

INTERNATIONAL STANDARD

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Ceramic tiles — Definitions, classification, characteristics and marking

*Carreaux et dalles céramiques — Définitions, classification, caractéristiques
et marquage*



Reference number
ISO 13006:1998(E)

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13006 was prepared by Technical Committee ISO/TC 189, *Ceramic tile*.

Annexes A to L form an integral part of this International Standard. Annexes M to P and the Bibliography are for information only.

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Ceramic tiles — Definitions, classification, characteristics and marking

1 Scope

This International Standard defines terms and establishes classifications, characteristics and marking requirements for ceramic tiles of the best commercial quality (first quality).

NOTE ISO 10545 describes the test procedures required to determine the product characteristics listed in ISO 13006. ISO 10545 is divided into parts each describing a specific test procedure or related matter.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

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

ISO 10545-2:1995, *Ceramic tiles — Part 2: Determination of dimensions and surface quality*.

ISO 10545-3:1995, *Ceramic tiles — Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density*.

ISO 10545-4:1994, *Ceramic tiles — Part 4: Determination of modulus of rupture and breaking strength*.

ISO 10545-5:1996, *Ceramic tiles — Part 5: Determination of impact resistance by measurement of coefficient of restitution*.

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

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

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

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

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

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

ISO 10545-12:1995, *Ceramic tiles — Part 12: Determination of frost resistance*.

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

ISO 10545-14:1995, *Ceramic tiles — Part 14: Determination of resistance to stains*.

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

ISO 10545-16:—¹⁾, *Ceramic tiles — Part 16: Determination of small colour differences*.

ISO 10545-17:—¹⁾, *Ceramic tiles — Part 17: Determination of coefficient of friction*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 1006 and the following apply.

3.1

ceramic tiles

thin slabs made from clays and/or other inorganic raw materials, generally used as coverings for floors and walls, usually shaped by extruding (A) or pressing (B) at room temperature but may be formed by other processes (C), then dried and subsequently fired at temperatures sufficient to develop the required properties; tiles can be glazed (GL) or unglazed (UGL) and are incombustible and unaffected by light

3.2

glaze

vitrified covering which is impermeable

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 an unglazed tile which has been given a glossy finish by mechanical polishing as the last stage of manufacture

3.5

extruded tiles

[designated as A]

tiles 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 International Standard classifies extruded tiles as “precision” or “natural”. The classification is dependent upon the different technical characteristics as listed in the individual product standards.

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 %.

3.6

dry-pressed tiles

[designated as B]

tiles formed from a finely milled body mixture and shaped in moulds at high pressure

3.7

tiles made by other processes

[designated as C]

tiles made by other than the normal commercial processes, i.e. extruded or dry-pressed

NOTE These tiles are not covered in this International Standard.

1) To be published.

3.8

spacer lugs

projections which are 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

See figure 2.

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.

3.9

water absorption

[symbol E]

percentage of water by mass, measured in accordance with ISO 10454-3

3.10 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.

3.10.1

nominal size

size used to describe the product

3.10.2

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.

3.10.3

actual size

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

3.10.4

coordinating size

[symbol C]

work size plus the joint width

3.10.5

modular size

tiles and sizes based on module M , $2 M$, $3 M$ and $5 M$ and also their multiples or subdivisions, except for tiles with a surface area of less than $9\,000\text{ mm}^2$

NOTE See ISO 1006 where $1 M = 100\text{ mm}$.

3.10.6

non-modular sizes

sizes not based on module M

NOTE 1 See ISO 1006 where $1 M = 100\text{ mm}$.

NOTE 2 Tiles of these sizes are those commonly used in most countries.

3.10.7

tolerance

difference between the permissible limits of size

4 Classification

4.1 Basis of classification

Ceramic tiles are divided into groups according to their method of manufacture and their water absorption (see 3.9 and table 1). The groups do not presuppose the usage of the products.

4.2 Methods of manufacture

There are three methods of manufacture as follows:

- method A, extruded tiles (see 3.5);
- method B, dry-pressed tiles (see 3.6);
- method C, tiles made by other processes (see 3.7).

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 for dry-pressed tiles:

- 1) $E \leq 0,5 \%$ (Group BI_a);
- 2) $0,5 \% < E \leq 3 \%$ (Group BI_b).

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

Group II is further divided as follows for extruded tiles:

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

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

5 Characteristics

Characteristics for different applications of ceramic tiles are given in table 2.

