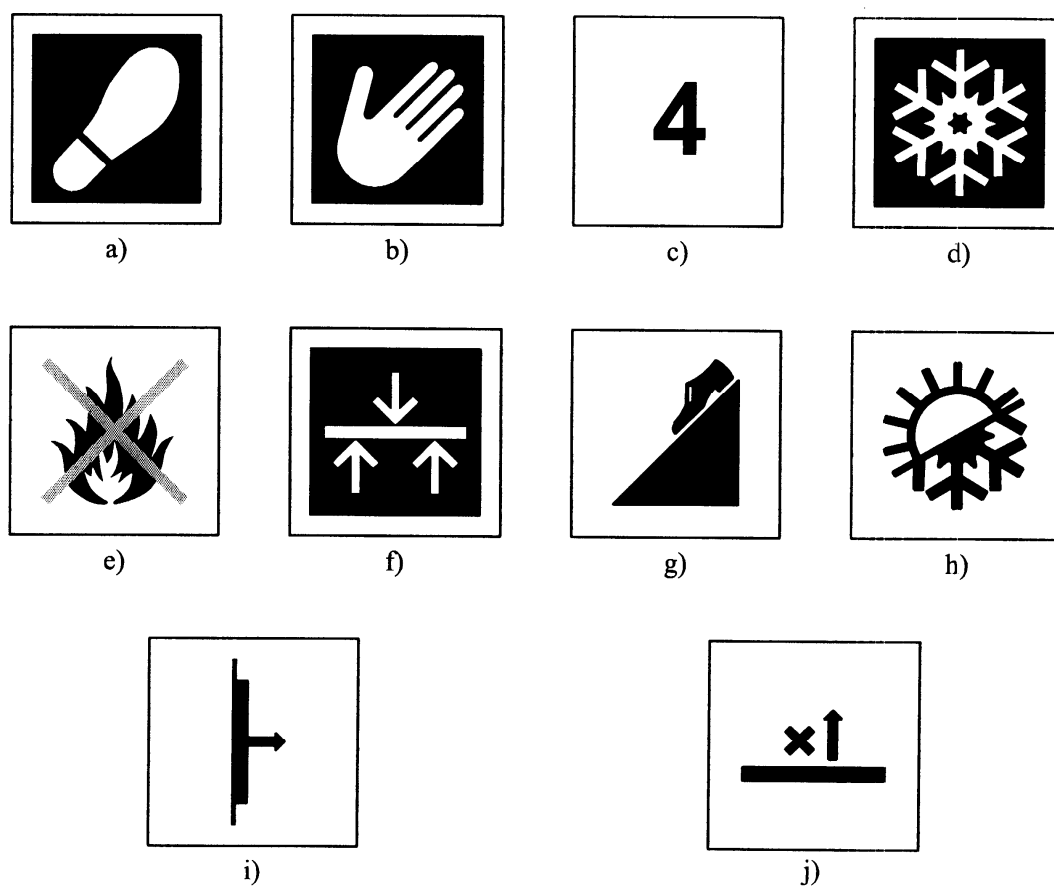


Figure R.1 — Recommended symbols

## Annex ZA (informative)

### Ceramic tiles for flooring and for wall and ceiling finishes – Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

#### ZA.1 Scope and general

This Annex ZA has the same scope as Clause 1 of this European Standard as supplemented by Annex Q.

With reference to Clause 1, this Annex ZA applies to ceramic tiles for use in construction finishing of flooring (internal and external) and of walls and ceilings (internal and external), fixed with adhesives or mortar or mechanically.

Dry-pressed unglazed tiles with water absorption greater than 10 % and tiles made by other processes (different from extruded or pressed) are not covered.

This European Standard has been prepared under the mandates given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard, shown in this annex, meet the requirements of the Mandates M/119 "Floorings" and M/121 "Internal and external wall and ceiling finishes" given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction product covered by this European Standard for its intended use(s). Reference shall be made to the information accompanying the CE marking.

**WARNING: Other requirements and other EU Directives, not affecting the fitness of intended use(s), can be applicable to the construction product falling within the scope of this European Standard.**

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this European Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply. An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through <http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm> ).

