

Nepal Standard

CERAMIC TILES—SPECIFICATION
(USING PRESSING METHOD)

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1. SCOPE

This standard specifies sizes, dimensional tolerances, surface quality, mechanical, physical and chemical requirements, and marking of ceramic tiles manufactured through pressing method.

The standard is applicable for pressed ceramic glazed or unglazed tiles of first quality (also known as premium quality) for use as both floor and wall coverings. For the purpose of definition, first quality (premium quality) tiles are tiles that are fairly free from any kind of surface or dimensional defects that may otherwise impair the aesthetics or functionality of the product. These tiles should conform to dimensional, physical, chemical and surface requirements as defined in this standard.

The standard does not cover ceramic tiles manufactured by other processes, like extrusion process.

2. REFERENCES

2.1. The standards given at Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3. DEFINITIONS

3.1. Ceramic Tiles

Thin slabs made from inorganic raw materials such as clays, silica, fluxing aids such as feldspars, coloring and other mineral raw materials, generally used as coverings for floors, walls or facades. They are prepared by grinding, sieving, mixing, moistening etc, and are shaped by pressing, extruding, casting or other processes, usually at room temperature. They are then dried and subsequently fired at a high temperature. Tiles may be glazed (GL), unglazed (UGL) or engobed. They may be rectified (R) or unrectified (UR) and may be polished (P) or unpolished (UP). Ceramic tiles are incombustible and unaffected by light. Depending on degree of vitrification their water absorption may vary. A low water absorption tile is also called porcelain tile. An extremely low water absorption tile is called a fully vitrified tile and this may be glazed or unglazed and polished or unpolished.

3.2. Glaze

A vitrified covering that is practically impermeable.

3.3. Engobe

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

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3.4. Pressed Tiles (Shaping B)

Tiles formed from a body reduced to powder or small grains and shaped in moulds at high pressure. They may be glazed or unglazed, rectified or unrectified, and polished or unpolished.

3.5 Water Absorption

The water absorption (percent by mass) measures the increase in mass (expressed as a percentage of the mass of the dry material) of tiles which after determination of the dry mass are:

- a) Placed under water, then boiled and, after wards, cooled during specified times while still completely immersed, taken out of the water and reweighed after removing excess of water, or
- b) Placed under vacuum at specified pressure and then impregnated with water, taken out and reweighed after removing excess of water

3.6 Coordinating Size

The size of coordinating dimension (refer table 1 & 3)

3.7 Nominal Size

The size used to describe the product.

3.8 Work Size

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

3.9 Actual Size

The size obtained by measuring a tile in accordance with test method on Determination of Dimensions and Surface Quality as defined in test Methods-NS**

3.10 Tolerances

The difference between actual and permissible limits of size

3.11 Rectified Tile

A ceramic tile that, after firing, is subjected to a precise mechanical grinding of the edges to give the tile desired dimensions. Rectified tiles have tighter dimensional criteria for length and width, straightness of sides, and rectangularity than un-rectified tiles.

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3.12 Polished Tile

A ceramic tiles whose glazed or unglazed surface has been given a glossy finish by mechanical polishing as the last stage of manufacturing.

3.13 Spacer Lugs

Lugs are projections located along certain edges of tiles so that when two tiles are placed together in line, the lugs on adjacent edges separate the tiles. Lugs are positioned so that the joint between the tiles may be filled with grout without the lugs remaining exposed.

3.14 Sizes:

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.

3.14.1 Modular Sizes

This covers tiles and sizes based on M (M=100mm), 2M, 3M and 5M and also their multiples or submultiples or sub-divisions, except for tiles with a surface area of less than 9000 mm².

NOTE — The most important examples of modular sizes are listed in the individual product standards. A general definition of dimensions is given in Table1.

3.14.2 Non-modular Sizes

The sizes excluding those that are based on M.

4. CLASSIFICATION

4.1. Pressed ceramic tiles, based on their **water absorptions** shall be classified as Group B Ia, Group B Ib, Group B IIa, Group B IIb and Group B III.

