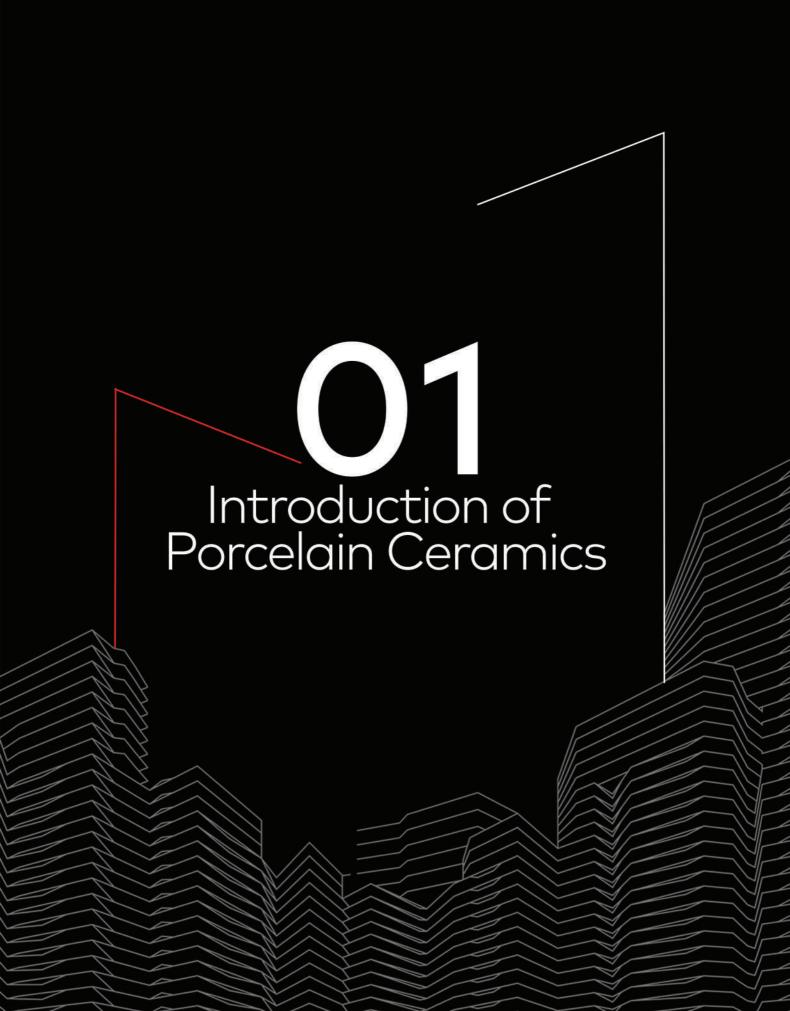
AXIMER CERAMIC





Introduction to Porcelain Ceramic

Fully translucent ceramic with equal or less water absorption percentage up to 0.5 mass percent called porcelain ceramic. In fact, porcelain ceramics are too compact and the rate of porousness in this regard are apropos zero. To be low-porous is the main trait of such a ceramic enabling the material exert a high chemical and strength mechanically reciprocal to any freeze clout.

Having a good resistance against cold weather enables this material to endure in such a climate to rug the outdoor uses. Moreover, porcelain ceramics are durable against chemical corrosive detergents and descalers, and also are easy to clean. The later trait enables the material to suit the high-traffic floors like the best option. Likewise, this special trait makes them ideal for sanitary areas in both health centers and or like in the home and offices, leaving very good results in raising the hygiene indicators.

Categorizing the Ceramics

Associated with the standards, based on a general categorization, ceramics are arranged contingent upon three main sorts: with a little absorption rate, medium rate, and high rate retrospectively called I, ii, iii.

A: ceramics with a little rate of absorption i.e. the rate must be lower or equal to 3% of the mass, belonging to i category that includes subcategories as follows:

1. For extruded ceramics i category: $Eb \ge 0.5\%$ (i) group) Ala ii category: $0.5\% \ge Eb \ge 3\%$ (ii) group) Alb

2. For dried pressed ceramics: iEb \geq 0.5% (i) group) Bla ii 0.5% \geq Eb \geq 3% (ii) group) Blb

B: For medium rate ceramics that have between 3 to 10 percent of absorption by the mass the categorization are as follows:

1.For extruded ceramics i $3\% \ge Eb \ge 6\%$ group Alla ii $6\% \ge Eb \ge 10\%$ group Allb 2.For dried pressed ceramics: $16\% \ge Eb \ge 3\%$ group Blla li $10\% \ge Eb \ge 6\%$ group Bllb

C: Ceramics with high rate of absorption that is upper than 10% belonging to the third class of iii.

Grading

Associated with national standardization, INSO 25, porcelain ceramics are solely graded by the quality of the surface into four hierarchical grades; manufactures are able to pack the product only based on this grading the stipulation of that are as follows:

First-best: when the sample associated with the national standard No. 9169-2 is tested should not have any of the 13 detects of the surface quality—except the body flaws, translucency flaw, and doddered lip tile onto the optical surface, enacted in the article 8 of the standard document should not be seen in a distance of one meter.

Second-best: when the sample associated with the national standard No. 9169-2 is tested should not have more than 3 items of the 13 detecs of the surface quality—except the body flaws, translucency flaw, and doddered lip tile onto the optical surface, enacted in the article 8 of the standard document should not be seen in a distance of 2 meter.

Third-best: when the sample associated with the national standard No. 9169-2 is tested should not have more than 3 items of the 13 detecs of the surface quality—except the body flaws, translucency flaw, and doddered lip tile onto the optical surface, enacted in the article 8 of the standard document should not be seen in a distance of 2 meter

Fourth-best: Only porcelain ceramics that cannot



be placed within above categories will be graded as the fourth best.

Notince 1: Associated with national standardization No. 9169-2 the 13 defects are as follows:

- · Body flaw;
- Transluency flaw;
- Unglazed;
- · Unsmooth surface;
- Needle porous;
- · Unmelted glaze;
- Stains;
- Underglaze detects;
- Décor detects;
- Doddered lip;
- Blisters;
- Incompatible the lib and the core.

Notice 2: Flaws, doddered lips are not the chief detect in the porcelain ceramics.

Some advantages of the porcelain ceramics in comparison with natural stones

- Some of the constructing stones are too sensitive touching by the water, and in this case lose their traits (TCNA p.10), while the absorption rate of the ceramic, porcelain ones especially, are apropos zero, and this enables the material endure in wet climate.
- Some of the natural stones are too porous by nature, and this might be hidden beneath the skin and later under the pressure could damage the material and wreck the appearance. On the other hand porcelain ceramics due to concoction process in high temperatures are tenacious against corrosion and frictions.
- Some stones, especially those, which are carbonate based with some sort of calcium and calcite, are too sensitive in touch with acids, and even in the face of weak or watery acids like lemon juice, reacting dramatically. This reactions symbolized with stains that are not so easy to clean (TCNA. P 11). Vice versa, porcelain ceramics

are highly tenacious in this regard; they have not such a drawback.

Formation Production	Group I E< 3%	Group IIa 3% < E < 6%	GroupIIb 6% < E < 10%	Group III E> 10%
Extrude method	Groupe AI _s E _s <0.5% (Reference in attached file) Groupe AI _s 3% < E < 6% (Reference in attached file A)	All _a -1 ^A (Reference in attached file B) All _a -2 (Reference in attached file P)	All _B -1A (Reference in attached file T)	AllI (Reference in attached file J)
Dried Press Method	Group Bia Eb< 0.5% (Reference in attached file) Groupe Bla 0.5% < Eb < 3% (Reference in attached file)	BIIA- (Reference in attached file K)	BIIA- (Reference in attached file D)	BIII (Reference in attached file Z)

A-Groupes Alla & Allb are being divided into two type with different traits.

B- Group BIII includes glazed tiles. Only haven't been few tiles formed with absorption rate upper than 10% by the dried method; this doesn't include standard items mentioned above.

Classification of tiles based on the amount of water absorption

Rocks are anisotropic materials, which means that they might have different appearances in different directions (TCNA p. 11), but the structure of the porcelain ceramic tiles are smooth and rectangle over the body.

- Stones are going to be flaky (TCNA p.11), while porcelain ceramics don't.
- Some stones in construction have salty pieces in the texture. These pieces over time and due to between-layer evaporation make salty look onto the surface of the stone tile (TCNA P.12) while in the ceramic raw concoction there is no trace of salt.
- In some stones, within the structure are mixed with other mineral materials such as iron. This leads the material to confront the bleeding phenomena (TCNAp.11). Hence, the wetness and humidity of the iron lifts itself up onto the surface and red flaws would be appeared. Porcelain



ceramic doesn't have this drawback as well.

- Another main reason why the use of ceramic in comparison to stone has a supremacy, is that some thin stones experience some flaws by dint of non-uniform shrinkage. The shrinkage onto the mortar by porcelain ceramic tiles is the same over the body.
- Specific weight of natural stones used in Construction works such as granite and marble is 2700-2800 kg/m3, while the weight specific to ceramics is about 2200 kg/m3, which is about 25% lighter.
- The thickness of the stone used in facade construction is about 20 mm and more, while porcelain ceramic can be used with thinner thickness. For instance, due to specific weight of granite stone, the weight of one square meter of granite with 20mm thicknesses is apropos 56 Kg. But Porcelain ceramic is different. The weight of one square meter of ceramic with a thickness of about 11 mm is about 24 kg, which is more than 50% lighter.

Other pros and cons of the Porcelain Ceramic Tiles

- Limited size tolerance: Porcelain ceramics due to supremacy of the raw materials and the sufficient processes (chamfering & rectifying) have a tolerance by size which is not wide a range.
- High fracture resistance and modulus of rupture: Due to the fact that porcelain ceramics through dried press method are being pressed under heavy pressures, the fracture resistance and modulus of rupture by such materials boost that this trait enables us to install and use them onto high-traffic areas, industrial sites and outdoor uses and also as the façade tiling.
- Abrasion resistance: The high density of the products makes them resistant against the abrasion, and contingent upon glazed or

non-glazed the use in the high-traffic corridors would be perfect based on the class of the tiles.

- Fire resistance: basically, ceramic is a fire-resistant material and has been categorized in A1 associated with highest standardization in this regard.
- Abundance in supply chain: porcelain ceramics due to the technology-led production lines, are being produced in a high-volume tonnage with variety of colors and layouts.
- Easy to cut: porcelain ceramics, due to smoothness and high density of the mass, has an advantage to be cut and drilled easily in arbitrary sizes and dimensions.
- Hygiene: The ceramic behavior is going not to scatter detrimental chemical gases. It has a high resistance against stains and are easy to clean with simple detergents and even water. They have not an expiring date by the way.
- The beauty: porcelain ceramics are being produced in a variety of colors and layouts and this leads the designers be more creative. This also makes the ceramic tiles compatible with any surroundings.
- Energy-sufficient operation: porcelain ceramics can save energy under ceiled circumstances. They free the heat by getting it cold. Then, this trait would be tangible when the heaters would be turned off. During the time they work, ceramics get the heat and after the turning off of the heaters, tiles emit the energy slowly and this makes the environs suitable to live in.

Extruded Tiles | Terms and definitions

Ceramics whose body is plastic by means of the extruder is shaped as a dermal column. The column will be cut in the form of ceramics.



Dried-press Tiles

Ceramics made from a mixture of ground and softened raw materials; they are formed inside the mold and with high pressure.

The Tile Surfaces

Polished Porcelain Ceramic Tile

The rough surface of the porcelain ceramics will be polished by the process. This makes the tile enable, at the end of the process, to work for us without glaze having a splendid surface yet. These tiles are used in residential and commercial unites with mellow traffic as the floor rug or the wall tiling.

Matte Porcelain Tile

Making them suitable to be used in floors and walls indoor and outdoor, matte tiles have traits including skidding resistant due to the high rate of friction, easy to clean, friction resistant etc.

Semi-Polished Porcelain Ceramic Tile

The surface of these ceramics is partially and not very polished. In addition to having a surface that is resistant to people slipping (compared to the polished surface), the glossiness of the ceramic is also ensured. These ceramics are used in the floor and body of spaces.

Relief Porcelain Ceramic Tile

These ceramics have prominent designs and textures on their surface. Porcelain ceramics with a raised surface can be used for the floor and wall, around the pool and in the facade of the building.

Glaze

Transluent and impenetrable cover of the tile

Joint

The distance between the edges of adjacent ceramics

Nominal Size

It is the size used to introduce the product.