6 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

7 Requirements

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

8 Marking and specifications

8.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard;
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

8.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained in accordance with ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

8.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex A

AI M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex A

AI 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

9 Ordering

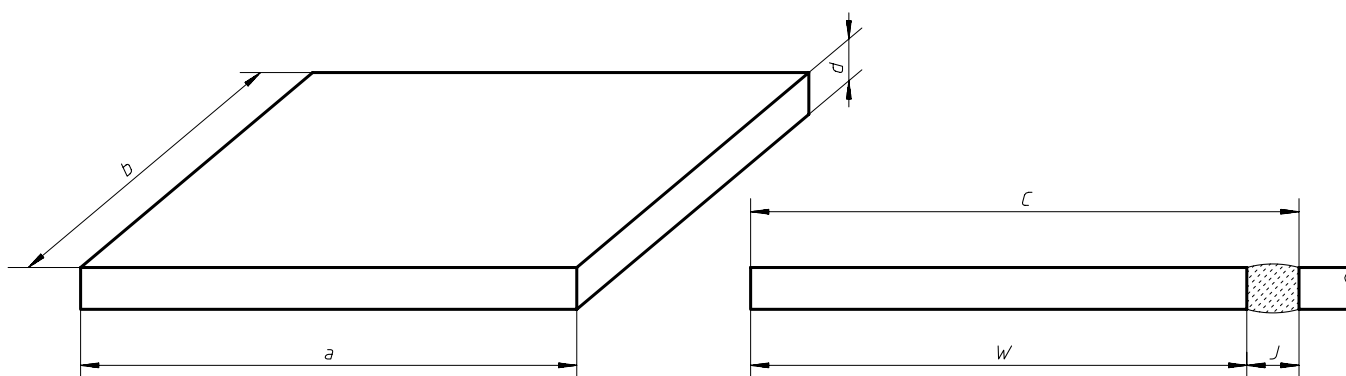
When an order is placed, items such as size, thickness, type of surface, colour, profile, abrasion class for glazed tiles and other properties shall be agreed by the parties concerned.

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

Shaping	Group I $E \leq 3 \%$	Group II _a $3 \% \leq E < 6 \%$	Group II _b $6 \% \leq E < 10 \%$	Group III $E > 10 \%$
A Extruded	Group AI (see annex A)	Group AII _{a-1} ¹⁾ (see annex B)	Group AII _{b-1} ¹⁾ (see annex D)	Group AIII (see annex F)
		Group AII _{a-2} ¹⁾ (see annex C)	Group AII _{b-2} ¹⁾ (see annex E)	
B Dry pressed	Group BI _a $E \leq 0,5 \%$ (see annex G)	Group BII _a (see annex J)	Group BII _b (see annex K)	Group BIII ²⁾ (see annex L)
	Group BI _b $0,5 \% < E \leq 3 \%$ (see annex H)			
C Tiles made by other processes	Group CI ³⁾	Group CII _a ³⁾	Group CII _b ³⁾	Group CIII ³⁾
1) Groups AII_a and AII_b are divided into two parts (Parts 1 and 2) with different product specifications. 2) 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. 3) These tiles are not covered in this International Standard.				