4.1.1. Tiles of Very Low and Low Water Absorption (Group I)

- a) $E \leq 0.08$ percent (Group B Ia) — Ceramic fully vitrified tiles; and
- b) 0.08 percent $< E \leq 3$ percent (Group B Ib) — Ceramic porcelain tiles.

4.1.2. Tiles of Medium Water Absorption (Group II)

- a) 3 percent $< E \leq 6$ percent (Group B IIa) — Ceramic floor tiles; and
- b) 6 percent $< E \leq 10$ percent (Group B IIb) — Ceramic floor tiles.

4.1.3. Tiles of High Water Absorption (Group III) $E > 10$ percent (Group B III) — Ceramic wall tiles

4.2. The surface of tiles can be smooth, profiled, wavy, decorated or finished in any other way. It can be unglazed (UGL) or glazed (GL). Glazed tiles shall be of glossy, matt or semi-matt finish. The surface may also be polished (P), semi-polished (lappato or lapped or honed finish) (SP),

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or unpolished (UP). The surface and mechanical characteristics of glazed, unglazed, unpolished, polished and semi-polished tiles are different and shall be as defined in this standard. Surface specifications for certain special finishes, such as metallic or lustre are not defined in the standard and these shall be as agreed to between the manufacturer and the purchaser.

- 4.3. The edges of the tile may be rectified (R) or unrectified (UR). Unrectified tiles are tiles that under go no further dimensional processing after the tiles are fired. Rectified tiles are tiles whose edges have been cut or ground to a precise dimension after the tiles have been fired. The dimensional tolerances of rectified and unrectified tiles are different and shall be as defined in this standard.

Note: Tiles may have spacer lugs.

5. SHAPES AND SIZES

- 5.1. Unless otherwise specified the shape and size of pressed ceramic tiles shall be as given below (see also Fig.1 and Fig.2):

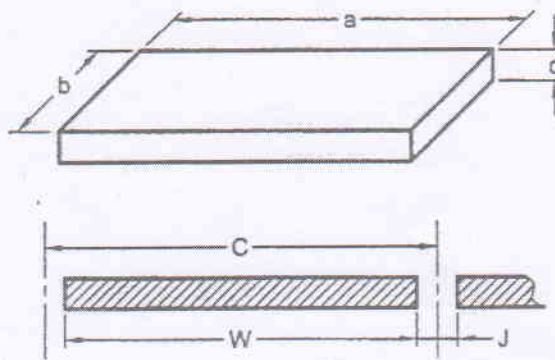
5.1.1. Tables 1 and 2—For tiles with water absorption $E > 10$ percent (Group B III),

5.1.2. Tables 3 and 4— for tiles with water absorption $6 < E \leq 10$ percent (Group B II b), $3 < E \leq 6$ percent (Group B II a), $0.08 < E \leq 3$ percent (Group B I b), and $E \leq 0.08$ percent (Group B I a).

NOTES

1. B denotes shaping method (Pressed tiles)
2. Table 1 and Table 3 give the most common modular sizes.
3. Table 2 and Table 4 give the most common non- modular sizes.

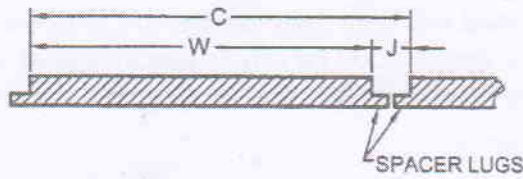
- 5.2. Pressed tiles may also be manufactured in dimensions other than those given in Tables 1 to 4. In such cases the work size shall be as declared by the manufacturer. The relevant requirements for work size and thickness given in the respective tables shall however apply.



Co-ordinating size (C) = Work size (W) + Joint width (J), Work size (W) = Dimensions of the visible faces a and b.

FIG.1 TILE

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Co-ordinating size(C) = Work size (W)+Joint width(J), Work size(W)=Dimensions of the visible faces a and b.

