INTERNATIONAL STANDARD

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Ceramic tiles —

Part 1: Sampling and basis for acceptance

Carreaux et dalles céramiques —

Partie 1: Échantillonnage et conditions de réception

Reference number
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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

This second edition cancels and replaces the first edition (ISO 10545-1:1995), which has been technically revised.

ISO 10545 consists of the following parts, under the general title *Ceramic Tiles*:

— *Part 1: Sampling and basis for acceptance*

— *Part 2: Determination of dimensions and surface quality*

— *Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density*

— *Part 4: Determination of modulus of rupture and breaking strength*

— *Part 5: Determination of impact resistance by measurement of coefficient of restitution*

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

— *Part 7: Determination of resistance to surface abrasion for glazed tiles*

— *Part 8: Determination of linear thermal expansion*

— *Part 9: Determination of resistance to thermal shock*

— *Part 10: Determination of moisture expansion*

— *Part 11: Determination of crazing resistance for glazed tiles*

— *Part 12: Determination of frost resistance*

— *Part 13: Determination of chemical resistance*

— *Part 14: Determination of resistance to stains*

— *Part 15: Determination of lead and cadmium given off by glazed tiles*

— *Part 16: Determination of small colour differences*

Ceramic tiles —

Part 1: Sampling and basis for acceptance

1 Scope

This part of ISO 10545 specifies rules for batching, sampling, inspection, and acceptance/rejection of ceramic tiles.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
order
quantity of tiles ordered at one time

Note 1 to entry: An order may consist of one or more consignments.

2.2
consignment
quantity of tiles delivered during a period of 2 d

2.3
homogeneous consignment/subconsignment
consignment or subconsignment that consists of tiles from one manufacturer, produced under conditions and with properties that are presumed uniform

2.4
inspection lot
quantity of tiles submitted for inspection manufactured by one manufacturer under conditions and with properties that are presumed uniform

2.5
sample
specified number of tiles taken from an inspection lot

2.6
sample size
number of tiles to be tested for each property

2.7
requirement
required characteristic as specified for the property in the relevant product standard

2.8
non-conforming unit
tile that does not meet the requirement for the property concerned

3 Principle

This part of ISO 10545 provides for a sampling inspection system with a double sampling plan, partly for the method of inspection by attributes (individual values) and partly for a method of inspection by average values (variables).

The number of tiles to be tested varies for each property (see Table 1).

4 Constitution of inspection lots

An inspection lot can consist of one or more homogeneous consignments or subconsignments.

Any consignment which is not homogeneous shall be divided into subconsignments which are assumed to be homogeneous and which might then constitute inspection lots.

If non-homogeneity is not relevant to the properties to be tested, by agreement between the supplier and consumer, the consignment can be treated as homogeneous.

NOTE For example, a consignment of tiles, of the same type with different glazes, can be homogeneous with regard to dimensions and water absorption and non-homogeneous with regard to surface quality. In the same way, accessories which differ only in shape from the remaining tiles in the sample can be considered homogeneous with respect to the other properties.

5 Extent of the inspection

The choice of properties to be considered for inspection shall be subject to agreement between the supplier and consumer and might depend on the size of the inspection lot.

NOTE In principle, a complete range of tests has to only be executed for inspection lots of more than 5 000 m^2 of tiles. Testing is usually not considered to be necessary for inspection lots of less than 1 000 m^2 of tiles.

The number of inspection lots to be drawn for testing shall be subject to agreement between the parties concerned.

6 Sampling

6.1 The sampling location shall be subject to agreement between the supplier and consumer.

6.2 One or more representatives of each party concerned can be present at the time the sample is taken. Samples shall be taken at random from the inspection lot. Two samples shall be taken. It might not be necessary to test the second sample. Each sample shall be packed separately and shall be sealed and marked as agreed by the parties concerned

6.3 For each property, the number of tiles to be tested is indicated as “sample size” in column 2 of Table 1.

7 Inspection

7.1 The tiles in the sample shall be tested according to the test methods specified in the relevant product standards.

7.2 The test results shall be evaluated according to Clause 8.

8 Determination of acceptability of inspection lots

8.1 Inspection by attributes

8.1.1 When the number of non-conforming units found in the initial sample is less than or equal to the acceptance number Ac_1, indicated in column 3 of Table 1, the inspection lot from which the sample was drawn shall be considered acceptable.