## EN 14411:2006 (E)

Table ZA.1 — Relevant clauses for ceramic tiles for internal floorings

Essential characteristics (Mandate M/119)	Requirement clause in this European Standard	Mandated levels and/or classes	Notes and test methods
<b>Reaction to fire</b> (only tiles intended for use subjected to reaction to fire regulations)		A1 <sub>fl</sub> without testing or F	Decision 96/603/EEC, as amended
<b>Breaking strength</b>	See Tables A.1 to L.1 and R.1	—	EN ISO 10545-4. See threshold values in Tables A.1 to L.1 and R.1
<b>Slipperiness</b>		—	Declare test method used (*)
<b>Durability</b>		—	(1)
<b>Release of regulated dangerous substances</b> (with reference to Directive 93/43/EEC as amended, or when requested by national legislation)	See Annex Q and ZA.1, Note	—	EN ISO 10545-15
(*) According to the test method(s) applicable in Member State of destination (where required by legislation). 1 Durability tests are not considered for internal uses as practical experience of at least 50 years in this field shows that durability of tiles can be the same as the life time of the building. For external uses, the only test considered valid to check production is freeze/thaw, as this allows the integrity of the product (i.e. the maintenance of its performance) to be evaluated.			

Table ZA.2 — Relevant clauses for ceramic tiles for external floorings

Essential characteristics (Mandate M/119)	Requirement clause in this European Standard	Mandated levels and/or classes	Notes and test methods
<b>Breaking strength</b>	See Tables A.1 to L.1 and R.1	—	EN ISO 10545-4. See threshold values Tables A.1 to L.1 and R.1
<b>Slipperiness</b> (for pedestrian circulation areas only) <b>Skid resistance</b> (for vehicular circulation areas only)		—	Declare test method (s)used (*)
<b>Durability, freeze/thaw/frost resistance) (**)</b>	See frost resistance in Tables A.1 to L.1 and R.1	—	EN ISO 10545-12
(*) According to the test method(s) applicable in Member State of destination (where required by legislation). (**) This evaluates the integrity of the product, that is the maintenance of performance.			

Table ZA.3 — Relevant clauses for ceramic tiles for internal wall/ceiling finishes

Essential characteristics (Mandate M/121)	Requirement clause in this European Standard	Mandated levels and/or classes	Notes and test methods
<b>Reaction to fire</b> (only for tiles intended for uses on walls/ceilings subject to reaction to fire regulations)	—	A1 without testing or F	Decision 96/603/EEC, as amended
<b>Release of regulated dangerous substances*</b> (as relevant) — release of cadmium** — release of lead**	ZA.1, Note See Annex Q See Annex Q	— — —	EN ISO 10545-15 EN ISO 10545-15
<b>Flexural tensile strength</b> (only for tiles intended for use in suspended ceilings)	See modulus of rupture in Tables A.1 to L.1 and R.1	—	EN ISO 10545-4. See threshold values in Tables A.1 to L.1 and R.1
<b>Bond strength/adhesion</b> (only for tiles intended for uses subject to requirements against accidental fall of objects on to transit areas)	a) for cementitious adhesives: see EN 12004 b) for dispersion adhesives: see EN 12004 c) for reaction resin adhesives: EN 12004	—	See EN 12004***
<b>Durability</b>	—	—	(1)

\* In particular, those dangerous substances defined in Council Directive 76/769/EEC, as amended; with reference to Directive 93/43/EEC as amended.

\*\* Only in case of material in contact with food or when requested by national legislation.

\*\*\* When performing the test the actual tiles and the suitable adhesives or mortar shall be used.

The proposed test methods are intended to determine the adhesion strength of adhesive and have not been developed to determine ceramic tile characteristics.

NOTE Durability tests are not considered for internal uses as practical experience of at least 50 years in this field shows that the durability of tiles can be the same as the life time of the building.

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Table ZA.4 — Relevant clauses for ceramic tiles for external wall/ceiling finishes

Essential characteristics (Mandate M/121)	Requirement clause in this European Standard	Mandated levels and/or classes	Notes and test methods
<b>Reaction to fire</b> (only for tiles intended for uses on walls/ceilings subject to reaction to fire regulations)	—	A1 without testing or F	Decision 96/603/EEC, as amended
<b>Release of regulated dangerous substances*</b> (as relevant)	ZA.1, Note	—	
<b>Flexural tensile strength</b> (only for tiles intended for use in suspended ceilings)	See modulus of rupture in Tables A.1 to L.1 and R.1	—	EN ISO 10545-4. See threshold values in Tables A.1 to L.1 and R.1
<b>Bond strength/adhesion</b> (only for tiles intended for uses subject to requirements against accidental fall of objects on to transit areas)	a) for cementitious adhesives: see EN 12004 b) for dispersion adhesives: see EN 12004 c) for reaction resin adhesives: EN 12004	—	See EN 12004**
<b>Thermal shock resistance</b> (where relevant according to material)	See Table A1 to L1 and R1	—	ISO 10545-9
<b>Durability, freeze/thaw/frost resistance)</b>	See frost resistance in Tables A.1 to L.1 and R.1	—	ISO 10545-12
<p>* In particular, those dangerous substances defined in Council Directive 76/769/EEC, as amended, with reference to Directive 93/43/EEC as amended.</p> <p>** When performing the test the actual tiles and the suitable adhesives or mortar shall be used.</p> <p>The proposed test methods are intended to determine the adhesion strength of adhesive and have not been developed to determine ceramic tile characteristics.</p>			

NOTE 2 For external uses, the only test considered valid to check production is freeze/thaw as this allows the integrity of the product (i.e. the maintenance of its performance) to be evaluated.