FIG.2 TILE WITH SPACER LUGS

5.3 Spacer Lug

5.3.1 Spacer lug projection where provided in the tiles, shall normally be of 0.6mm. The lugs on adjacent edges shall separate the tiles by a distance of not less than the specified width of joints (see Fig. 2).

5.3.2 Pressed tiles may be made with other spacer lug systems and in such cases the manufacturer's work size shall apply.

NOTE—Some tiles have one or more manufacturing projections along certain edges and smaller than 0.3mm. These are not intended as spacer lugs and shall not be used to space joints.

6 REQUIREMENTS

Dimensional, physical and chemical requirements of the tiles shall be as given below:

Tables 5 to 9— For tiles of Group B III, B IIb, B IIa, B Ib and B Ia, respectively.

7 SAMPLING

Sampling and basis for acceptance shall be in accordance with Test Method for sampling and basis of method as per NS**.

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Table 2 Non-modular Sizes for Tiles with Water Absorption, E > 10 Percent (Group B III)
(Clause 5.1)

Sl No.	Nominal Size (N) cm	Work Size (W)		Thickness (d)
		Length (a) (3)	Width (b) (4)	
(1)	(2)			(5)
i)	10.8 × 10.8			
ii)	15 × 7.5			
iii)	15.2 × 7.6			
iv)	15.2 × 15.2			
v)	21.6 × 10.8			
vi)	25 × 33			
vii)	31.5 × 42			
viii)	32 × 32			
ix)	25 × 38			
x)	32 × 40			
xi)	32 × 48			
xii)	32 × 60			
xiii)	33 × 33			
xiv)	33 × 48			
xv)	33 × 60			
xvi)	33 × 90			

The manufacturer shall choose the work size in such a way that the difference between the work size and the nominal size is not more than ± 2 percent or 5 mm, whichever is lower

The thickness shall be specified by the manufacturer. It includes the profile on the visible face and on the rear side

For spacer lug tiles, one work size shall apply for each nominal size within the limits mentioned above

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Table 3 Modular Preferred Sizes for Tiles with Water Absorption, $6 < E \leq 10$ Percent (Group B IIb), $3 < E \leq 6$ Percent (Group B IIa), $0.08 < E \leq 3$ Percent (Group B Ib), $E \leq 0.08$ Percent (Group B Ia) (Clause 5.1)

SI No.	Coordinating Size (C) cm	Work Size (W)		Thickness (d)
		Length (a) (3)	Width (b) (4)	
(1)	(2)			(5)
i)	M10 × 10	} The manufacturer shall choose the work size in order to allow a nominal joint width between 2 mm and 5 mm	} The thickness shall be specified by the manufacturer. It includes the profile on the visible face and on the rear side	
ii)	M15 × 15			
iii)	M15 × 10			
iv)	M20 × 10			
v)	M20 × 15			
vi)	M20 × 20			
vii)	M25 × 25			
viii)	M30 × 30			
ix)	M30 × 45			
x)	M40 × 30			
xi)	M40 × 40			
xii)	M45 × 45			
xiii)	M40 × 80			
xiv)	M45 × 90			
xv)	M50 × 50			
xvi)	M60 × 60			
xvii)	M60 × 90			
xviii)	M80 × 80			
xix)	M90 × 90			
xx)	M60 × 120			
xxi)	M100 × 100			
xxii)	M90 × 120			
xxiii)	M120 × 120			

Table 4 Non-Modular Sizes for Tiles with Water Absorption, $6 < E \leq 10$ Percent (Group B IIb), $3 < E \leq 6$ Percent (Group B IIa), $0.08 < E \leq 3$ Percent (Group B Ib), $E \leq 0.08$ Percent (Group B Ia) (Clause 5.1)

SI No.	Nominal Size (N) cm	Work Size (W)		Thickness (d)
		Length (a) (3)	Width (b) (4)	
(1)	(2)			(5)
i)	15 × 7.5	} The manufacturer shall choose the work size in such a way that the difference between the work size and the nominal size is not more than ± 2 percent or 5 mm, whichever is lower	} The thickness shall be specified by the manufacturer. It includes the profile on the visible face and on the rear side	
ii)	15.2 × 7.6			
iii)	15.2 × 15.2			
iv)	30.6 × 30.6			
v)	31.5 × 31.5			
vi)	32 × 32			
vii)	33 × 48			
viii)	40.6 × 40.6			
ix)	60.5 × 60.5			
x)	81.5 × 81.5			