Work Size

It is specified by the manufacturer and it should match the actual size after applying the permitted deviations.

Actual Size

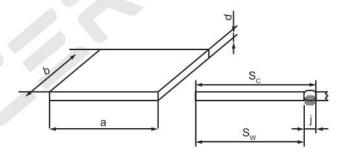
The dimension that has been measure through national standard means no. 9169-2.

Coordinating Size

Work size plus the width

Tolerance

The difference is permissible and tolerable limits and in civil works the meaning of clearance limit and permissible deviation is used.



Guidance

A and b: Visible surface dimensions

D:Thicknesse

J:Joint

Sc : Coordinating Size Sw : Work Dimension

What does shade variation mean?

Dividing a set of the same product in the tonality of different codes: in the same color (with a very slight difference in the nuance) of the same electricity and design.

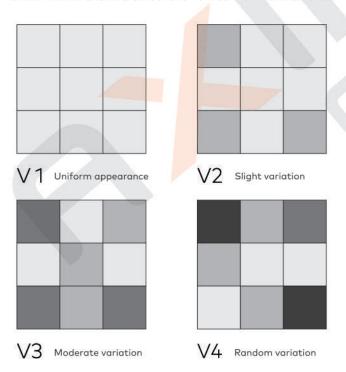


V1: 1: Small Difference: the least possible shade difference between the existing parts, after installation, a unified appearance is obtained.

V2: low average difference: or low shade difference; after installing the floor and the walls a balanced appearance is obtained by the atmosphere.

V3: high difference: significant difference in the shade of the same color, but the designs are different.

V4: random difference: the highest possible SHADE difference of colors varies from tile to tile.



The floor ceramics in public places

In public and high-traffic spaces such as subway stations, it is necessary that the ceramics used are of chemical resistance and have high mechanical strength. For these places, a glazed or unglazed porcelain ceramic, with high hardness and resistance should be chosen against stains, slips and chemicals. Even though glossy surfaces are more eye-catching, but in such an environment, due to the fact that the surface wears quickly, it may lose its gloss and transparency quickly. Therefore, polished ceramics are not suitable for this environment.

Another point is that in this case, scratches and stains will show more. According to this description, the matte surface for these surfaces is suggested.

Use of ceramic floor in commercial buildings

In these spaces, ceramics must be resistant to the load of fixed heavy machinery. In addition, it should be against the traffic load of people and cars in traffic and wear and mechanical pressure of the surface as well be resistant. Also, in these spaces, due to the possibility of spilling acidic and chemical substances on the surface, the chemical resistance must be high. The high risk of slippage must also be allowed for, because if a liquid is poured on its surface, it will always be a skidding surface.



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Ceramic tiles - Definition, classification, characteristics, assessment and verification of constancy of performance and marking

Carreaux céramiques - Définitions, classification, caractéristiques, évaluation et vérification de la constance de performance et marquage Keramische Fliesen und Platten - Definitionen, Klassifizierung, Eigenschaften, Konformitätsbewertung und Kennzeichnung

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

		Water absorption (E _b)				
Shaping	Group I $E_{\rm b} \le 3 \%$	Group II_a 3 % < $E_b \le 6$ %	Group II _b $6 \% < E_b \le 10 \%$	Group III E _b > 10 %		
Method A	Group AI _a $E_b \le 0.5 \%$ (see Annex L)	Group All _{a-1} ^{a)} (see Annex B)	Group All _{b-1} a) (see Annex D)	Group AIII		
Extruded	xtruded Group Alb Group Alla-2 a) Group Alla-2 a)	Group All _{b-2} a) (see Annex E)	(see Annex F)			
Method B	Group Bl_a $E_b \le 0.5 \%$ (see Annex G)	Group BII _a	Group BII _b	Group BIII _b		
Dry-pressed	Group BI _b $0.5\% < E_b \le 3\%$ (see Annex H)	(see Annex I)	(see Annex J)	(see Annex K)		

a) Groups Alla and Allb are divided into two parts (Parts 1 and 2) with different product specification. Part 1 covers most of the tiles in the group; Part 2 covers certain specific products, which are manufactured under different names (e.g. terre cuite in France and Belgium, cotto in Italy and baldosin catalán in Spain).

b) Group BIII covers glazed ceramic 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.



Table 2 — Characteristics of ceramic tiles required for different applications

	Characteristics a)	Floo	Floorings		alls	Test method	
A)	Dimensions and surface quality	Inte- rior	Exte- rior	Inte- rior	Exte- rior	Reference	
A.1	Length and width	X	Х	Х	Х	EN ISO 10545-2	
A.2	Thickness	X	X	X	X	EN ISO 10545-2	
A.3	Straightness of sides (i.e. facial sides) ^{b)}	X	X	X	X	EN ISO 10545-2	
A.4	Rectangularity ^{b)}	X	X	Х	X	EN ISO 10545-2	
A.5	Surface flatness (curvature and warpage)	X	X	X	X	EN ISO 10545-2	
A.6	Surface quality	Х	X	Х	Х	EN ISO 10545-2	
В)	Physical properties		Exte- rior	Inte- rior	Exte-	Reference	
B.1	Water absorption	X	X	X	×	EN ISO 10545-3	
B.2	Breaking strength ^{c)}	X	X	X	X	EN ISO 10545-4	
B.3	Flexural tensile strength ^{d)} or Modulus of rupture ^{d)}	X	X	X	X	EN ISO 10545-4	
B.4 a) Resistance to deep abrasion – unglazed tiles		X	X			EN ISO 10545-6	
B.4 b)	Resistance to surface abrasion – glazed tiles c)	X	X		20	EN ISO 10545-7	
B.5	Linear thermal expansion ^{e)}	X	X	X	X	EN ISO 10545-8	
B.6	Resistance to thermal shock ¹⁾	X	X	X	X	EN ISO 10545-9	
B.7	Resistance to crazing ⁹⁾	X	X	X	X	EN ISO 10545-11	
B.8	Freeze-thaw resistance ^{h)}		X	1	X	EN 1015-12	
B.9	Slipperiness ¹⁾		X			FprCEN/TS 16165:2011 ¹⁾	
B.10a)	Bond strength/adhesion k) – cementitious adhesives	10	-	Х	Х	EN 12004:2007, 4.	
B.10b)	Bond strength/adhesion k) – dispersion adhesives			X	X	EN 12004:2007, 4.	
B.10c)	Bond strength/adhesion k) - reaction resin adhesives			X	X	EN 12004:2007, 4.	
B.10d)	Bond strength/ad <mark>hesion ^{k)} – mort</mark> ar	D		X	X	EN ISO 10545-12	
B.11	Moisture expansion ¹⁾	X	X	X	X	EN ISO 10545-10	
B.12	Small colour differences m)	X	X	X	X	EN ISO 10545-16	
B.13	Impact resistance n	X	X			EN ISO 10545-5	
B.14	Reaction to fire o	X		X	X	WT	
B.15	Tactility ^{p)}	X	X			CEN TS 15209 ⁱ⁾	
C)	Chemical properties	Inte- rior	Exte- rior	Inte- rior	Exte- rior	Reference	
C.1 a)	Resistance to staining – glazed tiles ^{q)}	X	X	X	X	EN ISO 10545-14	
C.1 b)	Resistance to staining – unglazed tiles 9	X	X	X	X	EN ISO 10545-14	
C.2 a)	Resistance to acids and alkalis of low concentration "	X	X	X	X	EN ISO 10545-13	
C.2 b)	Resistance to acids and alkalis of high concentration "	X	X	X	X	EN ISO 10545-13	
C.2 c)	Resistance to household cleaning agents and swimming pool chemicals ⁿ	X	X	X	X	EN ISO 10545-13	
C.3 a)	Release of cadmium – glazed tiles t)	х	X	X	X	EN ISO 10545-15	
C.3 b)	Release of lead – glazed tiles ¹⁾	X	X	x	X	EN ISO 10545-15	
C.3 c)	Release of other dangerous substances 5)	×	X	x	X	As relevant	



Annex G (normative)

Requirements for dry-pressed ceramic tiles with low water absorption of Group Bl_a $(E_b \le 0.5 \%)$

Requirements for dimensions and surface quality and for physical and chemical properties of this group of ceramic tiles shall be in accordance with Table G.1.

Table G.1 — Requirements for dry-pressed ceramic tiles with low water absorption, Group Bl_a ($E_{\rm b} \le$ 0,5 %)

Characteristics	Requirements	for nomin	nal size N	Test method
	7cm≤N<15cm	N≥	15 cm	
	(mm)	(%)	(mm)	
A) DIMENSIONS AND SURFACE QUALITY		· _		> .
A.1 Length and width				
The work size shall be chosen as follows for:				
a) modular tiles:	in order to allow of between 2 an		joint width	
b) non-modular tiles:	so that the diff work size and th more than 2 % (e nominal	size is not	=
The permissible deviation of the average size for each tile (2 or 4 sides) from the work size (W)	± 0,9 mm	± 0,6 %	± 2,0 mm	EN ISO 10545-2
A.2 Thickness	3	(i	in .	
a) The thickness shall be specified	Declare	ed thicknes	ss	
b) The permissible deviation, of the average thickness of each tile from the work size thickness	± 0,5 mm	± 5 %	± 0,5 mm	EN ISO 10545-2
A.3 Straightness of sides b (facial sides)	io.			
The maximum permissible deviation from straightness, related to the corresponding work sizes	± 0,75 mm	± 0,5 %	± 1,5 mm	EN ISO 10545-2



Table G.1 (continued)

Characteristics	Requirements f	Test method		
	7cm≤ <i>N</i> <15cm	N≥	15 cm	
	(mm)	(%)	(mm)	
A) DIMENSIONS AND SURFACE QUALITY				
A.4 Rectangularity b		· · · · · · · · · · · · · · · · · · ·		3)
The maximum permissible deviation from rectangularity related to the corresponding work sizes.	± 0,75 mm	± 0,5 %	± 2,0 mm	EN ISO 10545-2
A.5 Surface flatness				
The maximum permissible deviation from flatness:				
a) centre curvature, related to diago- nal calculated from the work sizes;	± 0,75 mm	± 0,5 %	± 2,0 mm	EN ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	± 0,75 mm	± 0,5 %	± 2,0 mm	EN ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	± 0,75 mm	± 0,5 %	± 2,0 mm	EN ISO 10545-2
A.6 Surface quality ^c	A minimum of 95 % free from visible def the appearance of a	ects that wo	ould impair	EN ISO 10545-2
B) PHYSICAL PROPERTIES				
B.1 Water absorption (in % by mass)	E _b ≤ Individual m	0,5 % aximum 0,6	6 %	EN ISO 10545-3
B.2 Breaking strength, for:				
a) Thickness ≥ 7,5 mm	Not less t	han 1 300 l	N	EN ISO 10545-4
b) Thickness < 7,5 mm	Not less	than 700 N		EN ISO 10545-4
B.3 Flexural tensile strength or modulus of rupture ^d	Minimum Individual min	n 35 N/mm² imum 32 N		EN ISO 10545-4
B.4 Abrasion resistance	0			500
Resistance to deep abrasion of unglazed tiles: removed volume	Maximui	m 175 mm ³		EN ISO 10545-6
 Resistance to surface abrasion of glazed tiles intended for use on floors e 		n class and s passed		EN ISO 10545-7
B.5 Coefficient of linear thermal expansion	ansion:			
 from ambient temperature to 100 °C 	Declar	ed value ^f		EN ISO 10545-8
B.6 Thermal shock resistance	Pass according t	o EN ISO 1	0545-1 ⁹	EN ISO 10545-9
B.7 Crazing resistance: glazed tiles h	Pass according t	o EN ISO 1	0545-1 ^g	EN ISO 10545-11
B.8 Frost resistance	Pass according t	o EN ISO 1	0545-1 ^g	EN ISO 10545-12



Table G.1 (continued)