NOTE 3 According to Decision 96/603/EEC, ceramic tiles are classified as A (A<sub>fl</sub> for floorings) for reaction to fire. This means that these products have 'no contribution to fire' and no testing is required. Class F may also be used for reaction to fire (according to Decision 94/611/EC class 'F' (F<sub>fl</sub> for floorings) means 'no performance determined')

Manufacturers placing their products on the market of countries that do not have regulatory requirements for a given characteristic for a particular intended use are not obliged to determine nor declare the performance with regard to this characteristic and the "no performance determined" option (NPD) may be used. In Tables ZA.1 to ZA.4, the characteristics against which NPD may be used are slipperiness, skid resistance, bond strength/ adhesion, flexural tensile strength (except for tiles used in suspended ceilings), thermal shock and freeze/thaw resistance (when not required according to Tables A.1 to L.1 or R.1). For release of cadmium and lead, see ZA.3.

## ZA.2 Procedures for the attestation of conformity of products

### ZA.2.1 Procedures for the attestation of conformity of flooring

Ceramic tiles for the intended uses listed below shall follow the system of attestation of conformity shown in Table ZA.5

**Table ZA.5 — Attestation of conformity systems – Flooring**

Products	Intended uses	Level(s) or class(es)	Attestation of conformity systems
Ceramic tiles	For internal uses including enclosed public transport premises	A1 <sub>fl</sub> *** and F	4
	For external uses and road finishes to cover external pedestrian and vehicular circulation areas	—	4
	Products subject to dangerous substances regulations <sup>1)</sup>	—	3
<p>System 3: See CPD Annex III.2.(ii), second possibility.</p> <p>System 4: See CPD Annex III.2.(ii), third possibility.</p> <p>*** Products/materials that do not require to be tested for reaction to fire (i.e. products/materials of Class A1 according to Commission Decision 96/603/EC, as amended).</p> <p>1) In particular those dangerous substances defined in Directive 76/769/EEC, as amended; with reference to Directive 93/43/EEC as amended.</p>			

Ceramic tiles are considered as reaction to fire Class A1<sub>fl</sub>, without testing, according to Decision 96/603/EEC, as amended, therefore system 4 applies.

Only for release of cadmium and lead (when required by legislation) will system 3 of attestation of conformity be adopted, the task for the notified test laboratory being limited to the initial type testing for this characteristic.

The evaluation of conformity of the ceramic tiles covered by this European standard in respect of the relevant characteristics for the intended end use listed in Tables ZA.1 and ZA.2 shall be carried out in accordance with clause 6 of this standard.

### ZA.2.2 Procedures for the attestation of conformity of wall and ceiling finishes

Ceramic tiles, for the intended uses listed below, shall follow the system of attestation of conformity shown in Table ZA.6.

Ceramic tiles are considered as reaction to fire Class A1, without testing, according to Decision 96/603/EEC, as amended, therefore system 4 applies.

Only for release of cadmium and lead (when required by legislation) and safety in use (modulus of rupture) requirements for internal suspended ceilings will system 3 of attestation of conformity be adopted, the task for the notified test laboratory being limited to the initial type testing for these characteristics.

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The evaluation of conformity of the ceramic tiles covered by this European standard in respect of the relevant characteristics for the intended end use listed in Tables ZA.3 and ZA.4 shall be carried out in accordance with clause 6 of this standard.

**Table ZA.6 — Attestation of conformity systems – Wall and ceiling finishes**

Products	Intended uses	Level(s) or class(es)	Attestation of conformity system(s)
Ceramic tiles	As internal or external finishes in walls or ceilings subject to reaction to fire regulations	A1*** and F	4
	As internal or external finishes in walls or ceilings subject to regulations on dangerous substances <sup>1)</sup> , and in internal suspended ceilings subject to safety in use requirements	—	3
	As internal or external finishes in walls or ceilings for uses other than mentioned above	—	4
<p>System 3: See CPD Annex III.2.(ii), second possibility.</p> <p>System 4: See CPD Annex III.2.(ii), third possibility.</p> <p>*** Products/materials that do not require to be tested for reaction to fire (i.e. products/materials of Class A1 according to Commission Decision 96/603/EC, as amended).</p> <p>1) In particular those dangerous substances defined in Directive 76/769/EEC, as amended; with reference to Directive 93/43/EEC as amended.</p>			

**ZA.3 CE marking and labelling****ZA.3.1 CE marking**

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE conformity marking symbol to affix shall be in accordance with Directive 93/68/EEC.