8.1.2 When the number of non-conforming units found in the initial sample is greater than or equal to the rejection number Re_1, indicated in column 4 of Table 1, this justifies rejection of the inspection lot.

8.1.3 When the number of non-conforming units found in the initial sample lies between the acceptance number and the rejection number (columns 3 and 4 of Table 1), a second sample of the same size as the initial sample shall be taken and tested.

8.1.4 The number of non-conforming units found in the initial and second samples shall be totaled.

8.1.5 If the total number of non-conforming units is less than or equal to the acceptance number Ac_2, indicated in column 5 of Table 1, the inspection lot shall be considered acceptable.

8.1.6 If the total number of non-conforming units is greater than or equal to the second rejection number Re_2, indicated in column 6 of Table 1, this justifies rejection of the inspection lot.

8.1.7 When the relevant product standard calls for more than one property to be tested, the second sample taken (see 8.1.3) shall only be inspected in accordance with those tests which, at the time of inspection of the initial sample, gave numbers of non-conforming units between the acceptance number Ac_1 and the rejection number Re_1.

8.2 Inspection by the average value

8.2.1 If the average value $(\bar{x}_1)$ of the test results of the initial sample meets the requirements, the inspection lot shall be considered acceptable (column 7 of Table 1).

8.2.2 If the average value $(\bar{x}_1)$ does not meet the requirements, a second sample of the same size as the initial sample shall be taken (column 8 of Table 1).

8.2.3 If the average value $(\bar{x}_2)$ of the test results of the combined initial and second samples meets the requirements, the inspection lot shall be considered acceptable (column 9 of Table 1).

8.2.4 If the average value $(\bar{x}_2)$ does not meet the requirements, this justifies rejection of the inspection lot (column 10 of Table 1).

9 Acceptance Report

The acceptance report shall include the following information:

a) a reference to this part of ISO 10545 (i.e. ISO 10545-1);

b) a description of the tiles;

c) the sampling procedure;

d) the constitution of the inspection lot;

e) the determination of acceptability for each of the tested characteristics.

Table 1 — Sampling Criteria

1	2		3	4	5	6	7	8	9	10	11
Properties	**Sample size**		**Inspection by attribute, if required**				**Inspection by average value, if required**				**Test method**
			Initial sample		**Initial + second sample**		**Initial sample**		**Initial + second sample**		
	Initial	**Second**	**Acceptance number** Ac_1	**Rejection number** Re_1	**Acceptance number** Ac_2	**Rejection number** Re_2	**Acceptable if**	**Second sample to be drawn if**	**Acceptable if**	**Second sample to be drawn if**	ISO 10545 **part**
Dimensions[a]	10	10	0	2	1	2	—	—	—	—	2
Surface quality[b]	30	30	1	3	3	4	—	—	—	—	2
	40	40	1	4	4	5	—	—	—	—	
	50	50	2	5	5	6	—	—	—	—	
	60	60	2	5	6	7	—	—	—	—	
	70	70	2	6	7	8	—	—	—	—	
	80	80	3	7	8	9	—	—	—	—	
	90	90	4	8	9	10	—	—	—	—	
	100	100	4	9	10	11	—	—	—	—	
	1 m^2	1 m^2	4 %	9 %	5 %	>5 %	—	—	—	—	
Water absorption[c]	5[d]	5[d]	0	2	1	2	$\bar{x}_1 > L$[e]	$\bar{x}_1 < L$	$\bar{x}_2 > L$	$\bar{x}_2 < L$	3
	10	10	0	2	1	2	$\bar{x}_1 < U$[f]	$\bar{x}_1 > U$	$\bar{x}_2 < U$	$\bar{x}_2 > U$	
Modulus of rupture[c]	7[g]	7[g]	0	2	1	2	$\bar{x}_1 > L$	$\bar{x}_1 < L$	$\bar{x}_2 > L$	$\bar{x}_2 < L$	4
	10	10	0	2	1	2					
Breaking Strength[c]	7[g]	7[g]	0	2	1	2	$\bar{x}_1 > L$	$\bar{x}_1 < L$	$\bar{x}_2 > L$	$\bar{x}_2 < L$	4
	10	10	0	2	1	2					
Deep Abrasion UGL	5	5	0	2[h]	1[h]	2[h]	—	—	—	—	6
Coefficient of linear thermal expansion	2	2	0	2[i]	1[i]	2[i]	—	—	—	—	8