Characteristics	Requirements for	Requirements for nominal size N			
	7cm≤ <i>N</i> <15cm	N≥	15 cm]	
	(mm)	(%)	(mm)	H Company	
B) PHYSICAL PROPERTIES					
B.9 Slipperiness	Declared	value(s) 9		prCEN/TS 16165:2011	
B.10 Bond strength/adhesion i, for:	90				
a) cementitious adhesives k	Declare	d value(s)	a 4	EN 12004:2007, 4.1	
b) dispersion adhesives k	Declare	d value(s)		EN 12004:2007, 4.2	
c) reaction resin adhesives k	Declare	d value(s)		EN 12004:2007, 4.3	
d) mortar	Declare	d value(s)		EN 1015-12 ¹	
B.11 Moisture expansion (in mm/m)	Declare	d value f	1	EN ISO 10545-10	
B.12 Small colour differences for:					
a) Glazed tiles	ΔE <	0,75		EN ISO 10545-16	
b) Unglazed tiles	ΔE	< 1,0	1 19	EN ISO 10545-16	
B.13 Impact resistance, as:					
- Coefficient of restitution (COR)	nt of restitution (COR) Declared value ^f		EN ISO 10545-5		
B.14 Reaction to fire	(Class A1 or A1 _{FL}) ^m		_		
B.15 Tactility ⁿ	Declare surfa	Declare surface description ^g		CEN/TS 15209 1	
C) CHEMICAL PROPERTIES		9		*	
C.1 Resistance to staining, for:				94:	
a) Glazed tiles	Minimum Class 3		EN ISO 10545-14		
b) Unglazed tiles	Declare	ed value f		EN ISO 10545-14	
C.2 Resistance to chemicals				ar.	
Resistance to low concentrations of acids and alkalis	Declare	ed value ^f		EN ISO 10545-13	
 Resistance to high concentrations of acids and alkalis 	Declare	ed value ^f		EN ISO 10545-13	
Resistance to household chemicals and swimming pool salts	Minimur Minimur	n class B		EN ISO 10545-13	
C.3 Release of dangerous substan	ces			1.	
a) Cadmium (in mg/dm²)	Declare	d value ⁹		EN ISO 10545-15	
b) Lead (in mg/dm²)	Declare	d value ⁹		EN ISO 10545-15	
c) other dangerous substances °	Declar	Declared value		As relevant	



Table G.1 (concluded)

- 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 of the given tile and desirable. Spots or coloured dots which are introduced for decorative purposes are not considered a defect.
- Mot applicable to ceramic tiles with breaking strength > 3 000 N.
- Where required, the abrasion class resistance according to Annex M may be declared.
- See Annex N Additional information on applicability.
- ⁹ See Table 2 for uses where it is applicable.
- ^h Certain decorative effects may have a tendency to craze. They are to be identified by the manufacturer, in which case the crazing test given in EN ISO 10545-11 is not applicable.
- Unless a different test method is required by national regulations in the market of the relevant Member State(s) for the intended use, in which case the test method and results shall be declared as given therein (as long as a consolidated European test method is not available).
- For intended uses subject to requirements against accidental fall of objects on to transit areas only. Tests are to be performed using the actual tiles and suitable adhesive and/or mortar.
- For the types of adhesives, defined in EN 12004:2007 only.
- The proposed test methods are intended to determine the adhesion strength of adhesive and have not been developed to determine ceramic tile characteristics. Thus, there might be no correlation between the declared bond strength and the performance of the tile in use (other factors like proper installation techniques and type of background support will influence the final performance).
- ^m Ceramics, as a homogeneously distributed material used for ceramic tiles, is considered as material of known and stable performance with respect to the reaction to fire performance as it does not consist of any organic material. As such it does not contribute to the fire and it may be considered without the need for testing (CWT) as the Class A1 material⁷. The reaction to fire performance of ceramic tiles may also be classified also as Class A1 according to EN 13501-1.
- For tactile paving surfaces only i.e. when required for blind or vision impaired persons.
- o When relevant, see Notes 1 and 2 in ZA.1 for the performance of the product concerning this characteristic, if any to be declared.

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TEST REPORT

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PAGE Nº: 1 / 3

DATE OF TEST REPORT: 23/09/2022

DATE OF RECEIPT OF THE SAMPLE: 21/09/2022 DATE OF TESTS PERFORMANCE: 21 - 23/09/2022

NUMBER OF SAMPLES SUPPLIED: 5 specimens (20x20 cm)

DESCRIPTION OF THE SAMPLE: (Information provided by client)

Dry - pressed ceramic tiles, 600 mm x 1200 mm, glazed. Ref.:

-- N - C -- Code laboratory: 220-2-22

TEST CARRIED OUT:

- UNE-EN-ISO 10545-3: DETERMINATION OF WATER ABSORPTION.

- ANNEX: PICTURE OF TESTED SAMPLE.





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, Nº 46 – 12003 CASTELLÓN TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com Test report nº: 60.065 Page nº: 2 / 3 Petitioner: IMPERIO Date: 23/09/2022

DETERMINATION OF WATER ABSORPTION

DESCRIPTION OF THE SAMPLE. - (Information provided by client)

Dry - pressed ceramic tiles, 600 mm x 1200 mm, glazed. Ref.:

-- **N - C** -- Code laboratory: 220-2-22

RESULTS.- (Test performed after UNE-EN-ISO 10545 Part 3:2018)

- * We have tested specimens of 200 mm x 200 mm, obtained by cutting.
- * Water absorption for each specimen:

Specimen	Water absorption (E _v) (%)		
1	0.4		
2	0.3		
3	0.4		
4	0.5		
5	0.3		

* Average water absorption of the sample: 0.4 %

* Measurement uncertainty: U = ± 0.1 % (k=2)

* Average value uncertainty: U = ± 0.2 % (k=2)





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, Nº 46 - 12003 CASTELLÓN TEL: 964 208 583 - FAX: 964 723 141 www.laboratoriocarpi.com

Test report nº: 60.065 Page nº: 3 / 3 Petitioner: IMPERIO

Date: 23/09/2022

ANNEX: PICTURE OF TESTED SAMPLE

220-2

CATALAN

JOSE ANTONIO | Firmado digitalmente por JOSE ANTONIO | ESTIBALEZ | CATALAN Fecha: 2022.09.23 08:12:47 +02'00'

> José A. Estibález Catalán MANAGER

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C.C.I.A.A. Modena n. 228587 - Tribunale di Modena n° 2231 - C.F. e P. IVA n. 01592020364

MECCANICA ECOLOGIA CERAMICA AUTOMOTIVE

Modena, 27/09/22

To AXIMER tile and flooring material

L.L.C. SKB PLAZA BUILDING SHOP 1 UM AL SHEIF

41111111 DUBAI UA

Attn. Mr. Mohammad Ebrahim Bargshady

MATERIAL and/or SAMPLE to be tested	Denomination of the Sample	Client Reference – Your delivery	date
Ceramic tiles	Natural Concrete Ash Code:FGM-R5090	Your delivery	09/09/2022

Here attached, you will receive the Test Report of Serial No. 20225935/n, which shows the results of tests required.

MODENA CENTRO PROVE

Director tione dr. Giuseru





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TEST REPORT: 20225935/1

Modena, 27/09/22

AXIMER tile and flooring material L.L.C. - - SKB PLAZA BUILDING

CUSTOMER SHOP 1

UM AL SHEIF - 41111111 - DUBAI - UA

MATERIAL and/o SAMPLE to be

tested

Ceramic tiles;

Denomination Natural Concrete Ash - Code:FGM-R5090;

09/09/2022; Date of sample reception Date of sample acceptation 09/09/2022;

Kind of test executed Determination of Water Absorption

Referring standards ISO 10545-3:2018

No one Shifting from standards

Scales cod. MCP C148 - Tank for vacuum cod. MCP C128 - Forced Equipment

ventilation stove cod. MCP

Subcontracted phases No one Sampling made by Customer

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C.C.I.A.A. Modena n. 228587 - Tribunale di Modena n° 2231 C.F. e P. IVA n. 01592020364

DETERMINATION OF WATER ABSORPTION

Beginning date : 21/09/2022 Analysis ending date : 22/09/2022

RESULTS

Tested specimen dimensions (cm): 20x20 N° specimens tested: 5

Sample n°	Water Absorption E _v (%)
1	0,33%
2	0,25%
3	0,24%
4	0,32%
5	0,34%
Average value	0,30%



MODENA CENTRO PROVE Ceramic Dept. Responsible P.I. De Pasquale Roberto

Director Sant'Unione dr. Giuseppe





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, № 46 – 12003 CASTELLÓN TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com



TEST REPORT

PETITIONER: IMPERIO

TEST REPORT Nº: 60.068

PAGE Nº: 1 / 3

DATE OF TEST REPORT: 23/09/2022

DATE OF RECEIPT OF THE SAMPLE: 21/09/2022

DATE OF TESTS PERFORMANCE: 21 – 23/09/2022

NUMBER OF SAMPLES SUPPLIED: 6 specimens (20x20 cm)

DESCRIPTION OF THE SAMPLE: (Information provided by client)

Dry - pressed ceramic tiles, 1200 mm x 2800 mm, glazed. Ref.:

-- **S - L** -- Code laboratory: 220-5-22

TEST CARRIED OUT:

- UNE-EN-ISO 10545-3: DETERMINATION OF WATER ABSORPTION.

- ANNEX: PICTURE OF TESTED SAMPLE.





C.I.F.: Q - 4670001- I

AVENIDA DEL MAR, № 46 – 12003 CASTELLÓN TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com Test report nº: 60.068 Page nº: 2/3 Petitioner: IMPERIO Date: 23/09/2022

DETERMINATION OF WATER ABSORPTION

DESCRIPTION OF THE SAMPLE, - (Information provided by client)

Dry - pressed ceramic tiles, 1200 mm x 2800 mm, glazed. Ref.:

-- **S - L** -- Code laboratory: 220-5-22

RESULTS .- (Test performed after UNE-EN-ISO 10545 Part 3:2018)

- * We have tested specimens of 200 mm x 200 mm, obtained by cutting.
- * Water absorption for each specimen:

Specimen	Water absorption (E _v) (%)		
1	0.3		
2	0.3		
3	0.3		
4	0.2		
5	0.3		
6	0.3		

* Average water absorption of the sample: 0.3 %

* Measurement uncertainty: $U = \pm 0.1 \%$ (k=2)

* Average value uncertainty: U = ± 0.1 % (k=2)



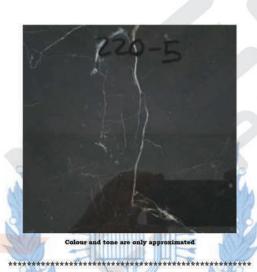


C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, Nº 46 - 12003 CASTELLÓN TEL: 964 208 583 - FAX: 964 723 141 www.laboratoriocarpi.com

Test report no: 60.068 Page no: 3 / 3 Petitioner: IMPERIO Date: 23/09/2022

ANNEX: PICTURE OF TESTED SAMPLE



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José A. Estibález Catalán MANAGER

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MECCANICA ECOLOGIA CERAMICA AUTOMOTIVE

Modena, 27/09/22

To AXIMER tile and flooring material L.L.C.

SKB PLAZA BUILDING SHOP 1

UM AL SHEIF

41111111 DUBAI UA

Attn. Mr. Mohammad Ebrahim Bargshady

MATERIAL and/or SAMPLE to be tested	Denomination of the Sample	Client Reference – Your delivery	date
Ceramic tiles	Saint Laurent Code:FGPB-L5160	Your delivery	09/09/2022

Here attached, you will receive the Test Report of Serial No. 20225933/n, which shows the results of tests required.

MODENA CENTRO PROVE

Director
Sant'Unione dr. Giuseppe





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TEST REPORT: 20225933/1

Modena, 27/09/22

CUSTOMER

AXIMER tile and flooring material L.L.C. - - SKB PLAZA BUILDING

SHOP 1

UM AL SHEIF - 41111111 - DUBAI - UA

MATERIAL and/o SAMPLE to be

tested

Ceramic tiles;

Denomination Saint Laurent - Code:FGPB-L5160;

Date of sample reception 09/09/2022; Date of sample acceptation 09/09/2022;

Kind of test executed Determination of Water Absorption

ISO 10545-3:2018 Referring standards

Shifting from standards No one

Scales cod. MCP C148 - Tank for vacuum cod. MCP C128 - Forced Equipment

ventilation stove cod. MCP C43

Subcontracted phases No one Sampling made by Customer

The test results reported in this Test Report refer only to the sample sampled by our staff and / or given by the Customer as received.