Table 2 — Characteristics required for different applications

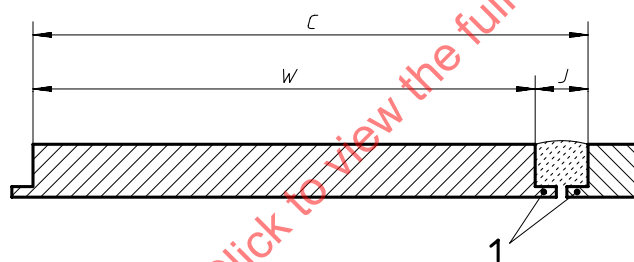
Characteristics	Floors		Walls		Test
Dimensions and surface quality	Interior	Exterior	Interior	Exterior	Reference
Length and width	X	X	X	X	ISO 10545-2
Thickness	X	X	X	X	ISO 10545-2
Straightness of sides	X	X	X	X	ISO 10545-2
Rectangularity	X	X	X	X	ISO 10545-2
Surface flatness (curvature and warpage)	X	X	X	X	ISO 10545-2
Surface quality	X	X	X	X	ISO 10545-2
Physical properties	Interior	Exterior	Interior	Exterior	Reference
Water absorption	X	X	X	X	ISO 10545-3
Breaking strength	X	X	X	X	ISO 10545-4
Modulus of rupture	X	X	X	X	ISO 10545-4
Resistance to deep abrasion – unglazed tiles	X	X			ISO 10545-6
Resistance to surface abrasion – glazed tiles	X	X			ISO 10545-7
Linear thermal expansion ¹⁾	X	X	X	X	ISO 10545-8
Resistance to thermal shock ¹⁾	X	X	X	X	ISO 10545-9
Resistance to crazing – glazed tiles	X	X	X	X	ISO 10545-11
Frost resistance ²⁾		X		X	ISO 10545-12
Coefficient of friction	X	X			ISO 10545-17
Moisture expansion ¹⁾	X	X	X	X	ISO 10545-10
Small colour differences ¹⁾	X	X	X	X	ISO 10545-16
Impact resistance ¹⁾	X	X			ISO 10545-5
Chemical properties	Interior	Exterior	Interior	Exterior	Reference
Resistance to staining					ISO 10545-14
— glazed tiles	X	X	X	X	ISO 10545-14
— unglazed tiles ¹⁾	X	X	X	X	ISO 10545-14
Resistance to low concentrations of acids and alkalis.	X	X	X	X	ISO 10545-13
Resistance to high concentrations of acids and alkalis. ¹⁾	X	X	X	X	ISO 10545-13
Resistance to household cleaners and swimming pool salts.	X	X	X	X	ISO 10545-13
Lead and cadmium release – glazed tiles ¹⁾	X	X	X	X	ISO 10545-15
1) Test method available.					
2) For tiles intended to be used in situations where frost conditions apply.					



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

$$E \leq 3 \%$$

Group AI

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, $E \leq 3 \%$

Dimensions and surface quality	Precision	Natural	Test
Length and width			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm¹⁾; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 3 mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	$\pm 1,0 \%$ to a maximum of ± 2 mm	$\pm 2,0 \%$ to a maximum of ± 4 mm	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).	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
Thickness			
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.	$\pm 10 \%$	$\pm 10 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,5 \%$	$\pm 0,6 \%$	ISO 10545-2

Table A.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
Rectangularity ²⁾			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2
Surface flatness			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 0,8 \%$	$\pm 1,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2
Physical properties	Precision	Natural	Test
Water absorption Percent by mass ⁸⁾	$\leq 3,0 \%$ Individual maximum 3,3 %	$\leq 3,0 \%$ Individual maximum 3,3 %	ISO 10545-3
Breaking strength, in N			
a) Thickness $\geq 7,5$ mm	Not less than 1 100	Not less than 1 100	ISO 10545-4
b) Thickness $< 7,5$ mm	Not less than 600	Not less than 600	ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 23 Individual minimum 18	Minimum 23 Individual minimum 18	ISO 10545-4
Abrasion resistance			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 275	Maximum 275	ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾			
From ambient temperature to 100 °C.	Test method available	Test method available	ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available	Test method available	ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required	Required	ISO 10545-11
Frost resistance	Test method available	Test method available	ISO 10545-12
Coefficient of friction			
Tiles intended for use on floors.	Manufacturer to state value and test method used	Manufacturer to state value and test method used	ISO 10545-17

Table A.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	Test method available	ISO 10545-5
Chemical properties	Precision	Natural	Test
Resistance to staining			
a) Glazed tiles	Minimum Class 3	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	Test method available	ISO 10545-14
Resistance to chemicals			
Resistance to low concentrations of acids and alkalis			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Lead and cadmium release ⁵⁾	Test method available	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack. 8) A fully vitrified tile is a tile with water absorption of a maximum individual value of 0,5 % (sometimes described as impervious).			

A.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

A.3 Marking and specifications

A.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

A.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

A.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex A

AI M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex A

AI 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

A.4 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.