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Table 5 Test Requirements for Tiles with Water Absorption, E > 10 Percent (Group B III)
(Clause 6)

SI No. (1)	Characteristic (2)	Requirement (3)	Method of Test. Ref to Refer to NS** (4)
1)	Dimensions and surface quality :		
	a) Length and width:		
	1) The deviation in percent of the average size of each tile (2 or 4 sides) from the work size (W) :		
	i) Un-rectified	$N \leq 15 \text{ cm} : \pm 0.5$	
		$N > 15 \text{ cm} : \pm 0.4$	
	ii) Rectified	$N \leq 15 \text{ cm} : \pm 0.2$	
		$N > 15 \text{ cm} : \pm 0.2$	
	NOTES		
	1 'N' represents the nominal dimension of tile.		
	2 For tiles with spacer lugs, the requirement shall be $\begin{matrix} +0.6 \\ -0.3 \end{matrix}$		
	2) The deviation in percent of the average size of each tile (2 or 4 sides) from the average of the 10 test specimens (20 or 40 sides) :		
	i) Un-rectified	$N \leq 15 \text{ cm} : \pm 0.4$	
		$N > 15 \text{ cm} : \pm 0.3$	
	ii) Rectified	$N \leq 15 \text{ cm} : \pm 0.3$	
		$N > 15 \text{ cm} : \pm 0.2$	
	NOTE — For tiles with spacer lugs, the requirement shall be ± 0.25 .		
	b) Thickness :		
	The deviation in percent of the average thickness of each tile from the work size thickness :		
	1) $N \leq 15 \text{ cm}$	± 7.0	
	2) $N > 15 \text{ cm}$	± 5.0	
	c) Straightness of sides ¹⁾ (Facial sides) :		
	The maximum deviation from straightness, in percent related to the corresponding work size :		
	1) Un-rectified	± 0.2	
	2) Rectified	± 0.15	
	d) Rectangularity ²⁾ :		
	The maximum deviation from rectangularity, in percent related to the corresponding work size		
	1) Un-rectified	± 0.3	
	2) Rectified	± 0.2	
	NOTE — For tiles with spacer lugs, the requirement shall be ± 0.3 .		
	e) Surface flatness :		
	The maximum deviation from flatness, in percent:		
	1) Centre curvature, related to diagonal calculated from the work sizes	± 0.3	

Refer to NS**

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Table 5 (Concluded)

SI No. (1)	Characteristic (2)	Requirement (3)	Method of Test, Ref to Refer to NS** (4)
	2) Edge curvature, related to the corresponding work size	± 0.3	} Refer to NS**
	3) Warpage, related to diagonal calculated from the work sizes	± 0.3	
	f) Surface Quality ²⁾	Minimum 95 percent of tiles shall be free from visible defects that would impair the appearance of a major area of the tiles	
ii)	Physical Properties :		
	a) Water absorption, percent by weight	Average > 10 percent, (When the value exceeds 20 percent this shall be indicated by the manufacturer). Individual 9 percent, <i>Min</i>	Refer to NS**
	b) Modulus of rupture, in N/mm ²	12, Minimum for thickness ≥ 7.5 mm 15, Minimum for thickness < 7.5 mm	Refer to NS**
	c) Breaking strength, in N	200, Minimum for thickness < 7.5 mm 600, Minimum for thickness ≥ 7.5 mm	Refer to NS**
	d) Moisture expansion, in mm/m	0.04, <i>Max</i>	Refer to NS**
	e) Scratch hardness of surface (Mohs ³⁾)	5, <i>Min</i>	Refer to NS**
	f) Co-efficient of linear thermal expansion from ambient temperature to 100°C	9 × 10 ⁻⁴ K ⁻¹ , <i>Max</i>	Refer to NS**
	g) Thermal shock resistance	10 cycles, <i>Min</i>	Refer to NS**
	h) Impact resistance — Coefficient of restitution	0.55, <i>Min</i>	Refer to NS**
	j) Co-efficient of friction — Tiles intended for use on floors	Where required manufacturer to declare value	Manufacturer to declare test method(s)
	k) Craze resistance ³⁾	4 cycles at 7.5 bar, <i>Min</i>	Refer to NS**
	m) Resistance to surface abrasion of glazed tiles Class I to Class V ³⁾ (Applicable for floor tiles only)	Class II, <i>Min</i>	Refer to NS**
iii)	Chemical properties :		
	a) Resistance to staining of glazed tiles	Class I, <i>Min</i>	Refer to NS**
	b) Resistance to household chemicals and swimming pool water cleansers except to cleansing agents containing hydrofluoric acid and its compounds — Glazed tiles	Class AA, <i>Min</i>	Refer to NS**
	c) Resistance to acids and alkalis (with the exception of hydrofluoric acid and its compounds) — Glazed tiles	Required, if agreed according to the chemical resistance class indicated by the manufacturer	Refer to NS**