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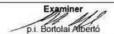
DETERMINATION OF WATER ABSORPTION

Beginning date: 21/09/2022 Analysis ending date : 22/09/2022

RESULTS

Tested specimen dimensions (cm): 20x20 N° specimens tested:

Sample n°	Water Absorption E _v (%)
1	0,19%
2	0,26%
3	0,25%
4	0,24%
5	0,26%
Average value	0,24%



MODENA CENTRO PROVE Ceramic Dept. Responsible P.I. De Pasquale Roberto

MODENA CENTRO PROVE

Director
Sant'Unione dr. Giuseppe





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, Nº 46 – 12003 CASTELLÓN TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com



TEST REPORT

PETITIONER: IMPERIO

TEST REPORT Nº: 60.066

PAGE N°: 1 / 3

DATE OF TEST REPORT: 23/09/2022

DATE OF RECEIPT OF THE SAMPLE: 21/09/2022

DATE OF TESTS PERFORMANCE: 21 – 23/09/2022

NUMBER OF SAMPLES SUPPLIED: 5 specimens (20x20 cm)

DESCRIPTION OF THE SAMPLE: (Information provided by client)

Dry - pressed ceramic tiles, 600 mm x 1200 mm, glazed. Ref.:

-- C-G --

Code laboratory: 220-3-22

TEST CARRIED OUT:

- UNE-EN-ISO 10545-3: DETERMINATION OF WATER ABSORPTION.

- ANNEX: PICTURE OF TESTED SAMPLE.





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, № 46 – 12003 CASTELLÓN

TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com Test report nº: 60.066 Page nº: 2 / 3 Petitioner: IMPERIO Date: 23/09/2022

DETERMINATION OF WATER ABSORPTION

DESCRIPTION OF THE SAMPLE.- (Information provided by client)

Dry - pressed ceramic tiles, 600 mm x 1200 mm, glazed. Ref.:

-- **C - G** -- Code laboratory: 220-3-22

RESULTS .- (Test performed after UNE-EN-ISO 10545 Part 3:2018)

- * We have tested specimens of 200 mm x 200 mm, obtained by cutting.
- * Water absorption for each specimen:

Specimen	Water absorption (E _v)
1	0.2
2	0.2
3	0.2
4	0.3
5	0.2

* Average water absorption of the sample: 0.2 %

* Measurement uncertainty: U = ± 0.1 % (k=2)

* Average value uncertainty: U = ± 0.1 % (k=2)





C.I.F.: Q - 4670001- I

AVENIDA DEL MAR, Nº 46 - 12003 CASTELLÓN TEL: 964 208 583 - FAX: 964 723 141 www.laboratoriocarpi.com

Test report nº: 60.066 Page nº: 3 / 3 Petitioner: IMPERIO Date: 23/09/2022

ANNEX: PICTURE OF TESTED SAMPLE

220-3

ESTIBALEZ CATALAN

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MECCANICA **ECOLOGIA** CERAMICA AUTOMOTIVE

Modena, 27/09/22

To **AXIMER** tile and flooring material

SKB PLAZA BUILDING SHOP 1 UM AL SHEIF 41111111 DUBAI UA

Attn. Mr. Mohammad Ebrahim Bargshady

MATERIAL and/or SAMPLE to be tested	Denomination of the Sample	Client Reference – Your delivery	date
Ceramic tiles	Extra Calacatta Gold Glazed Polished-Code:FGPB-R1280	Your delivery	09/09/2022

Here attached, you will receive the Test Report of Serial No. 20225930/n, which shows the results of tests required.

MODENA CENTRO PROVE





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TEST REPORT: 20225930/1

Modena, 27/09/22

CUSTOMER

AXIMER tile and flooring material L.L.C. - - SKB PLAZA BUILDING

SHOP 1

UM AL SHEIF - 41111111 - DUBAI - UA

MATERIAL and/o SAMPLE to be

Date of sample acceptation

tested

Ceramic tiles;

09/09/2022;

Denomination Extra Calacatta Gold Glazed Polished - Code: FGPB-R1280;

Date of sample reception 09/09/2022;

Determination of Water Absorption Kind of test executed

ISO 10545-3:2018 Referring standards

Shifting from standards

Scales cod. MCP C148 - Tank for vacuum cod. MCP C128 - Forced Equipment

ventilation stove cod. MCP C43

Subcontracted phases Sampling made by Customer

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p.i. Bortolai Albertó

Ceramic Dept. Responsible

MODENA CENTRO PROVE Director





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C.C.I.A.A. Modena n. 228587 - Tribunale di Modena n° 2231 C.F. e P. IVA n. 01592020364

DETERMINATION OF WATER ABSORPTION

Beginning date : 22/09/2022 Analysis ending date : 23/09/2022

RESULTS

Tested specimen dimensions (cm): 20x20 N° specimens tested: 5

Sample n°	Water Absorption E _v (%)
1	0,34%
2	0,42%
3	0,42%
4	0,43%
5	0,34%
Average value	0,39%



MODENA CENTRO PROVE Ceramic Dept. Responsible P.I. De Pasquale Roberto

MODENA CENTRO PROVE

Director

Sant'Unione dr. Giuseppe





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, Nº 46 – 12003 CASTELLÓN TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com



TEST REPORT

PETITIONER: IMPERIO

TEST REPORT Nº: 60.064

PAGE Nº: 1/3

DATE OF TEST REPORT: 23/09/2022

DATE OF RECEIPT OF THE SAMPLE: 21/09/2022

DATE OF TESTS PERFORMANCE: 21 – 23/09/2022

NUMBER OF SAMPLES SUPPLIED: 5 specimens (20x20 cm)

DESCRIPTION OF THE SAMPLE: (Information provided by client)

Dry - pressed ceramic tiles, 1200 mm x 2800 mm, glazed. Ref.:

-- P - N --

Code laboratory: 220-1-22

TEST CARRIED OUT:

- UNE-EN-ISO 10545-3: DETERMINATION OF WATER ABSORPTION.

- ANNEX: PICTURE OF TESTED SAMPLE.





C.I.F.: Q - 4670001- I

AVENIDA DEL MAR, Nº 46 – 12003 CASTELLÓN TEL: 964 208 583 – FAX: 964 723 141 www.laboratoriocarpi.com Test report n°: 60.064 Page n°: 2 / 3 Petitioner: IMPERIO Date: 23/09/2022

DETERMINATION OF WATER ABSORPTION

DESCRIPTION OF THE SAMPLE, - (Information provided by client)

Dry - pressed ceramic tiles, 1200 mm x 2800 mm, glazed. Ref.:

-- P - N --

Code laboratory: 220-1-22

RESULTS.- (Test performed after UNE-EN-ISO 10545 Part 3:2018)

- * We have tested specimens of 200 mm x 200 mm, obtained by cutting.
- * Water absorption for each specimen:

Specimen	Water absorption (E _v) (%)
1	0.2
2	0.2
3	0.2
4	0.2
5	0.2

* Average water absorption of the sample: 0.2 %

* Measurement uncertainty: U = ± 0.1 % (k=2)

* Average value uncertainty: U = ± 0.1 % (k=2)





C.I.F.: Q - 4670001-1

AVENIDA DEL MAR, Nº 46 - 12003 CASTELLÓN TEL: 964 208 583 - FAX: 964 723 141 www.laboratoriocarpi.com

Test report nº: 60.064 Page nº: 3 / 3 Petitioner: IMPERIO Date: 23/09/2022

ANNEX: PICTURE OF TESTED SAMPLE



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> José A. Estibález Catalán MANAGER

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MECCANICA ECOLOGIA CERAMICA AUTOMOTIVE

Modena, 27/09/22

To AXIMER tile and flooring material L.L.C.
SKB PLAZA BUILDING

SKB PLAZA BUILDING SHOP 1 UM AL SHEIF 41111111 DUBAI UA

Attn. Mr. Mohammad Ebrahim Bargshady

MATERIAL and/or SAMPLE to be tested	Denomination of the Sample	Client Reference – Your delivery	date	
Ceramic tiles	Polaris Natural Code:IM2025L-N	Your delivery	09/09/2022	
*				

Here attached, you will receive the Test Report of Serial No. 20225929/n, which shows the results of tests required.

MODENA CENTRO PROVE

Director
Sant'Unione dr. Giuseppe





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C.C.I.A.A. Modena n. 228587 - Tribunale di Modena n° 2231 C.F. e P. IVA n. 01592020364

TEST REPORT: 20225929/1

Modena, 27/09/22

AXIMER tile and flooring material L.L.C. - - SKB PLAZA BUILDING

CUSTOMER SHOP 1

UM AL SHEIF - 41111111 - DUBAI - UA

MATERIAL and/o SAMPLE to be

tested

Ceramic tiles:

Denomination Polaris Natural - Code: IM2025L-N;

09/09/2022; Date of sample reception Date of sample acceptation 09/09/2022;

Kind of test executed **Determination of Water Absorption**

ISO 10545-3:2018 Referring standards

No one Shifting from standards

Scales cod. MCP C148 - Tank for vacuum cod. MCP C128 - Forced Equipment

ventilation stove cod. MCP C43

Subcontracted phases No one Sampling made by Customer

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DETERMINATION OF WATER ABSORPTION

Beginning date: 22/09/2022 Analysis ending date : 23/09/2022

RESULTS

Tested specimen dimensions (cm): 20x20 N° specimens tested: 5

Sample n°	Water Absorption E _v (%)		
1	0,17%		
2	0,18%		
3	0,19%		
4	0,19%		
5	0,18%		
Average value	0,18%		



MODENA CENTRO PROVE Ceramic Dept. Responsible P.I. De Pasquale Roberto

MODENA CENTRO PROVE
Director
Sant'Unione dr. Giuseppe





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C.C.I.A.A. Modena n. 228587 - Tribunale di Modena n° 2231 - C.F. e P. IVA n. 01592020364

MECCANICA ECOLOGIA CERAMICA AUTOMOTIVE

> Modena, 27/09/22 To **AXIMER** tile and flooring material

L.L.C. SKB PLAZA BUILDING SHOP 1 UM AL SHEIF 41111111 DUBAI UA

Attn. Mr. Mohammad Ebrahim Bargshady

MATERIAL and/or SAMPLE to be tested	Denomination of the Sample	Client Reference – Your delivery	date
Ceramic tiles	Liquid Marble Book Match Polished - Code:IM2035L-P	Your delivery	09/09/2022

Here attached, you will receive the Test Report of Serial No. 20225932/n, which shows the results of tests required.

MODENA CENTRO PROVE





Sede legale e Laboratori: 41123 Modena (Italy) - Via Sallustio, 78

Tel. 059 822417 r.a. - Fax 059380281 - e-mail : info@modenacentroprove.it - www.modenacentroprove.com C.C.I.A.A. Modena n. 228587 - Tribunale di Modena nº 2231 C.F. e P. IVA n. 01592020364

TEST REPORT: 20225932/1

Modena, 27/09/22

AXIMER tile and flooring material L.L.C. - - SKB PLAZA BUILDING

CUSTOMER SHOP 1

UM AL SHEIF - 41111111 - DUBAI - UA

MATERIAL and/o SAMPLE to be

tested

Ceramic tiles;

Denomination Liquid Marble Book Match Polished - Code: IM2035L-P;

Date of sample reception 09/09/2022; 09/09/2022: Date of sample acceptation

Kind of test executed **Determination of Water Absorption**

ISO 10545-3:2018 Referring standards

Shifting from standards No one

Scales cod. MCP C148 - Tank for vacuum cod. MCP C128 - Forced Equipment

ventilation stove cod. MCP C43

Subcontracted phases No one Sampling made by Customer

The test results reported in this Test Report refer only to the sample sampled by our staff and / or given by the Customer as received.

The sample identification data were provided by the customer. Further additional information provided by the Customer will be reported in the Test Report in blue color. If the information provided by the customer influences the validity of the results, MCP declines all responsibility.

Any changes / additions made to the Test Report after its first issue will be identified by underlining the text.

The Customer undertakes to r<mark>epro</mark>duce this document in its entirety. Any form of partial reproduction is prohibited.

The storage times of the samples are indicated on the offer or contract to which this Test Report refers.