Annex B (normative)

Extruded ceramic tiles

$$3 \% < E \leq 6 \%$$

Group AII_a — 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_a, 3 % < E ≤ 6 %

Dimensions and surface quality	Precision	Natural	Test
Length and width			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm¹⁾; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 3 mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	± 1,25 % to a maximum of ± 2 mm	± 2,0 % to a maximum of ± 4 mm	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).	± 1,0 %	± 1,5 %	ISO 10545-2
Thickness			
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.	± 10 %	± 10 %	ISO 10545-2
Straightness of sides ²⁾ (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	± 0,5 %	± 0,6 %	ISO 10545-2

Table B.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
Rectangularity ²⁾			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2
Surface flatness			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 0,5 \%$	$\pm 1,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 0,8 \%$	$\pm 1,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2
Physical properties	Precision	Natural	Test
Water absorption Percent by mass	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	ISO 10545-3
Breaking strength, in N			
a) Thickness $\geq 7,5$ mm	Not less than 950	Not less than 950	ISO 10545-4
b) Thickness $< 7,5$ mm	Not less than 600	Not less than 600	ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 20 Individual minimum 18	Minimum 20 Individual minimum 18	ISO 10545-4
Abrasion resistance			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 393	Maximum 393	ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾			
From ambient temperature to 100 °C.	Test method available	Test method available	ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available	Test method available	ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required	Required	ISO 10545-11
Frost resistance ⁵⁾	Test method available	Test method available	ISO 10545-12
Coefficient of friction			
Tiles intended for use on floors.	Manufacturer to state value and test method used	Manufacturer to state value and test method used	ISO 10545-17

Table B.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	Test method available	ISO 10545-5
Chemical properties	Precision	Natural	Test
Resistance to staining			
a) Glazed tiles	Minimum Class 3	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	Test method available	ISO 10545-14
Resistance to chemicals			
Resistance to low concentrations of acids and alkalis			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Lead and cadmium release ⁵⁾	Test method available	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack.			

B.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

B.3 Marking and specifications

B.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;

- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

B.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

B.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex B

AI_{IIa}-Part 1 M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex B

AI_{IIa}-Part 1 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

B.4 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.

Annex C (normative)

Extruded ceramic tiles

$$3 \% < E \leq 6 \%$$

Group AII_a — 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_{a-2}, 3 % < E ≤ 6 %

Dimensions and surface quality	Precision	Natural	Test
Length and width			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm¹⁾; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 3 mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	± 1,5 % to a maximum of ± 2 mm	± 2,0 % to a maximum of ± 4 mm	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).	± 1,5 %	± 1,5 %	ISO 10545-2
Thickness			
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.	± 10 %	± 10 %	ISO 10545-2
Straightness of sides ²⁾ (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	± 1,0 %	± 1,0 %	ISO 10545-2

Table C.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
Rectangularity ²⁾			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2
Surface flatness			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2
Physical properties	Precision	Natural	Test
Water absorption Percent by mass	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	$3,0 \% < E \leq 6,0 \%$ Individual maximum 6,5 %	ISO 10545-3
Breaking strength, in N			
a) Thickness $\geq 7,5$ mm	Not less than 800	Not less than 800	ISO 10545-4
b) Thickness $< 7,5$ mm	Not less than 600	Not less than 600	ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 13 Individual minimum 11	Minimum 13 Individual minimum 11	ISO 10545-4
Abrasion resistance			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 541	Maximum 541	ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾			
From ambient temperature to 100 °C.	Test method available	Test method available	ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available	Test method available	ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required	Required	ISO 10545-11
Frost resistance ⁵⁾	Test method available	Test method available	ISO 10545-12
Coefficient of friction			
Tiles intended for use on floors.	Manufacturer to state value and test method used	Manufacturer to state value and test method used	ISO 10545-17

Table C.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	Test method available	ISO 10545-5
Chemical properties	Precision	Natural	Test
Resistance to staining			
a) Glazed tiles	Minimum Class 3	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	Test method available	ISO 10545-14
Resistance to chemicals			
Resistance to low concentrations of acids and alkalis			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Lead and cadmium release ⁵⁾	Test method available	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack.			

C.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

C.3 Marking and specifications

C.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

C.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

C.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex C

AI_a-Part 2 M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex C

AI_a-Part 2 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

C.4 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.