Table 1 *(continued)*

1	2		3	4	5	6	7	8	9	10	11
Properties	**Sample size**		**Inspection by attribute, if required**				**Inspection by average value, if required**				**Test method**
			Initial sample		**Initial + second sample**		**Initial sample**		**Initial + second sample**		
	Initial	**Second**	**Acceptance number** Ac_1	**Rejection number** Re_1	**Acceptance number** Ac_2	**Rejection number** Re_2	**Acceptable if**	**Second sample to be drawn if**	**Acceptable if**	**Second sample to be drawn if**	ISO 10545 **part**
Crazing resistance	5	5	0	2	1	2	—	—	—	—	11
Chemical resistance[j]	5	5	0	2	1	2	—	—	—	—	13
Stain resistance[j]	5	5	0	2	1	2	—	—	—	—	14
Frost resistance[k]	10	—	0	1	—	—	—	—	—	—	12
Thermal shock resistance	5	5	0	2	1	2	—	—	—	—	9
Moisture expansion	5	—	—	Attribution by manufacturer's declaration							10
Resistance to abrasion G[k]	11	—	—	Attribution by manufacturer's declaration							7
Colour difference	5	—	—	Attribution by manufacturer's declaration							16
Impact resistance	5	—	—	Attribution by manufacturer's declaration							5
Lead and cadmium release	5	—	—	Attribution by manufacturer's declaration							15

Table 1 *(continued)*

1	2		3	4	5	6	7	8	9	10	11
Properties	**Sample size**		**Inspection by attribute, if required**				**Inspection by average value, if required**				**Test method**
			Initial sample		**Initial + second sample**		**Initial sample**		**Initial + second sample**		
	Initial	**Second**	**Acceptance number** Ac_1	**Rejection number** Re_1	**Acceptance number** Ac_2	**Rejection number** Re_2	**Acceptable if**	**Second sample to be drawn if**	**Acceptable if**	**Second sample to be drawn if**	ISO 10545 **part**

[a] Only for tiles with individual areas ≥4 cm^2. Sample size = 5 for tiles with edge length (nominal) L in the range of $L \geq 1\,000$ mm.

[b] At least 1 m^2 with a minimum of 30 tiles. Whatever the number of tiles in the 1 m^2, the test sample should be rounded to the nearest 10 tiles above. Conformity to acceptable quality level (AQL) 2,5 % in accordance with ISO 2859-1 or ISO 3951 (all parts), is an acceptable alternative to the procedure in this table. Sample size = 20 for tiles with edge length (nominal) L in the range of $L \geq 1\,000$ mm.

[c] The sample size depends on the size of the tile. Sample size = 5 for tiles with edge length (nominal) L in the range of $L \geq 1\,000$ mm.

[d] Only for tiles with individual surface areas ≥0,04 m^2. In the case of tiles with a mass <50 g, a sufficient number should be taken so as to form five test specimens, each weighing between 50 g and 100 g.

[e] L: Lower specification limit.

[f] U: Upper specification limit.

[g] Only for tiles with lengths ≥48 mm.

[h] Number of measurements.

[I] Number of test specimens.

[j] Per test solution.

[k] There is no double sampling test procedure for these properties. Sample size = 5 for tiles with edge length (nominal) L in the range of $L \geq 1\,000$ mm.

Bibliography

[1] ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

[2] ISO 3951 (all parts), *Sampling procedures for inspection by variables*

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