MODENA CENTRO PROVE Ceramic Dept. Responsible MODENA CENTRO PROVE





Sede legale e Laboratori: 41123 Modena (Italy) - Via Sallustio, 78

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C.C.I.A.A. Modena n. 228587 - Tribunale di Modena n° 2231 C.F. e P. IVA n. 01592020364

DETERMINATION OF WATER ABSORPTION

Beginning date : 22/09/2022 Analysis ending date : 23/09/2022

RESULTS

Tested specimen dimensions (cm): 20x20 N° specimens tested: 5

Sample n°	Water Absorption E _v (%)		
1	0,47%		
2	0,46%		
3	0,41%		
4	0,37%		
5	0,42%		
Average value	0,43%		





Director Sant'Unione dr. Giuseppe

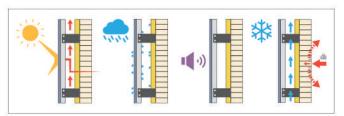




Installation of porcelain ceramic tiles with adhesive

Porcelain ceramic are tiles with water absorption of equal to or less than 0.5%, including Ala and Bla groups (INSO 25 and ISO 13006), made of kaolin soil compounds that are sintered at a temperature of about 1200 °C. Due to low water absorption, Ingredients and production process, porcelain ceramic tiles have high strength and unique technical characteristics. Because of their low water absorption, these ceramic tiles do not adhere well to cementitious mortars, so it is recommended to use proper adhesives for installation of porcelain ceramic tiles. The stages of installation of porcelain ceramic tiles with adhesive are as the followings:

The substrates on which porcelain ceramic tiles are installed have a great variety. Suitability of these substrates for coating with porcelain ceramic tiles depends on their adhesion, strength, elasticity and load-bearing capacity. Substrates are also affected by various factors like pressure, tension, shear and bending stresses which cause physical deformation and factors such as water and chemicals which cause structural (physical and chemical) damages. A suitable substrate for ceramic coatings should be able to adequately withstand the various factors and conditions which they are exposed to. According to these requirements, the first step of installation of porcelain ceramic tiles is investigation and if necessary modifying the substrate. For example neglecting the shrinkage, expansion and swelling in cementitious substrates, or the adhesion force in the coating applied on gypsum plaster, or the effects of moisture and heat in the coating applied on wood or cement boards, may cause serious problems.



Other important requirements before installing porcelain ceramic tiles include controlling the level and smoothness of the substrate, rectangularity of corners, and the verticality of the walls. In case of any inconsistency, the substrate surface should be modified.





Then the substrate should be cleaned. The presence of dust, oil, etc. will have a negative effect on the adhesion of the coating on the substrate.



In order to reduce the surface water absorption and obtain better adhesion, it is recommended to apply primer. When installing porcelain ceramic tiles on absorbent substrates or in conditions such as direct sunlight and wind and also installing porcelain ceramic tiles in hot seasons, it is recommended to apply primer in two layers perpendicular to each other.







When the primer is dry (45-60 minutes after applying), use proper adhesive for installation of porcelain ceramictiles with technical specifications in accordance with EN 12004. In accordance with European standard, TS EN 12004, adhesives are classified into different groups according to their technical specifications. Ceramic tiles have different dimensions and water absorption ratio and are installed on different substrates with different conditions, so we need classification to be able to make the right choice. Choosing one type of adhesive for all situations is not suitable.



Due to low water absorption of porcelain ceramic tiles, considering the requirements of the mentioned standards as well as the manufacturer's recommendations about suitability of the adhesive produced for porcelain ceramic tiles with specific dimensions and for installation in specific area is very important. So, to choose the right adhesive, you can refer to the adhesive selection guide tables provided in the chemical manual catalog. Prepare the adhesive according to the instructions on the back of the product









packaging. It is necessary to use a proper mixer and stick to the mixing ratio recommended by the manufacturer.



For installation of large format ceramic tiles (like 60×120), use the combined method. In this method the adhesive must be spread on the substrate with 10mm x 10mm square-notched trowel, then a thin layer of adhesive is applied with a trowel on the back of the ceramic tile, and the ceramic tile is first installed on the substrate by applying uniform vertical pressure and then pressure to sides. To spread the adhesive on the back of the tile easier and obtain a uniform adhesive thickness, it's recommended that the adhesive be spread in the same direction as the substrate and the size of the notched trowel should be smaller than the one that used for spreading the adhesive on the substrate.





The adhesive should be spread in a straight line parallel to the short side of the ceramic tile to reduce the distance traveled by air being pushed out and obtain better adhesion.

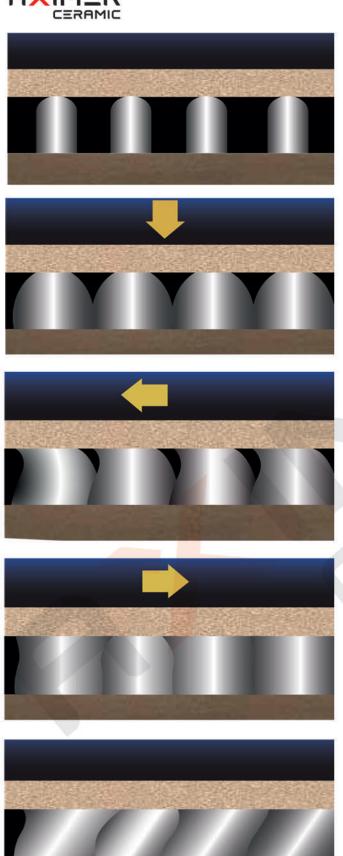




Place the porcelain ceramic tiles on the combed adhesive bed. For large size porcelain slabs, use runners and frames with suction cups. To break the ribs, move the ceramic tile at least the width of the ribs perpendicular to the ribs direction.







Fix the ceramic tiles using a rubber hammer with weight and size appropriate to the dimensions of the tiles. When tapping, the free hand must be on the ceramic tile.



The adhesion coverage on the back of the ceramic tile should be as high as possible. Pressing the ceramic tiles on the substrate and break the adhesive ribs is a very important stage in installation of porcelain ceramic tiles and neglecting that, will affect the quality and durability of the adhesion.





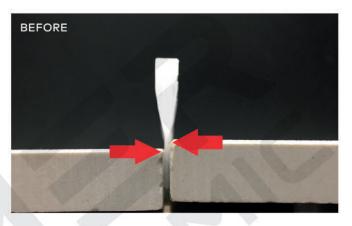


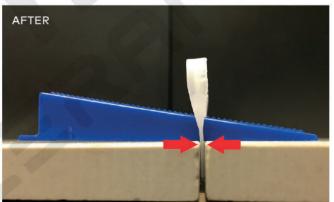
Standards recommend at least 3 mm joint between ceramic tiles which could be increased according to the size of the tiles, the area of use (internal or external), and the stresses expected when in service. To maintain the correct gap between each tile, it's recommended to use spacers between the porcelain ceramic tiles.





To ensure the leveling of the edges and avoid lippage between adjacent ceramic tiles, it's also recommended to use wedge and leveling clips.









Warnings and tips for installation of porcelain ceramics with adhesive

Additional water, adhesive, or other ingredients should not be added after the original mixing

- Regardless of whether transverse deformation measures flexibility, even when highly flexible fixing materials are used, unstable backgrounds might still cause the installations to fail. It should therefore always be ensured that backgrounds are sufficiently rigid and stable, so that the tiling does not become subjected to excessive stresses leading to failure.
- When using cement-based adhesives, Tiles should be fixed dry.
- Adhesive open time and pot life specified by the manufacturer and should be considered.

The adhesive that its open time has expired must be removed. Pouring it back into the pot, adding water and remix it is not allowed. During the open time, if our hands are in contact with the adhesive, it sticks to our hands. If our hands are in contact with the adhesive after the end of the open time, it will not stick to our hands.





Where the surface is sound and true but is contaminated by oil, paint, etc., these should be

mechanically removed or the surface should be cleaned with a suitable wash, before the application of the adhesive.

- The amount of adhesive prepared should be such that it can be used during the pot life. Each adhesive has its own pot life, which varies according to the conditions. Especially in very hot environments (hotter than 30 °C) and dry and windy environments, the pot life is greatly reduced. Therefore, the amount of adhesive that is prepared should be small and when it is not used, it should be covered by a suitable light-colored cover. In these cases, adding extra water and mixing it to adjust the consistency of the adhesive is not allowed.
- Adhesive consistency should be such that, when applied with the recommended notched trowel to the back of the ceramic tile or substrate, the ridges formed in the adhesive do notflow or slump.





Using the hammer for applying pressure on the ceramic should be done in one step. After installation, even if a short time has elapsed (for example, 5-10 minutes), ceramic tile should not be tapped or pressed with the hammer. In such cases, it is recommended that the ceramic be removed from the surface and re-installed using fresh adhesive mortar



To endure generated stresses between the substrate and coated surface, it's recommended to consider movement joints (with maximum 6-8 m distances) and fill it with resilient polyurethane sealant or movement joint profiles. When using a profile for filling the movement joints, the proper joint width is 10 mm.







Polyurethane sealant

Otherwise, all the joints may have the same width and in maximum 6-8 m distances they should be filled with a resilient polyurethane sealant. Other joints must be filled with grouts.

The surface of the ceramic tiles must be cleaned in every stage.

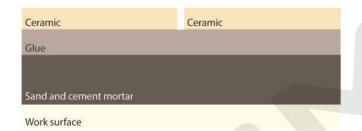






Installation of Porcelain Ceramics Using the Method Wet on Wet

To install porcelain ceramics as a floor covering, the best installation method is to implement a smooth and smooth infrastructure such as concrete, cement plaster or mosaic flooring so that we can install the ceramic on the desired floor using appropriate cement-based adhesives. But in cases where there is no access to smooth infrastructure and the implementation facilities are not available or we don't have enough time using the "Wet on Wet" method, which is a combination of matte sand-cement and cement-based adhesive; by that we are able to do a great job.

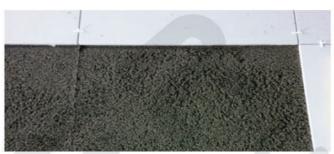


Method Steps of Wet on Wet

- Ensuring the cleanliness and strength of the work surface;
- Applying a layer of cement sand mortar on the work-bed;
- Condensing matte to prevent possible settlements caused by loading and the passage of time;
- Applying glue on the back of the ceramic with a toothed trowel;
- Placing the ceramic on the mat and applying the impact using; Rubber hammer;
- Placing a spacer beneath the ceramics to maintain the band width;
- Use of clips and aligning wedges to prevent from slippage.







Method Steps of Wet on Wet

- In this method the ratio of cement-sand mortar should be 1 to 4;
- The rate of adding water by this method should be more cautious lesser than other mortars;
- The suitable thickness of the mortar layer should be 3 to 5 cm;
- If the thickness of the mortar is more than 5 cm, foundation must be done on the substrate, and if there is no time for foundation the mortar should be poured in several layers and compacted.
- It is recommended to use ceramics to compact the mortar, in such a way that after pouring the mortar, a ceramic is placed on it and the mortar is compacted by hitting the ceramic with a rubber hammer. To do so, it is better to consider a ceramic only for this task.
- To work with cement-based adhesives with technical specifications of at least C2 and according to the selection guide chart, manufacturered glue should be used for ceramic installation.
- The suitable band width is 3-5 mm.
- This method is suitable for small and medium sized ceramics and to install large formats is inadvisable.
- Inserting intervals in every 6 to 8 meter is highly advisable in indoor spaces, every 3.5 to 4.5 meter for outdoor environs as well.





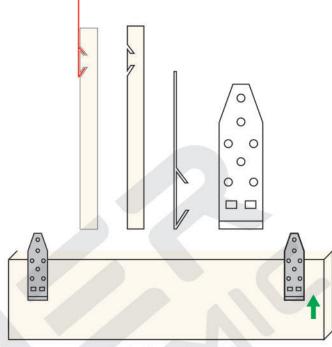
Adhesive installation method – The Scope

Installing porcelain ceramics by adhesive-scope method

By this approach, which is a combination of the two sort of jointing mechanical and chemical, ceramics should be placed by applying two ad-hoc clasp as the mechanical joint and a cement-based and floppy adhesive behind the smooth back of the tile as the chemo jointer.

Steps of adhesive-scope method

- •Creating two double grooves on the back of the ceramics using a special female groove machine;
- Applying glue on the back of the ceramic and the surface of the substrate (combined method);
- Installing special clips inside the created grooves;
- Placing the ceramic on the surface and moving the ceramic on the adhesive bed in the direction perpendicular to the adhesive grooves;
- Aligning ceramics and removing screws and clasps upper to the bed surface;
- Due to the fact that water is used to cool the blade of the slotting machine— it is necessary to carry out the next steps after drying the space of the grooves;
- In this method, it is recommended to use a suitable cement-based adhesive with C2TE S2 technical specifications. The use of adhesives with C2TE S2 specification is required for installing ceramics in the body of the outer space or large size ceramics;
- While placing the clips inside the groove, the adhesive inside the groove is pushed forward due to the movement of the clip and the appendages of the clip are engaged inside the groove. Make sure that after placing the clips, if the space of the groove remains empty, this space should be filled with the chemo jointer;
- Before installing ceramics, two layers of primer should be applied on the work surface in order to control water absorption and increase adhesive adhesion;
- It is recommended to install ceramics in horizontal rows;



Details of the scope glue method

- It is recommended that the bond between the ceramic is 5-10 mm and the bonds are filled with suitable cement-based bonding materials with technical specifications CG2 WA;
- Any sort of unevenness in the level of the work surface will increase the consumption of adhesive and reduce its efficiency, so control the smoothness of the surface is important;
- The temperature, humidity and wind rate in the place should be according to the recommendations of the chemical manufacturer;
- This method can be used for a maximum height of 3-floor projects;
- It is recommended to have movement joints at intervals of at least 6 to 8 meters for the interior space and at least 3.5 to 4.5 meters for the exterior space.