Annex D (normative)

Extruded ceramic tiles $6 \% < E \leq 10 \%$ Group AII_b — 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_{b-1}, $6 \% < E \leq 10 \%$

Dimensions and surface quality	Precision	Natural	Test
Length and width			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm¹⁾; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 3 mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	$\pm 2,0 \%$ to a maximum of ± 2 mm	$\pm 2,0 \%$ to a maximum of ± 4 mm	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).	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Thickness			
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.	$\pm 10 \%$	$\pm 10 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2

Table D.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
Rectangularity ²⁾			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2
Surface flatness			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2
Physical properties	Precision	Natural	Test
Water absorption Percent by mass	$6 \% < E \leq 10 \%$ Individual maximum 11 %	$6 \% < E \leq 10 \%$ Individual maximum 11 %	ISO 10545-3
Breaking strength, in N	Not less than 900	Not less than 900	ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 17,5 Individual minimum 15	Minimum 17,5 Individual minimum 15	ISO 10545-4
Abrasion resistance			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 649	Maximum 649	ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾			
From ambient temperature to 100 °C.	Test method available	Test method available	ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available	Test method available	ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required	Required	ISO 10545-11
Frost resistance ⁵⁾	Test method available	Test method available	ISO 10545-12
Coefficient of friction			
Tiles intended for use on floors.	Manufacturer to state value and test method used	Manufacturer to state value and test method used	ISO 10545-17

Table D.1 (concluded)

Dimensions and surface quality	Precision	Natural	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	Test method available	ISO 10545-5
Chemical properties	Precision	Natural	Test
Resistance to staining			
a) Glazed tiles	Minimum Class 3	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	Test method available	ISO 10545-14
Resistance to chemicals			
Resistance to low concentrations of acids and alkalis			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Lead and cadmium release ⁵⁾	Test method available	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack.			

D.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

D.3 Marking and specifications

D.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

D.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

D.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex D

AI_I_b-Part 1 M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex D

AI_I_b-Part 1 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

D.4 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.

Annex E (normative)

Extruded ceramic tiles

$$6 \% < E \leq 10 \%$$

Group AII_b — 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_{b-2}, $6 \% < E \leq 10 \%$

Dimensions and surface quality	Precision	Natural	Test
Length and width			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm¹⁾; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 3 mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	$\pm 2,0 \%$ to a maximum of ± 2 mm	$\pm 2,0 \%$ to a maximum of ± 4 mm	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).	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Thickness			
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.	$\pm 10 \%$	$\pm 10 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2

Table E.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
Rectangularity ²⁾			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2
Surface flatness			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2
Physical properties	Precision	Natural	Test
Water absorption Percent by mass	$6 \% < E \leq 10 \%$ Individual maximum 11 %	$6 \% < E \leq 10 \%$ Individual maximum 11 %	ISO 10545-3
Breaking strength, in N	Not less than 750	Not less than 750	ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 9 Individual minimum 8	Minimum 9 Individual minimum 8	ISO 10545-4
Abrasion resistance			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 1 062	Maximum 1 062	ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾			
From ambient temperature to 100 °C.	Test method available	Test method available	ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available	Test method available	ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required	Required	ISO 10545-11
Frost resistance ⁵⁾	Test method available	Test method available	ISO 10545-12
Coefficient of friction			
Tiles intended for use on floors.	Manufacturer to state value and test method used	Manufacturer to state value and test method used	ISO 10545-17

Table E.1 (concluded)

Dimensions and surface quality	Precision	Natural	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	Test method available	ISO 10545-5
Chemical properties	Precision	Natural	Test
Resistance to staining			
a) Glazed tiles	Minimum Class 3	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	Test method available	ISO 10545-14
Resistance to chemicals			
Resistance to low concentrations of acids and alkalis			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Lead and cadmium release ⁵⁾	Test method available	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack.			

E.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

E.3 Marking and specifications

E.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

E.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

E.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex E

AI_I_b-Part 2 M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex E

AI_I_b-Part 2 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

E.4 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.

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
Length and width			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm¹⁾; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 3 mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	$\pm 2,0 \%$ to a maximum of ± 2 mm	$\pm 2,0 \%$ to a maximum of ± 4 mm	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).	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Thickness			
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.	$\pm 10 \%$	$\pm 10 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2

Table F.1 (continued)

Dimensions and surface quality	Precision	Natural	Test
Rectangularity ²⁾			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 1,0 \%$	ISO 10545-2
Surface flatness			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 1,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,5 \%$	$\pm 1,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2
Physical properties	Precision	Natural	Test
Water absorption Percent by mass	$E > 10 \%$	$E > 10 \%$	ISO 10545-3
Breaking strength, in N	Not less than 600	Not less than 600	ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 8 Individual minimum 7	Minimum 8 Individual minimum 7	ISO 10545-4
Abrasion resistance			
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 2 365	Maximum 2 365	ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed	Report abrasion class and cycles passed	ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾			
From ambient temperature to 100 °C.	Test method available	Test method available	ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available	Test method available	ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required	Required	ISO 10545-11
Frost resistance ⁵⁾	Test method available	Test method available	ISO 10545-12
Coefficient of friction			
Tiles intended for use on floors.	Manufacturer to state value and test method used	Manufacturer to state value and test method used	ISO 10545-17