¹⁾ Not applicable for tiles have curved or irregular shape.

²⁾ Because of firing, slight variation in shade or colour is unavoidable and is inherent to the manufacturing process. This is not to be construed as a defect, so long as it doesn't disturb the overall aesthetics. Also, variations in design or colour or shade that are intentionally introduced and spots or colours introduced for decorative purposes are not to be considered as a defect.

³⁾ Certain decorative effects may have a tendency to craze. These shall be identified by the manufacturer, in which case the crazing test is not applicable.

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Table 7 Test Requirements for Tiles with Water Absorption, $3 < E \leq 6$ Percent (Group B IIa)
(Clause 6)

Sl No.	Characteristic	Nominal Size (N)		Method of Test, Ref t 1) Refer to NS**	
		N ≤ 20 cm	N > 20 cm		
(1)	(2)	(3)	(4)	(5)	
i) Dimensions and surface quality :					
a) Length and width:					
1) The deviation in percent of the average size of each tile (2 or 4 sides) from the work size (W) :					
i) Un-rectified		± 0.6	± 0.4	Refer to NS**	
ii) Rectified		± 0.3	± 0.1		
2) The deviation in percent of the average size of each tile (2 or 4 sides) from the average size of the 10 test specimen (20 or 40 sides):					
i) Un-rectified		± 0.5	± 0.4		
ii) Rectified		± 0.2	± 0.1		
b) Thickness:					
The deviation, in percent of the average thickness of each tile from the work size thickness		± 10	± 5		
c) Straightness of sides ¹⁾ (Facial sides):					
The maximum deviation from straightness, in percent related to the corresponding work sizes					
1) Un-rectified		± 0.5	± 0.3		
2) Rectified		± 0.3	± 0.1		
d) Rectangularity ²⁾					
The maximum deviation from rectangularity in percent related to the corresponding work sizes :					
1) Un-rectified		± 0.6	± 0.3		
2) Rectified		± 0.3	± 0.1		
e) Surface flatness :					
The maximum deviation from flatness, in percent:					
1) Centre curvature, related to diagonal calculated from the work sizes		± 0.75	± 0.5		
2) Edge curvature, related to the corresponding work size		± 0.75	± 0.5		
3) Warpage, related to the diagonal calculated from the work sizes		± 0.75	± 0.5		
f) Surface quality ²⁾					
		Minimum 95% of tiles shall be free from visible defects that would impair the appearance of a major area of the tiles			
ii) Physical properties :					
a) Water absorption percent by weight		Average $3 < E \leq 6$, Individual 6.2, Max		Refer to NS**	
b) Modulus of rupture, in N/mm ²		Average 22, Individual 20, Min			
c) Breaking strength, in N		600, Minimum for thickness < 7.5 mm 1 000, Minimum for thickness ≥ 7.5 mm			
d) Moisture expansion, in mm/m		0.03, Max			
e) Scratch hardness of surface ³⁾ (Mohs' scale)		4, Min			
f) Resistance to surface abrasion of glazed tiles Class I to V ³⁾ (Applicable for floor application only)		Class II, Min			
g) Co-efficient of linear thermal expansion from ambient temperature to 100° C (K ⁻¹)		9 × 10 ⁻⁶ , Max			
h) Thermal shock resistance		10 cycles, Min			
j) Craze resistance ⁴⁾		4 cycles at 7.5 Bar, Min			
k) Impact resistance — Coefficient of restitution		0.55, Min			
m) Coefficient of friction — Tiles intended for use on floors		Where required manufacturer to declare value		Manufacturer to declare Test Method(s) (Part 10)	
n) Frost resistance		Required, if agreed to between manufacturer and purchaser 345, Max			
p) Resistance to deep abrasion of unglazed tiles, volume of material removed in cubic millimeter ³⁾ (Applicable for floor application only)		345, Max			
iii) Chemical properties :					
a) Resistance to staining of glazed tiles		Class 1, Min		Refer to NS**	
b) Resistance to household chemicals and swimming pool water cleansers except to cleansing agents containing hydrofluoric acid and its compounds — Glazed tiles		Class AA, Min			
c) Resistance to acids and alkalis (with the exceptions of hydrofluoric acid and its compounds) — Glazed tiles		Required, if agreed according to the chemical resistance class indicated by the manufacturer.			