Requirements of glue-scoop-mortar method

It is possible if the conditions for implementing the dry installation method or installation with adhesive are not available or if the work surface is not level. There is also the use of adhesive-scoop-mortar method.

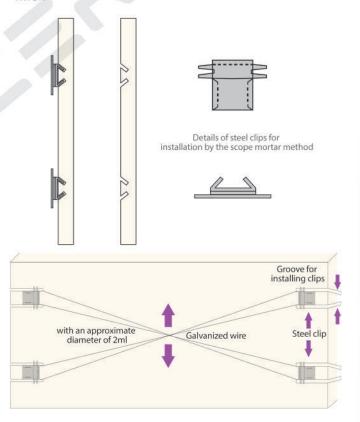
To go through this way, which combines the use of mortar-scoop method and the ad hoc adhesive, the ceramics by means of wire wires will mechanically have more contact with the mat, and the cement-based adhesive chemically binds the ceramics to the mat behind them connects ensuring the reliability and efficiency as the installation guarantee. In this method, after the glue dries behind the ceramics' back—ceramic installation is done with the traditional matter sand-cement mortar method.





Steps of glue-scoop-mortar method

- Creating 4 grooves on the back of the ceramic and perpendicular to the short dimension using a slotting machine to install the scopes, applying cement base glue with technical specifications of at least C2T and According to the manufacturer's adhesive selection guide chart on the back ceramics with a toothed trowel. Installation of special clips inside the grooves:
- Use of stainless steel wire with a diameter of 2 mm in the interior and 4 mm in the exterior in order to close clips to each other and creating a matte space behind the ceramics;
- Filling the space between the work surface and the back of the ceramic with matte Sand-cement filler.





Requirements of glue-scoop-mortar method

- •The distance of the grooves from the edge of the ceramic should be about 10 cm;
- In installing ceramics with this method, at least 24 hours of apply adhesive on the back of the ceramic;
- The stainless steel wire should be as far as possible from the back of the ceramic in order to obtain a suitable matte finish;
- To fill the space behind the ceramics, you should use matte filler— use sand-cement 1:5;
- Suitable band for performing ceramics in the body of the interior space3-10 and in the body, the outer space is 8-10 mm and is recommended the straps can be filled with suitable cement-based strapping materials;
- Recommended that at intervals of at least 6 to 8 meters for space internal and at least 3.5 to 4.5 meters for the outer space of the moving seam be embedded;
- Ensuring the cleaning of the ceramic surface in all stages.

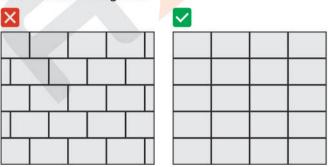




Necessity of embedding tile joints and movement joints in ceramic tiled surfaces

In coverings with porcelain ceramics or other covering materials such as tiles, stones, etc., considering joints and filling them with proper grouts will help in a durable and lasting performance. Here are some of the benefits of considering joints in ceramic tiled surfaces:

- 1- Create an integrated frame around ceramic tile: Due to low water absorption of porcelain ceramic tile, considering joints and filling them with proper grouts, which have a strong bond with this type of ceramic, an integrated frame is created between ceramic tiles, which add to the strength and durability of the ceramic covering. In case of using traditional sand-cement slurry (combination of white cement and stone powder or other similar compounds) due to low water absorption of porcelain ceramics, the slurry will not bond with ceramic tiles and over time, the slurry separates from them.
- 2- Preventing the growth of fungus and bacteria in the case of using proper grouts: If no joint is embedded between ceramic tiles, considering that it is theoretically not possible to reduce the gap between the two ceramic tiles to zero, and there will always be a gap, which due to its very small width, cannot be filled with slurry or grouts, it will be a good place for fungusand bacteria to accumulate and grow.



3-Covering of allowable tolerances and installation issues:Due to the possibility of human errors in the installation of ceramic tiles and the existence of allowable tolerances, the installation of porcelain

ceramic tiles with proper joint width will help to solve these resulting problems. 4- Ease of replacing damaged ceramic tiles: If the ceramic tiles are installed with proper joint width, if any of the ceramic tiles are damaged by impact or any other reasons, due to the joints and sufficient gap, it's possible to empty the grouts with suitable tools and replace damaged ceramic tiles without affecting the adjacent tiles.

5- Visual integration: Embedding joints between the ceramic tiles and filling them with proper grouts gives a uniform and desirable appearance to the tiled surface

Recommendations of official technical resources regarding the embedding of the joints

Code 55

7-3-1-4- floor covering with ceramic: The joint width between ceramic tiles is 2 to 5 mm and generally an average of 3 mm

National Standard of Iran No. 12495-3 23-5- Connections: It is recommended that the width of the ceramic tile joints should not be less than 3 mm.

AS 3958.1

5-4-6- Finished surfaces and joints: for the joint width, the following values are suggested: Floor:

- · Dry-pressed tiles: 3 mm
- Extruded tiles: 6 mm

Wall

- Dry-pressed tiles: 1.5 mm
- Extruded tiles: 6 mm

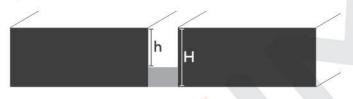
Note 1: Wider joints may be required to accommodate larger tiles, provide a decorative effect and other reasons.

Note 2: Joint widths are normally measured at the tile face.



Warnings and tips related to joints between ceramic tiles

- *The joint width must be at least two-thirds of the ceramic tile thickness
- * Before grouting, all excess adhesive in the joints must be removed before drying. Care must be taken not to damage the ceramics during this operation. The width of the joints must also be constant throughout the tiled surface.
- * To achieve a uniform width for the joints in ceramic tiled surface, it is recommended to use spacers.



$$h \ge \frac{2}{3}H$$

- *Joint alignment should be consistent throughout the installation. The final alignment should be within a tolerance of ± 4 mm in 2 m from the specified joint alignment.
- * Before grouting, espe<mark>cial</mark>ly when the ceramic is installed with adhesive, the joints must be completely dry, as the humidity may cause destructive effects.



The necessity of embedding movement joints

As we know, all materials have a coefficient of thermal expansion and depending on their physical characteristics, they respond to temperature changes. The increase in length due to temperature changes is determined by the "linear thermal expansion coefficient". This coefficient actually states how long the length will increase for each degree of temperature increase. The coefficient of linear thermal expansion depends on the material and is one of its characteristics. The amount of this coefficient is proportional to the length and temperature change of the material. In the case of porcelain ceramics, this coefficient averages about $\alpha = 6 \times 10$ -6.

In addition to changes in temperature, other factors such as changes in humidity and passing traffic also cause the ceramic to move relative to the adhesive mortar bed. By embedding a sufficient number of movement joints, additional stresses that may be caused by the movement of the ceramics will be prevented and the ceramics are protected from possible damages.

Recommendations of official technical resources regarding the embedding of movement joints

National Standard of Iran No. 12495-1 5-6- Movement joints

Embedding movement joints should be considered in the design stage. Factors such as drying shrinkage and humidity and temperature changes cause displacement pressures on the tiled surface, which can sometimes cause the ceramic tile to lose adhesion or crack. Sometimes it may be necessary for the tile movement joints to pass through the tile layer and its bed and be at



least 6 mm wide. The location of movement joints is determined by the designer in the design stage. Examples of these locations include: on structural expansion joints, at internal vertical angles and in centers of 3 m to 4.5 m vertically and horizontally, in places where the possibility of accumulation of stresses (for example, change in alignment directions) and so on.

TCNA

Movement joints spacing:

Interior areas 6-8 meters in each directionInterior or exterior areas which are exposed to direct sunlight or humidity 2.5-3.5 meters in each direction

BS 5385.1

6-5- Movement joint:

- It is recommended to consider movement joints in the following locations:
- Over existing and/or structural joints
- Where tiling abuts other material
- Where tiling is continuous across junctions of different background materials
- In large tiled areas, at internal vertical corners and at 3 m to 4.5 m centres horizontally and vertically
- Where stresses are likely to be concentrated, for example at changes of alignment

AS 3958.1

5-4-5- Movement joints:

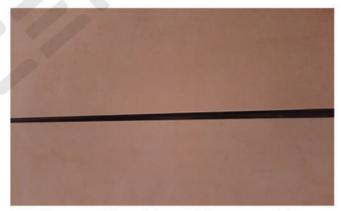
Movement joints are embedded on ceramic tiled surfaces for the following reasons:

- Separation of the tiled surface from fixed elements such as columns and walls
- Subdivision of large areas of tiled surface into smaller sections to compensate for induced strain from various causes.
- To interrupt the tiled surface to match discontinuities in the substrate such as construction joints and movement joints.

Warnings and tips related to movement joints

All joints should be rectangular in section, with firm, straight, smooth edges free from cavities and irregularities. The width:depth ratios and dimensions of the sealant profile in a joint should accord with the recommendations of the sealant manufacturer.

- * Where it is suspected that moisture movement or thermal movement of the background and/or tiling threatens the stability of the installation, provisions of additional movement joints should be considered.
- * When forming the joints, it is useful to insert a temporary filler strip that can be removed when the tiling is sufficiently firm; care should be taken to avoid grout and other materials becoming trapped in the joint cavity that prevent proper application of the sealant and might prevent movement of the joint, resulting in damage or displacement.



Temporary filler strip inserted in movement joint

- * Using a special type of sealant may not be suitable for all ceramic tiles. In this regard, the manufacturer's recommendations should be considered.
- * The movement joints should have a rectangular cross-section and their width should not change in depth and there should be no holes in them.



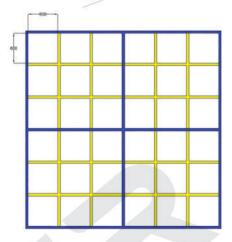
* In order to prevent the ceramic tiles from contamination when applying the sealant, it is recommended to cover the edges of the ceramic tiles with paper tape.



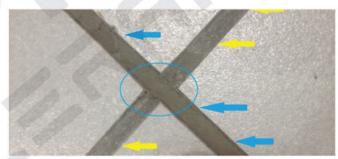
Recommendations for grouting and filling the movement joints on the surface coated with porcelain ceramic tiles

It is recommended by dividing the tiled surface into blocks of appropriate dimensions, fill the joints inside the blocks with cement-based grout and also use movement joint profiles for the movement joints around the blocks. If it is not possible to use movement joint profile, a combination of cement-based grout and flexible polyurethane material which has a flexible property can be used. For example, in the picture below, it can be seen that the tiled surface is divided into 4 blocks and the joints are filled with a combination of cement- based grouts (yellow color) and flexible grouts (blue color). In this case the width of all joints should be the same.





In the picture below, it can be seen that the tiled surface is grouted with a combination of cement-based grout (yellow color) and flexible grout (blue color). As shown in the picture, the joints filled with flexible grout are uniform and not interrupted by cement grout and form a frame around tiled surface.



Ceramic tiled floor of Bologna-Italy airpor

Grouting with cement-based grouts (ULTRAFUGA FLEX 2500)

- •Before use, notice the instructions on the product packaging, including storage conditions, specifications, applications, Preparation process and other technical information.
- Joints should be clean and free of any dust and excess material. If there are any additional materials such as adhesive, dried mortar, etc. in the joints, remove them and clean the joints.