Table F.1 (concluded)

Physical properties	Precision	Natural	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	Test method available	ISO 10545-5
Chemical properties	Precision	Natural	Test
Resistance to staining			
a) Glazed tiles	Minimum Class 3	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	Test method available	ISO 10545-14
Resistance to chemicals			
Resistance to low concentrations of acids and alkalis			
a) glazed tiles;	Manufacturer to state classification	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts			
a) glazed tiles;	Minimum GB Minimum UB	Minimum GB Minimum UB	ISO 10545-13
b) unglazed tiles ⁷⁾ .			
Lead and cadmium release ⁵⁾	Test method available	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack.			

F.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

F.3 Marking and specifications

F.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

F.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

F.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Precision extruded tile, ISO 13006:1998, annex F

AIII M25 cm × 12,5 cm (W 240 mm × 115 mm × 10 mm) GL

Natural extruded tile, ISO 13006:1998, annex F

AIII 15 cm × 15 cm (W 150 mm × 150 mm × 12,5 mm) UGL

F.4 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.

Annex G (normative)

Dry-pressed ceramic tiles with low water absorption

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

Group BI_a

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

Dimensions and surface quality	Surface S of the product (cm ²)				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
Length and width 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 ¹⁾ ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. ± 5 mm). The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (W).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	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).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
Thickness					
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.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2

Table G.1 (continued)

Dimensions and surface quality	Surface <i>S</i> of the product (cm ²)				Test
	<i>S</i> ≤ 90	90 < <i>S</i> ≤ 190	190 < <i>S</i> ≤ 410	<i>S</i> > 410	
Rectangularity ²⁾					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	± 1,0 %	± 0,6 %	± 0,6 %	± 0,6 %	ISO 10545-2
Surface flatness					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	± 1,0 %	± 0,5 %	± 0,5 %	± 0,5 %	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	± 1,0 %	± 0,5 %	± 0,5 %	± 0,5 %	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	± 1,0 %	± 0,5 %	± 0,5 %	± 0,5 %	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				ISO 10545-2
Physical properties	Requirements				Test
Water absorption Percent by mass ⁸⁾	≤ 0,5 % Individual maximum 0,6 %				ISO 10545-3
Breaking strength, in N					
a) Thickness ≥ 7,5 mm	Not less than 1 300				ISO 10545-4
b) Thickness < 7,5 mm	Not less than 700				ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength ≥ 3 000 N.	Minimum 35 Individual minimum 32				ISO 10545-4
Abrasion resistance					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 175				ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed				ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾					
From ambient temperature to 100 °C.	Test method available				ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available				ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required				ISO 10545-11
Frost resistance	Required				ISO 10545-12
Coefficient of friction					
Tiles intended for use on floors.	Manufacturer to state value and test method used				ISO 10545-17

Table G.1 (concluded)

Physical properties	Requirements	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	ISO 10545-5
Chemical properties		Test
Resistance to staining		
a) Glazed tiles	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	ISO 10545-14
Resistance to chemicals		
Resistance to low concentrations of acids and alkalis		
a) glazed tiles;	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .	Manufacturer to state classification	ISO 10545-13
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts		
a) glazed tiles;	Minimum GB	ISO 10545-13
b) unglazed tiles ⁷⁾ .	Minimum UB	
Lead and cadmium release ⁵⁾	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack. 8) A fully vitrified tile is a tile with water absorption of a maximum individual value of 0,5 % (sometimes described as impervious).		

G.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

G.3 Marking and specifications

G.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;

- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

G.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

G.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Dry-pressed tile, ISO 13006:1998, annex G

BI_a M20 cm × 20 cm (W 197 mm × 197 mm × 8 mm) GL

Dry-pressed tile, ISO 13006:1998, annex G

BI_a 15 cm × 15 cm (W 150 mm × 150 mm × 8 mm) UGL

G.4 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.

