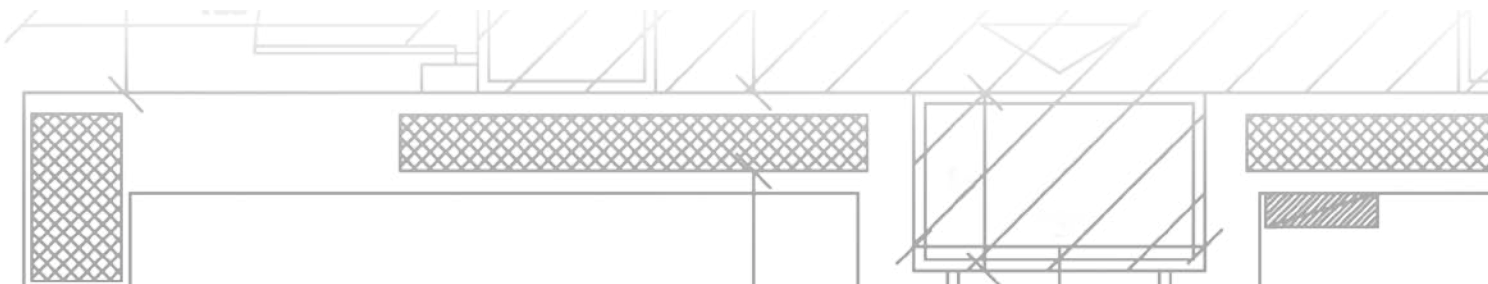




Technical Notebook

SYSTEMS FOR INSTALLING THIN PORCELAIN TILES



Technical Notebook

**SYSTEMS FOR INSTALLING
THIN PORCELAIN TILES**

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SYSTEMS FOR INSTALLING THIN PORCELAIN TILES



1. INTRODUCTION

The aim of this technical notebook is to present a series of useful guidelines on the best installation methods for thin porcelain tiles by defining the systems which MAPEI offers for the fixing of this type of product on internal and external walls and floors.

Modern technology applied in the ceramics sector permits very thin porcelain tiles around 3-5 mm thick and up to 1x3 m to be manufactured. Due to the reduced thickness, particularly large format and very low absorption rate typical of porcelain, it is extremely important to identify the correct fixing methods with extreme care and precision so that this type of tile is installed correctly.

As with any type of flooring and coating product, the durability and functionality of thin porcelain tiles depend greatly on precise design parameters, suitable preparation of the substrate, correct fixing methods and techniques using adhesives, grouts mortars and sealants for the joints which are selected according to the type of tile product and its final use.

For more detailed information please contact the MAPEI Technical Services Department.



2. TYPES OF MATERIAL

The thin porcelain tiles available on the market may be divided into two main categories:

a) Tiles with minimum thicknesses of 3 mm and formats up to 1x3 m produced by compacting the dry, raw materials on feeder belts without moulds followed by firing in special furnaces at a temperature of +1200°C. This type of tile is offered in three different versions:

- at a minimum thickness of 3 mm;
- with a reinforced back face by applying glass fibre mesh during the production cycle for a minimum thickness of approx. 3.5 mm, for higher resistance to pedestrian traffic;
- two 3 mm tiles sandwiched together with glass fibre reinforcement mesh (at the midpoint) between the two tiles for a total thickness of 7 mm. Suitable for environments with more intense traffic.

b) Tiles with a variable thickness from 4 to 5 mm produced by pressing the raw materials into moulds, with no reinforcement mesh, followed by firing in special furnaces at a temperature of +1200°C.

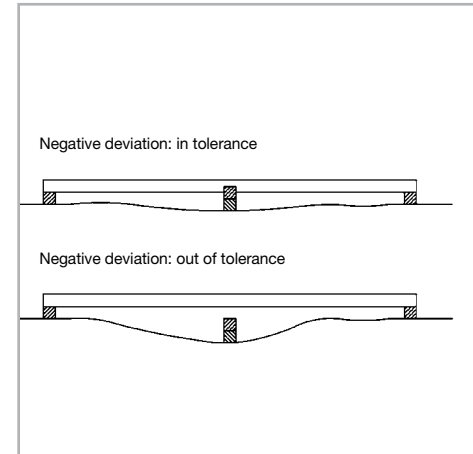
The increase in popularity of this type of tile depends on certain advantages which characterises the tile, and which makes them preferable to traditional tiles, especially in restoration work where fewer grout joints are required. The advantages include:

- thinner profile: may be applied on old floors without excessively modifying the height of the floor, resulting in a reduction in the amount of demolition work required;
- lighter: easier handling, lower transport costs and lower structural impact;

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- thinner profile, easier to cut;
- grouted joints have less pressure due to the large formats of the tiles;
- lower impact on the environment, lower quantities of raw materials and energy required per square metre.

Along with these advantages, the special characteristics of this type of product, and in particular its reduced profile makes it more fragile and subject to fracture. This means that certain precautions must be taken during handling, preparation of the substrates and installation which differ from those adopted when fixing conventional tiles.



3. HANDLING THE TILES

The tiles weigh from approximately 7 to 13 kg per square metre (dependent on the thickness) (a 60x120 mm tile weight from 5 to 9 kg). The tiles may be moved, by hand. In the case of particularly large format tiles, more than one person may be required when handling.

In general, when moving tiles by hand, the following precautions should be taken:

- a) always wear protective non-slip gloves;
- b) always wear safety footwear.