Required tools and materials

For a proper grouting, the following tools and materials are required:





Rubber trowel



Proper bucket for preparation of grouts



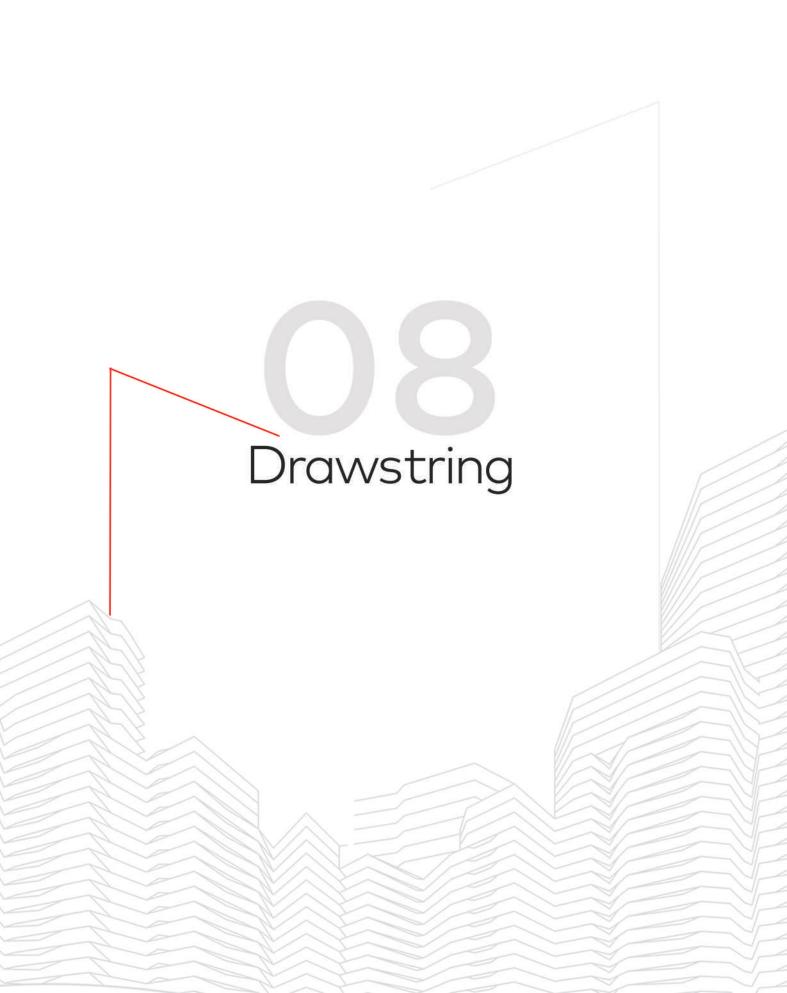
Cement-based grout



Sponge for cleaning the joints



Electric mixer





Preparation

Prepare a suitable and clean container for mixing grout material. It is recommended to use plastic buckets with proper capacity.

- Considering the weather conditions and the humidity of the environment, pour the amount of water recommended by the manufacturer into the bucket. Then gently add the grouts to it.
- To achieve a uniform and homogeneous mixture, mix the grout with an electric mixer.
- After the initial mix, wait about 5-10 minutes for the mixture to achieve Acceptable consistency then mix it again for 1-2 minutes. Now the grout is ready to use.

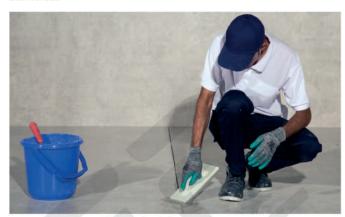


Grouting and cleaning

Before grouting, empty the joints from adhesive, dust and other excess materials. The joints must be completely clean.

- The joint depth must be at least two-thirds of the ceramic tile thickness.
- Fill the joints with the prepared grout using proper rubber trowel.
- . Make sure the joints are completely filled and there is no cavity.
- Remove excess grout from the surface by moving the trowel obliquely.
- After about 10-20 minutes when the grout has lost its flexibility, clean the joints with a damp sponge by moving it obliquely.
- After the ceramic surface is dry, if the cementitious residues remain on the ceramic

surface, clean it with a dry cloth and sweep the surface.



Filling the joints with grout



Cleaning the joints

Warning and tips for grouting

*The joints should be completely cleaned and any excess material should be removed from the joints. In some cases, spacers may be stuck between the ceramic tiles. In these cases, if too much force is applied to remove the spacers, the ceramic tiles may also shift and detach from the substrate. In these occasions use a cutter to remove the spacers. Under no circumstances should spacers remain inside the joints.



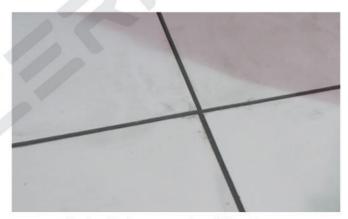


- * If cleaning the joints starts early, grouts may come out from the joints. On the other hand, late cleaning may cause the grout material dry on the ceramic tile surface.
- * Tools should be washed with plenty of water.
- * Any change in the amount of water recommended by the manufacturer for mixing the groutwill affect the characteristics and performance of the grout.
- * Do not dilute cement-based grouts with water (as slurry).
- * Do not add any additives that are not recommended by the manufacturer.
- * Suitable ambient temperature for grouting with cement-based grouts is 5-35 °C, unless the manufacturer has suggested another temperature range.
- * When mixing the grout is done, do not add excess water.
- * If the ceramic tiles have anti-slip or relief surfaces, cover the edges with paper tape before grouting (as shown in the picture bellow)





* It is recommended to consider all aspects for selecting grout color. Selection of a grout color that contrasts with the tile will emphasize the grout joint and correspondingly anyvariations in tile size and position. On the other hand, When a similar color grout is used, it is often more difficult to see the haze left after the initial grout cleaning and extra care must be taken to remove all haze.



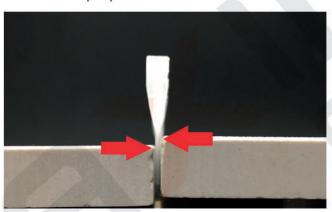
Contrast between grout and tile colors





Ceramic Tile Leveling System

Some factors such as variation in the thickness of the ceramic tiles (although this variation is allowed by standards), the allowable curvature of the ceramic tile surfaces, the joint widthbetween the ceramic tiles or the variation of the thickness of the adhesive mortar bed can cause differences in the level of the adjacent ceramic tile surfaces. This condition where one edge of a tile is higher than an adjacent tile is called lippage. The angle of the light (natural or artificial) and the reflective surface of the ceramic tile can make the lippage more noticeable. Even though a limited amount of lippage is allowed by standards, this value should be reduced to zero to prevent ceramic tile edges from damage. Wedge and leveling clip are used for this purpose.





After

The components of this system are:



Wedge



Leveling clip

To increase the efficiency of this system, it is recommended to use special pliers. The advantages of using pliers are increasing the leveling speed and accuracy and also the pressure force for adjusting the clips.



The special pliers for wedge and leveling clip



Steps of using wedge and leveling clips

1- Apply adhesive under the ceramic tile so that there is no cavity. Then remove the excess adhesive from the ceramic tile edges by a trowel and place one side of the edge of the leveling clip under the ceramic.





2- Then place the next ceramic tile on the other edge of the clip and adjust it by a rubber hammer.



3- Place the wedge into the clip and fix it with the special pliers.



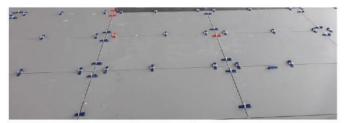


- 4- Finally, to remove the clips and wedges, gently tap the clip in the direction of the ceramictile joints with your safety shoes or with a plastic hammer so that the lower part of the clip remains under the ceramic tile and the upper part and the wedge come out. This should be done when the adhesive under the ceramic has dried and the ceramic tiles do not move due to the tapping.
- * The wedges can be used frequently, so collect them.



Most manufacturers offer the number of leveling clips and wedges used in the installation of ceramic tiles, according to the following chart, which is provided for some sizes.

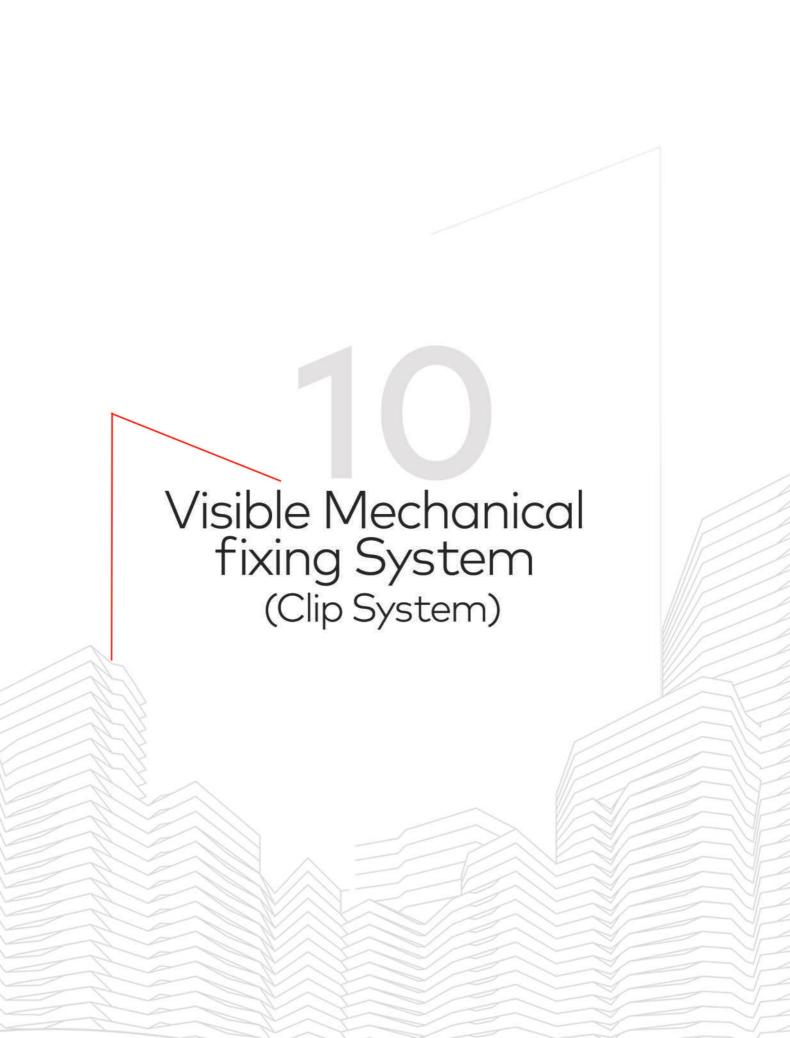
Ceramic tile size (cm) 30×30	40×40	60×60	80×80	100×100	60×120
Number of clips and wedges per square me	42	20	10	10	10	10



Appropriate number of leveling clips and wedges



Inappropriate number of leveling clips and wedges



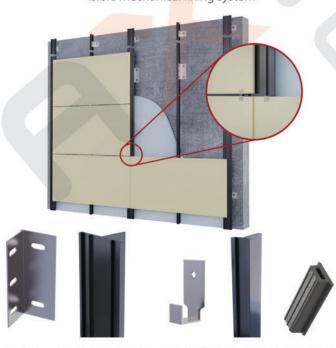


Visible Mechanical Fixing System (Clip System)

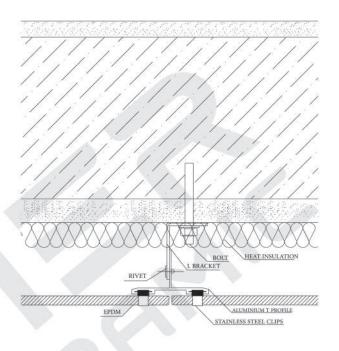
This fixing system is one of the most reliable systems for porcelain tile ventilated facades. Thanks to its several advantages such as high fixing speed, adjustment capability, and ease of ceramic tile replacement, this method is widely used. In this method, the clip is placed in such a way that the ceramic tile is placed inside and restrained. The clip is connected to the aluminum substructure as shown below. The clips are made of stainless steel and they can be painted with colors appropriate to the ceramic tile color to avoid attracting attention.