Annex H (normative)

Dry-pressed ceramic tiles with low water absorption

$$0,5 \% < E \leq 3 \%$$

Group BI_b

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_b, 0,5 % < E ≤ 3 %

Dimensions and surface quality	Surface <i>S</i> of the product (cm ²)				Test
	<i>S</i> ≤ 90	90 < <i>S</i> ≤ 190	190 < <i>S</i> ≤ 410	<i>S</i> > 410	
Length and width					
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 ¹⁾ ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than ± 2 % (max. ± 5 mm). The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<i>W</i>).	± 1,2 %	± 1,0 %	± 0,75 %	± 0,6 %	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).	± 0,75 %	± 0,5 %	± 0,5 %	± 0,5 %	ISO 10545-2
Thickness					
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.	± 10 %	± 10 %	± 5 %	± 5 %	ISO 10545-2
Straightness of sides ²⁾ (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	± 0,75 %	± 0,5 %	± 0,5 %	± 0,5 %	ISO 10545-2

Table H.1 (continued)

Dimensions and surface quality	Surface <i>S</i> of the product (cm ²)				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
Rectangularity ²⁾					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	ISO 10545-2
Surface flatness					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				ISO 10545-2
Physical properties	Requirements				Test
Water absorption Percent by mass ⁸⁾	$0,5 \% < E \leq 3 \%$ Individual maximum 3,3 %				ISO 10545-3
Breaking strength, in N					
a) Thickness $\geq 7,5$ mm	Not less than 1 100				ISO 10545-4
b) Thickness $< 7,5$ mm	Not less than 700				ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 30 Individual minimum 27				ISO 10545-4
Abrasion resistance					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 175				ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed				ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾					
From ambient temperature to 100 °C.	Test method available				ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available				ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required				ISO 10545-11
Frost resistance	Required				ISO 10545-12
Coefficient of friction					
Tiles intended for use on floors.	Manufacturer to state value and test method used				ISO 10545-17

Table H.1 (concluded)

Physical properties	Requirements	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	ISO 10545-5
Chemical properties	Requirements	Test
Resistance to staining		
a) Glazed tiles	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	ISO 10545-14
Resistance to chemicals		
Resistance to low concentrations of acids and alkalis		
a) glazed tiles;	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .	Manufacturer to state classification	ISO 10545-13
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts		
a) glazed tiles;	Minimum GB	ISO 10545-13
b) unglazed tiles ⁷⁾ .	Minimum UB	
Lead and cadmium release ⁵⁾	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack. 8) A fully vitrified tile is a tile with water absorption of a maximum individual value of 0,5 % (sometimes described as impervious).		

H.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

H.3 Marking and specifications

H.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;

- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

H.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

H.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Dry-pressed tile, ISO 13006:1998, annex H

BI_b M20 cm × 20 cm (W 197 mm × 197 mm × 8 mm) GL

Dry-pressed tile, ISO 13006:1998, annex H

BI_b 15 cm × 15 cm (W 150 mm × 150 mm × 8 mm) UGL

H.4 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.

Annex J (normative)

Dry-pressed ceramic tiles

$$3 \% < E \leq 6 \%$$

Group BII_a

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_a, $3 \% < E \leq 6 \%$

Dimensions and surface quality	Surface <i>S</i> of the product (cm ²)				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
Length and width 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 ¹⁾ ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. ± 5 mm). The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<i>W</i>).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	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).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
Thickness					
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.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2

Table J.1 (continued)

Dimensions and surface quality	Surface S of the product (cm ²)				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
Rectangularity ²⁾					
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	$\pm 0,6 \%$	ISO 10545-2
Surface flatness					
The maximum deviation from flatness, in percent:					
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 1,0 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
Surface quality ³⁾	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles				ISO 10545-2
Physical properties	Requirements				Test
Water absorption Percent by mass	$3 \% < E \leq 6 \%$ Individual maximum 6,5 %				ISO 10545-3
Breaking strength, in N					
a) Thickness $\geq 7,5$ mm	Not less than 1 000				ISO 10545-4
b) Thickness $< 7,5$ mm	Not less than 600				ISO 10545-4
Modulus of rupture, in N/mm² Not applicable to tiles with breaking strength $\geq 3\,000$ N.	Minimum 22 Individual minimum 20				ISO 10545-4
Abrasion resistance					
a) Resistance to deep abrasion of unglazed tiles: removed volume, in cubic millimetres.	Maximum 345				ISO 10545-6
b) Resistance to surface abrasion of glazed tiles intended for use on floors ⁴⁾ .	Report abrasion class and cycles passed				ISO 10545-7
Coefficient of linear thermal expansion ⁵⁾					
From ambient temperature to 100 °C.	Test method available				ISO 10545-8
Thermal shock resistance ⁵⁾	Test method available				ISO 10545-9
Crazing resistance: glazed tiles ⁶⁾	Required				ISO 10545-11
Frost resistance ⁵⁾	Test method available				ISO 10545-12
Coefficient of friction					
Tiles intended for use on floors.	Manufacturer to state value and test method used				ISO 10545-17