¹⁾ Not applicable for tiles have curved or irregular shape.

²⁾ Because of firing, slight variation in shade or colour is unavoidable and is inherent to the manufacturing process. This is not to be construed as a defect, so long as it doesn't disturb the overall aesthetics. Also, variations in design or colour or shade that

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are intentionally introduced and spots or colours introduced for decorative purposes are not to be considered as a defect.
³⁾ Certain decorative effects may have a tendency to craze. These shall be identified by the manufacturer, in which case the crazing test is not applicable.

Table 8 Test Requirements for Tiles with Water Absorption, 0.08 < E ≤ 3 percent (Group B Ib)
 (Clause6)

Sl No.	Characteristic	Nominal Size (N)		Method of Test, Ref to NS**
		N ≤ 20 cm	N > 20 cm	
(1)	(2)	(3)	(4)	(5)
i)	Dimensions and surface quality :			Refer to NS**
a)	Length and width:			
	1) The deviation in percent of the average size of each tile (2 or 4 sides) from the work size (W) :			
	i) Un-rectified	± 0.6	± 0.4	
	ii) Rectified	± 0.3	± 0.1	
	2) The deviation in percent of the average size of each tile (2 or 4 sides) from the average size of the 10 test specimen (20 or 40 sides)			
	i) Un-rectified	± 0.5	± 0.4	
	ii) Rectified	± 0.2	± 0.1	
b)	Thickness:			
	The deviation, in percent of the average thickness of each tile from the work size thickness	± 10	± 5	
c)	Straightness of sides ¹⁾ (Facial sides):			
	The maximum deviation from straightness, in percent related to the corresponding work sizes :			
	1) Un-rectified	± 0.5	± 0.3	
	2) Rectified	± 0.3	± 0.1	
d)	Rectangularity ²⁾ :			
	The maximum deviation from rectangularity in percent related to the corresponding work sizes :			
	1) Un-rectified	± 0.6	± 0.3	
	2) Rectified	± 0.3	± 0.1	
e)	Surface flatness :			
	The maximum deviation from flatness, in percent:			
	1) Centre curvature, related to diagonal calculated from the work sizes	± 0.75	± 0.5	
	2) Edge curvature, related to the corresponding work size	± 0.75	± 0.5	
	3) Warpage, related to the diagonal calculated from the work sizes	± 0.75	± 0.5	
f)	Surface quality ³⁾	Minimum 95 per cent of tiles shall be free from visible defects that would impair the appearance of a major area of the tiles		

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Table 9 Test Requirements for Tiles with Water Absorption, $E \leq 0.08$ Percent (Group B Ia)
(Clause 6)