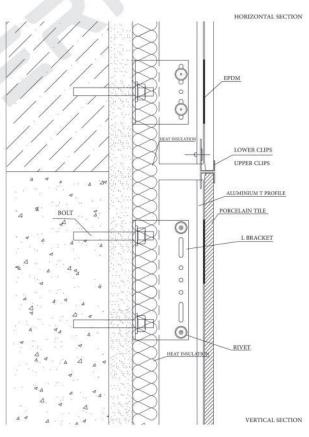


isible mechanical fixing system



Double Vertical T Profile Bottom Clip Vertical T Profile EPDM Rubber Visible mechanical fixing system components





Visible mechanical fixing system details



The stages of visible mechanical fixing system are

- 1. Preparing a workshop plan based on the current condition of the building façade
- 2. If necessary, the installation of a steel substructure to eliminate dimensional irregularities of the building
- 3. After designing the facade elements, according to the obtained design, the brackets are connected to the retaining wall or steel substructure by mechanical fasteners.
- 4. At this stage, a suitable thermal insulation is applied on the retaining wall.
- 5. After that, the vertical profiles are connected on the brackets at a distance of approximately 10 cm from the facade of the building. The maximum distance from the axis to the axis of the vertical profiles from each other is 60 cm.
- 6. Then EPDM rubbers are placed in the vertical profile grooves.











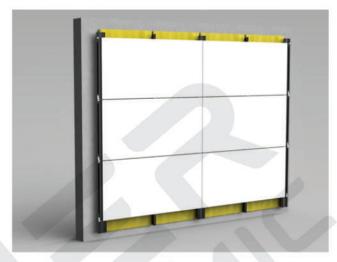


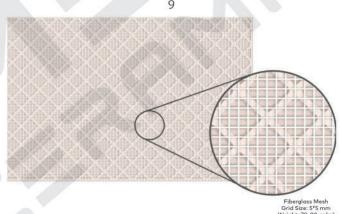
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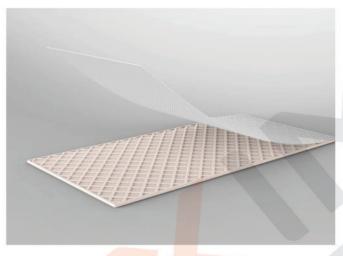
- 7. The bottom clips are placed in the vertical profile groove and are screwed to it.
- 8. Considering the issue of civil defense and in order to prevent the ceramic tiles from falling from the facade, all the ceramic tiles should be reinforced with fiberglass mesh and suitable adhesive.
- 9. Ceramic tiles are placed on the bottom clips and then the top clips are placed in the profile groove and on the ceramic tiles.
- 10. There should be a distance of 4-8 mm between the ceramic tiles.
- 11. The facade is created by repeating this process.

It is recommended that the vertical profiles be cut at the floor levels so that each part has a separate function from the other parts.





Ceramic tile reinforced with fiberglass mesh





8

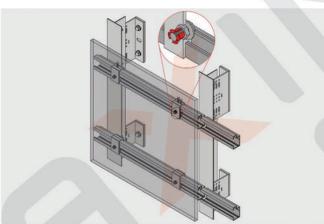


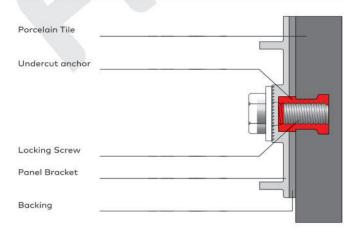


Invisible Mechanical Fixing System (Keil System)

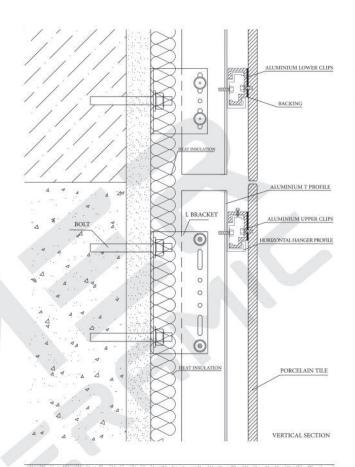
In this system, bracket and anchor are installed behind the ceramic tiles and placed on aluminum substrate on the building facade. The brackets are made of aluminum. It is easily possible to adjust or replace any of the ceramic tiles anywhere on the façade.

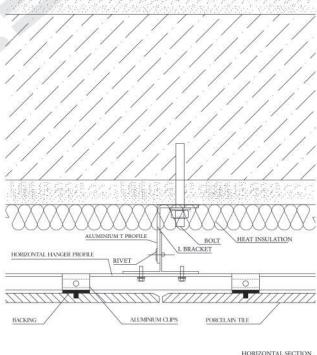






Invisible mechanical fixing system with anchors



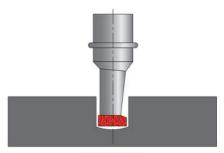


Invisible mechanical fixing system details

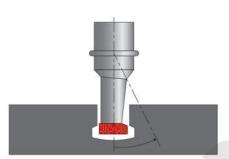


Preparation of ceramic panels

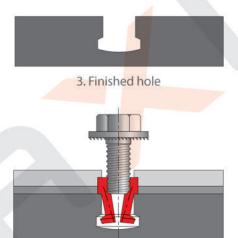
Preparing a ceramic panel involves the following steps:



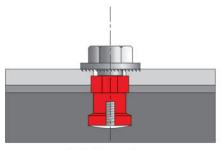
1. Drilling



2. Undercut



4. Anchor inserting

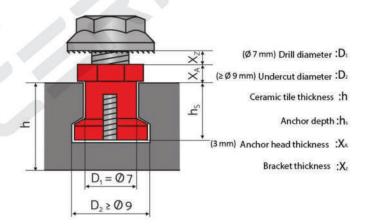


5. Bolt inserting





Preparation of ceramic panel



Undercut hole geometry

Invisible mechanical fixing system with anchors stages:

- 1. Preparing a workshop plan based on the current condition of the building façade
- 2. If necessary, the installation of a steel substructure to eliminate dimensional irregularities of the building
- 3. After designing the facade elements, according to the obtained design, the brackets are connected



to the retaining wall or steel substructure by mechanical fasteners.

- 4. At this stage, a suitable thermal insulation is applied on the retaining wall.
- 5. Considering the issue of civil defense and in order to prevent the ceramic tiles from falling from the facade, all the ceramic tiles should be reinforced with fiberglass mesh and suitable adhesive.
- 6. Ceramic back holes are made using the special drilling machine and drill head.
- 7. The anchors are placed inside the undercut holes and the brackets are screwed. (To ensure a sturdy connection, the holes are filled with flexible polyurethane adhesive)
- 8. After that, the vertical profiles are connected on the brackets at a distance of approximately 15 cm from the facade of the building.
- 9. Horizontal profiles (runners) are also installed on vertical profiles at appropriate height.
- 10. The ceramic panels are placed on the substructure by hanging the brackets behind the panel to the runners.
- 11. Finally, to obtain a suitable horizontal joint, the panel is placed in its proper place by an adjusting screw.
- 12. The facade is created by repeating this process.



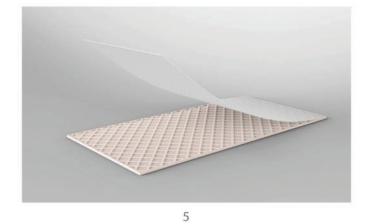




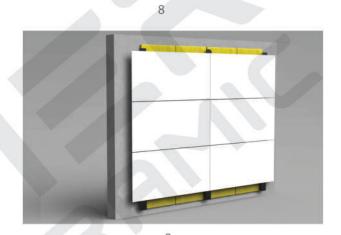


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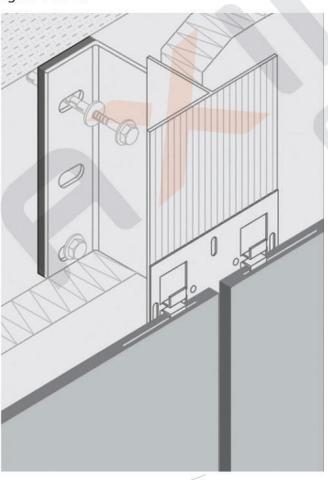
Invisible mechanical fixing system with anchors stages

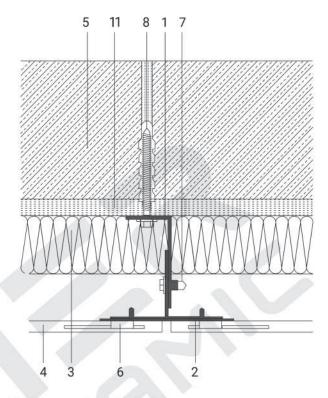




Invisible Mechanical Fixing System (With grooves in the ceramic tile width)

This fixing system is for installation of porcelain ceramic tiles with high strength. First, a groove with a length of 3 to 5 cm is created in the width of these porcelain ceramic tiles, thenafter installing aluminum substructure on building facade, the fixing process is done by placing a stainless steel concealed fixing clip in the ceramic groove. An example of these fixing clips can be seen in the figure below.





Invisible mechanical fixing system stages

- 1. Preparing a workshop plan based on the current condition of the building façade
- 2. If necessary, the installation of a steel substructure to eliminate dimensional irregularities of the building
- 3. After designing the facade elements, according to the obtained design, the brackets are connected to the retaining wall or steel substructure by mechanical fasteners.
- 4. At this stage, a suitable thermal insulation is applied on the retaining wall.
- 5. After that, the vertical profiles are connected on the brackets at a distance of approximately 10 cm from the facade of the building. The maximum distance from the axis to the axis of the vertical profiles from each other is 60 cm.
- 6. Considering the issue of civil defense and in order to prevent the ceramic tiles from falling from the facade, all the ceramic tiles should be reinforced with fiberglass mesh and suitable adhesive.
- 7. The surface of the vertical profiles is completely cleaned and dried. It is recommended to use



alcohol or acetone for this purpose.

- 8. The bottom fixing clips are installed on vertical profiles using screws or rivets at appropriate intervals.
- 9. Then a continuous strip of polyurethane adhesive with an angle of 45 degrees and a width of at least 10 mm is applied on the vertical profile.
- 10. The grooves with a length of 3 to 5 cm are created in the width of the ceramic tiles,
- and the ceramic tiles are placed on the bottom clips.
- 11. Then top clips are inserted into the grooves on the top of the ceramic tile and screwed to the vertical profile.
- 12. It's recommended to use leveling clips and wedges to improve fixing quality.
- 13. The facade is created by repeating this process.It is recommended that the vertical profiles be cut at the floor levels so that each part has a separate function from the other parts.



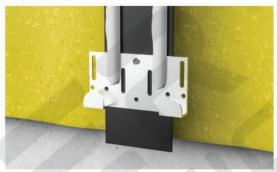
1. Cleaning and drying of vertical profiles



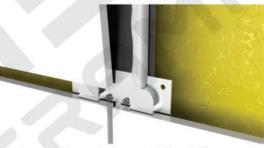
2. Installation of bottom fixing clips on vertical profiles



3. Applying polyurethane adhesive on the vertical profile



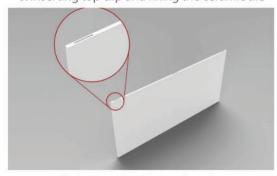
4. Adhesive overlapping with clips



5. Grooving ceramic tile width



6. Inserting top clip and fixing the ceramic tile



7. Using leveling clips and wedges

Invisible mechanical fixing system stages with grooves in the ceramic tile width





Consumer Guide

Important Points

Please make sure that the selected product is suitable for your usage according to field of application & site situation by technical consulting with our slae department.

- Before starting the application please check shade & caliber on cartons and make sure they are compliance with your order. Keep an empty carton at site.
- •Porcelain ceramic tiles have high quality in their physical & chemical characteristics however due to their low water absorption it is highly recommended to be applied by using proper surface preparation material, adhesives & grouting mortars. For more information please read "porcelain ceramic tiles introduction" section or contact our sale department.
- •Use trained & skillful installer for application, meanwhile it is necessary that allapplication procedure be monitored to gain required result.
- .All quality defects should be reported before starting application to our sale department.
- Before starting application please read the porcelain ceramic tiles application instruction.

Porcelain ceramic tiles application instruction

In porcelain ceramic tiles application, the following are recommended:

- Regard to unloading and pallets unpacking instruction
- Prepare the Surface; Make sure your surfaces are clean, smooth and firm.
- Applying of primer (to reduction of surface absorbency and proper adhesion)
- Using of cement based adhesives with C2TE S1 technical specification for ceramic installing in interior and C2TE S2 technical specification for ceramic installing in outdoor. (for ceramic installation on the façade it is recommended to use ventilated systems)
- Consideration of joint between ceramic tiles and expansion joint (according to the standards and instructions).
- . Using of leveling tools.
- Using of the cementitious grouts and regarding the grouting instruction.
- Using of the flexible polyurethane sealant or metal profiles for expansion joint.
- Attention to the cleaning of the ceramic tiles at all steps of work
- For more information please click on the above items or contact our training, researches and technical support department.