The CE conformity symbol for ceramic tiles shall appear on the packaging and/or the accompanying commercial documentation and shall be accompanied by the following information:

- reference to this European Standard;
- the name or identifying mark of the producer;
- the last two digits of the year in which the marking was affixed;
- the product classification and end uses;
- the indications to identify the characteristics of the products on the basis of the technical specifications (see Tables ZA.1, ZA.2, ZA.3 and ZA.4) as shown in ZA.3.2.

For ceramic tiles it may be appropriate to use a combination of locations for the CE marking, that is a minimum of information is included on the packaging (see example in ZA.3.2) whilst the complete information appears on the accompanying commercial documents and/or on the catalogues/web sites. When the



information is split in this way, the commercial documents shall include all the CE marking information including the information already placed on the packaging. However, if the complete CE marking is placed on the packaging, the manufacturer does not need to include any other information on the accompanying commercial documents.


Values for the release of lead or cadmium are given only when regulatory requirements in a given country require this. Where no such regulations exist, these characteristics are not given with the CE marking information at all – "NPD" does not need to be used in this case. The third example in ZA.3.2 shows the case where these substances are not listed.

NOTE 1 For products intended to be used for both flooring and wall finishes, the characteristics shown with the CE marking, relevant to both uses, may be combined.

NOTE 2 There might be no correlation between the declared bond strength and the performance of the tile in use.


### ZA.3.2 Examples of reference model for the marking and labelling

Example CE marking information on packaging:


	<i>CE symbol given in Directive 93/68/EEC as amended</i>
Any Co Ltd, PO Box 21, B-1050	<i>Name or identifying mark and registered address of the producer</i>
EN 14411	<i>Reference to this European Standard</i>

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Example CE marking information in accompanying commercial documents for flooring tiles:

		CE symbol given in Directive 93/68/EEC as amended
<b>Any Co Ltd, PO Box 21, B-1050</b>  06		Name or identifying mark and registered address of the producer  Last two digits of the year in which the marking was affixed
EN 14411 Ceramic tiles, dry-pressed, for internal and external floorings		Reference to this European Standard Product classification and intended use
Characteristics	Declared value	Information of regulated characteristics
Reaction to fire	A1 <sub>fl</sub>	
Breaking strength	> ... N	
Slipperiness	Declared value ... Declared test method used*	
Skid resistance	Declared value ... Declared test method used	
Freeze/thaw resistance (frost resistance)	Passed	
Release of dangerous substances		
— release of cadmium	... mg/dm <sup>2</sup>	
— release of lead	... mg/dm <sup>2</sup>	

Example CE marking information in accompanying commercial documents for wall and ceiling tiles:

		<i>CE symbol given in Directive 93/68/EEC as amended</i>	
<b>Any Co Ltd, PO Box 21, B-1050</b>  06		<i>Name or identifying mark and registered address of the producer</i>  <i>Last two digits of the year in which the marking was affixed</i>	
EN 14411 Ceramic tiles, dry-pressed, for internal and external wall/ceiling finishes		<i>Reference to this European Standard</i>  <i>Product classification and intended use</i>	
Characteristics	Declared value	<i>Information of regulated characteristics</i>	
Reaction to fire	A1		
Flexural tensile strength	> ... N/mm <sup>2</sup>		
Thermal shock resistance	Passed		
Freeze/thaw resistance (frost resistance)	Passed		
Release of dangerous substances			
— release of cadmium	mg/dm <sup>2</sup>		
— release of lead	... mg/dm <sup>2</sup>		
Bond strength	NPD		

NPD may be used when a performance level is not required by national legislation or when the product is not intended to be used for the use indicated for the characteristic (for example, for skid resistance, NPD may be used when tiles are 'not intended to be used for external vehicular circulation areas').

In addition to the specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

**EN 14411:2006 (E)****ZA.4 EC Declaration of conformity**

When compliance with this annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity (EC Declaration of conformity), which authorises the affixing of the CE marking. This declaration shall include:

- name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

- description of the product (type, identification, use,...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

- provisions to which the product conforms (i.e. Annex ZA of this EN), and a reference to the ITT report(s) and factory production control records (if appropriate);
- particular conditions applicable to the use of the product, (e.g. provisions for use under certain conditions);
- name and address of the notified laboratory(ies);
- name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The above mentioned declaration shall be presented in the language or languages accepted in the Member State in which the product is to be used.

## Bibliography

- [1] EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*

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