Sl No.	Characteristic	Nominal Size (N)		Method of Test, Ref to Refer to NS**
		$N \leq 20$ cm (3)	$N > 20$ cm (4)	
(1)	(2)			(5)
i)	Dimensions and surface quality :			Refer to NS**
a)	Length and width:			
	1) The deviation in percent of the average size of each tile (2 or 4 sides) from the work size (W) :			
	i) Un-rectified	± 0.6	± 0.4	
	ii) Rectified	± 0.3	± 0.1	
	2) The deviation in percent of the average size of each tile (2 or 4 sides) from the average size of the 10 test specimen (20 or 40 sides)			
	i) Un-rectified	± 0.5	± 0.4	
	ii) Rectified	± 0.2	± 0.1	
b)	Thickness:			
	The deviation, in percent of the average thickness of each tile from the work size thickness	± 10	± 5	
c)	Straightness of sides ¹⁾ (Facial sides):			
	The maximum deviation from straightness, in percent related to the corresponding work sizes :			
	1) Un-rectified	± 0.5	± 0.3	
	2) Rectified	± 0.3	± 0.1	
d)	Rectangularity ¹⁾ :			
	The maximum deviation from rectangularity in percent related to the corresponding work sizes :			
	1) Un-rectified	± 0.6	± 0.3	
	2) Rectified	± 0.3	± 0.1	
e)	Surface flatness :			
	The maximum deviation from flatness, in percent:			
	1) Centre curvature, related to diagonal calculated from the work sizes	± 0.75	± 0.5	
	2) Edge curvature, related to the corresponding work size	± 0.75	± 0.5	
	3) Warpage, related to the diagonal calculated from the work sizes	± 0.75	± 0.5	
f)	Surface quality ²⁾	Minimum 95 per cent of tiles shall be free from visible defects that would impair the appearance of a major area of the tiles		

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Table 9 (Concluded)

Sl No.	Characteristic	Nominal Size (N)		Method of Test, Ref to NS**
		N ≤ 20 cm	N > 20 cm	
(1)	(2)	(3)	(4)	(5)
ii) Physical properties :				
a)	Water absorption percent by weight	Average ≤ 0.08, Individual 0.1, <i>Max</i>		Refer to NS**
b)	Modulus of rupture, in N/mm ²	Average 35, Individual 32, <i>Min</i>		
c)	Breaking strength, in N	700, Minimum for thickness < 7.5 mm 1 300, Minimum for thickness ≥ 7.5 mm		
d)	Moisture expansion, in mm/m	0.02, <i>Max</i>		
e)	Scratch hardness of surface ¹⁾ (Mohs' scale)	5, <i>Min</i>		
f)	Resistance to surface abrasion of glazed tiles Class I to V ³⁾ (Applicable for floor application only)	Class II, <i>Min</i>		
g)	Co-efficient of linear thermal expansion from ambient temperature to 100° C (K ⁻¹)	6×10 ⁻⁶ , <i>Max</i>		
h)	Thermal shock resistance	10 cycles, <i>Min</i>		
j)	Crazing resistance ⁴⁾	4 cycles at 7.5 Bar, <i>Min</i>		
k)	Impact resistance — Coefficient of restitution	0.55, <i>Min</i>		
m)	Coefficient of friction — Tiles intended for use on floors	Where required manufacturer to declare value		Manufacturer to declare Test Method(s)
n)	Frost resistance	Required, if agreed to between manufacturer and purchaser		
p)	Resistance to deep abrasion of unglazed tiles, volume of material removed in cubic millimetre ³⁾ (Applicable for floor application only)	140, <i>Max</i>		Refer to NS**
q)	Bulk density, in g/cc	2.2, <i>Min</i>		
iii) Chemical properties :				
a) Resistance to staining :				
1) Glazed tiles		Class 1, <i>Min</i>		
2) Unglazed tiles		Class 2, <i>Min</i>		
b) Resistance to household chemicals and swimming pool water cleansers except to cleansing agents containing hydrofluoric acid and its compounds — glazed tiles:				Refer to NS**
1) Glazed tiles		Class AA, <i>Min</i>		
2) Unglazed tiles		Required, if agreed according to the chemical resistance class indicated by the manufacturer		
c) Resistance to acids and alkalis (with the exceptions of hydrofluoric acid and its compounds) — Glazed tiles				Refer to NS**
1) Glazed tiles		Required, if agreed according to the chemical resistance class indicated by the manufacturer		
2) Unglazed tiles		Required, if agreed according to the chemical resistance class indicated by the manufacturer		