Table J.1 (concluded)

Physical properties	Requirements	Test
Moisture expansion, in mm/m ⁵⁾	Test method available	ISO 10545-10
Small colour differences ⁵⁾	Test method available	ISO 10545-16
Impact resistance ⁵⁾	Test method available	ISO 10545-5
Chemical properties		Test
Resistance to staining		
a) Glazed tiles	Minimum Class 3	ISO 10545-14
b) Unglazed tiles ⁵⁾	Test method available	ISO 10545-14
Resistance to chemicals		
Resistance to low concentrations of acids and alkalis		
a) glazed tiles;	Manufacturer to state classification	ISO 10545-13
b) unglazed tiles ⁷⁾ .	Manufacturer to state classification	ISO 10545-13
Resistance to high concentrations of acids and alkalis ⁵⁾ .	Test method available	ISO 10545-13
Resistance to household chemicals and swimming pool salts		
a) glazed tiles;	Minimum GB	ISO 10545-13
b) unglazed tiles ⁷⁾ .	Minimum UB	
Lead and cadmium release ⁵⁾	Test method available	ISO 10545-15
1) Similar joint widths may be used to apply to traditional systems based on non-metric sizes. 2) Not applicable for tiles having curved shapes. 3) 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. 4) Reference may be made to annex N of this International Standard for the abrasion resistance classification for all glazed tiles intended for use on floors. 5) Reference may be made to annex P of this International Standard for information regarding requirements which are non-compulsory but which are listed "test method available". 6) Certain decorative effects may have a tendency to craze. They shall be identified by the manufacturer, in which case the crazing test given in ISO 10545-11 is not applicable. 7) If the hue becomes slightly different, this is not considered to be chemical attack.		

J.2 Sampling and basis for acceptance

The sampling and basis for acceptance shall be in accordance with that presented in ISO 10545-1.

J.3 Marking and specifications

J.3.1 Marking

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

- a) manufacturer's mark and/or trademark and the country of origin;
- b) mark to indicate first quality;
- c) type of tile and reference to the appropriate annex in this International Standard (see contents);
- d) nominal and work sizes, modular (M) or non-modular;
- e) nature of the surface, i.e. glazed (GL) or unglazed (UGL).

J.3.2 Product literature

Product literature for tiles intended for use on floors shall state:

- a) the results obtained from ISO 10545-17;
- b) the abrasion class for glazed tiles.

NOTE See also annex M for informative symbols.

J.3.3 Specifications

Tiles shall be specified by designating the following:

- a) the method of shaping;
- b) the annex in this International Standard covering the specific class of tile;
- c) nominal and work sizes, modular (M) and non-modular;
- d) the nature of the surface, i.e. glazed (GL) or unglazed (UGL).

EXAMPLES

Dry-pressed tile, ISO 13006:1998, annex J

BII_a M20 cm × 20 cm (W 197 mm × 197 mm × 8 mm) GL

Dry-pressed tile, ISO 13006:1998, annex J

BII_a 15 cm × 15 cm (W 150 mm × 150 mm × 8 mm) UGL

J.4 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.

Annex K (normative)

Dry-pressed ceramic tiles

$$6 \% < E \leq 10 \%$$

Group BII_b

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_b, $6 \% < E \leq 10 \%$

Dimensions and surface quality	Surface <i>S</i> of the product (cm ²)				Test
	$S \leq 90$	$90 < S \leq 190$	$190 < S \leq 410$	$S > 410$	
Length and width					
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 ¹⁾ ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 2 \%$ (max. ± 5 mm). The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size (<i>W</i>).	$\pm 1,2 \%$	$\pm 1,0 \%$	$\pm 0,75 \%$	$\pm 0,6 \%$	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).	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2
Thickness					
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.	$\pm 10 \%$	$\pm 10 \%$	$\pm 5 \%$	$\pm 5 \%$	ISO 10545-2
Straightness of sides ²⁾ (facial sides)					
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,75 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	$\pm 0,5 \%$	ISO 10545-2