¹⁾ Not applicable for tiles have curved or irregular shape.

²⁾ Because of firing, slight variation in shade or colour is unavoidable and is inherent to the manufacturing process. This is not

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to be construed as a defect, so long as it doesn't disturb the overall aesthetics. Also, variations in design or colour or shade that are intentionally introduced and spots or colours introduced for decorative purposes are not to be considered as a defect.
3) Certain decorative effects may have a tendency to craze. These shall be identified by the manufacturer, in which case the crazing test is not applicable.

8. MARKING AND DESIGNATION

8.1 Marking

Ceramic tiles and or their packaging shall be marked with the following:

- a) Name and address of the manufacturer and/ or trade-mark and the country of origin.
- b) Batch number/ date of manufacture, and
- c) Designation of tiles as per 8.2.

8.2 Designation

The tiles shall be designated by the following:

- 8.2.1 Classification (Group).
- 8.2.2 Nature of tile surface as glazed or unglazed denoted by GL or UGL.
- 8.2.3 Nature of the finish—Polished (P), Semi-polished (SP) or Unpolished (UP).
- 8.2.4 Nature of the edge finish—Rectified(R) or Un-rectified (UR).
- 8.2.5 Modular (M)/ coordinating size or non-modular (NM)/ nominal size (work size).

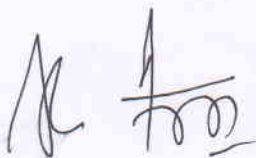

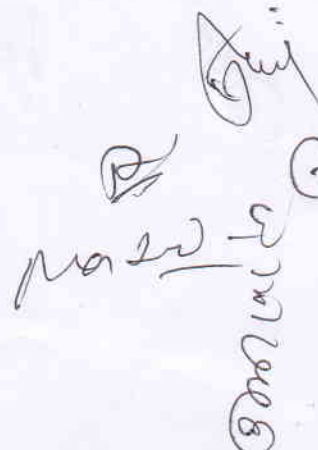
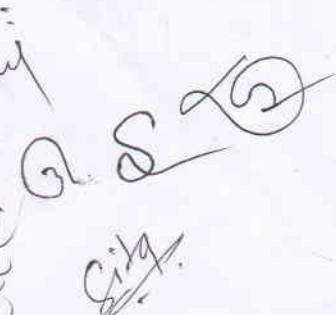
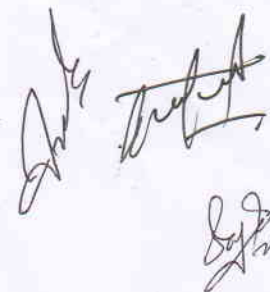

For example, a glazed unpolished and un-rectified pressed tile of water absorption Group B III having modular dimension 15cm×15cm and work size 148mm×148mm shall be designated as:

B III (Ceramic wall tiles), GL UP UR M 15cm×15cm (W148mm×148mm)

8.3 NS Certification Marking

The tiles may also be marked with the Standard Mark. The use of Standard Mark is governed by Bureau of Nepal Standards Act.

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ANNEX A
(Clause 2)
List of Referred Indian Standards

IS no.	Title
15622:2017 (Reaffirmed 2022)	Pressed Ceramic Tiles- Specification (First Revision)
13712:2019	Ceramic Tiles — Definitions, Classifications, Characteristics and Marking (Second Revision)

Handwritten signatures and initials:
He, 700, A.K. Mishra, S. Puri, P.P., ~~stated~~, ~~city~~, ~~Prasad~~