Once the tiles have been removed from their packaging, care must be taken when putting them in position by resting the long side of the tiles on the ground at an angle of 30° with respect to the substrate. Particular attention should be paid when handling the tiles to avoid chipping or breaking the corners.

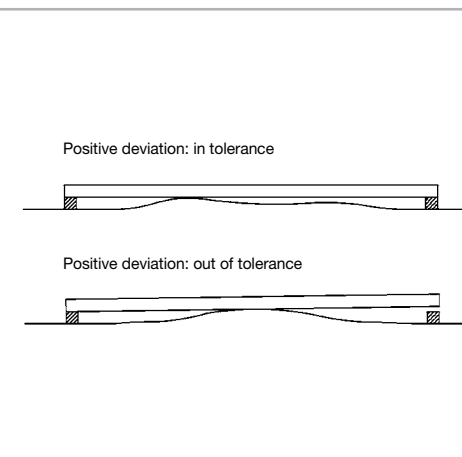


Fig. 4.1 - Checking the flatness tolerances

4. VERIFYING THE CONDITION AND TYPE OF SUBSTRATE

Thin porcelain tiles may be fixed on conventional substrates normally used in the building industry, such as: concrete, cementitious and anhydrite screeds, screeds made from **TOPCEM PRONTO** or **MAPECEM PRONTO**, heated screeds, old ceramic floors, stone or metal, cementitious render or gypsum tiling, lightweight concrete blocks, plasterboard and internal substrates waterproofed with cementitious products such as **MAPELASTIC** or synthetic resin products such as **MAPEGUM WPS** and **MAPELASTIC AQUADEFENSE**.

The suitability of a substrate for this type of product must be checked before tiling: substrates must always be stable, well cured (strong enough to withstand the foreseen loads and type of use), dry, clean, free of foreign objects, (dust, grease, oil, wax, paint, stripping compound and any other material which could compromise the bond), free of cracks and perfectly flat. Because of the reduced thickness of the tiles, the flatness of the substrate is particularly important. If there are voids or gaps in the substrate or in the adhesive layer, the tiles may fracture if subject to concentrated loads.

The flatness of the substrate must be checked with a straight-edge at least 2 m long by placing it on the surface of the screed in all directions (see Fig. 4.1). The maximum acceptable tolerance is ± 2 mm. If the high and low points exceed this value, the surface must be evened out using a suitable levelling product.

4.1 CONCRETE

Concrete must be well cured (for at least three months). The deflection in floor slabs must be less than $1/360$ of the total span. Concrete substrates must be free of loose areas and surface treatments which could potentially compromise the bond (such as an anti-vapour coat, adhesive residues, resin, stripping compound, etc.).

To guarantee the durability of the tiled finish, it is also necessary to make sure that floor tiles laid on the ground are correctly isolated to avoid problems caused by rising damp.

SYSTEMS FOR INSTALLING THIN PORCELAIN TILES

4.2 CONVENTIONAL CEMENTITIOUS SCREEDS

The thickness of the screed must be sufficient to cope with the design requirements, equal to at least 4 cm in the case of unbonded screeds. The composition of the mix must be assessed according to the mechanical performance required.

The flatness of the surface must be checked as described previously. The screed must be compact and homogenous through its entire thickness and any cracks in the screed must be monolithically sealed with epoxy resin, such as **EPORIP**, **EPOJET** or **EPORIP TURBO**.

Screeds must be cured sufficiently: the waiting time before installation is approximately 7-10 days per centimetre of thickness. Waiting times when installing on conventional screeds, may be particularly extended (in certain cases more than one month).

4.3 SCREEDS MADE FROM SPECIAL BINDERS OR PRE-BLENDED MORTAR

Waiting times before laying thin porcelain tiles may be reduced considerably by using special binders or pre-blended, normal-setting, quick-drying mortar such as **TOPCEM** or **TOPCEM PRONTO**, or quick-setting and drying mortar such as **MAPECEM** or **MAPECEM PRONTO**. All these products are also suitable for installing heated screeds without adding other admixtures. The use of pre-blended mortars also offers a better guarantee on the quality of inert materials, reduces the risk of dosage errors and is an excellent solution in those cases where acquisition and storage of raw materials is particularly difficult. Pre-blended mortars for screeds also carry the CE-mark, in compliance with EN 13813 standards.

4.3.1 MAPECEM - MAPECEM PRONTO SCREEDS

Screeds made from **MAPECEM** or **MAPECEM PRONTO** are characterised by their rapid setting and drying times and controlled shrinkage. Their use permits thin porcelain tiles to be laid just 3 hours after installing the substrate. **MAPECEM PRONTO** is classified CT-C60-F10 A_{1f} according to EN 13813.



Fig. 4.2 - Mixing TOPCEM PRONTO with a pumping system



Fig. 4.3 - Mechanised system with silos for storing, mixing and transporting blended TOPCEM PRONTO



Fig. 4.4 - Mechanised system with silos mounted on a truck for storing, mixing and transporting blended TOPCEM or TOPCEM PRONTO



Fig. 4.5 - Levelling TOPCEM PRONTO



Fig. 4.6 - Tamping a screed made from TOPCEM PRONTO



Fig. 4.7 - A heated screed made from TOPCEM PRONTO

4.3.2 TOPCEM - TOPCEM PRONTO SCREEDS

Screeds made using **TOPCEM** or **TOPCEM PRONTO** are characterised by their normal setting times, with similar workability characteristics to conventional screeds, short drying times and controlled shrinkage. Thin porcelain tiles may be laid on these types of substrate 24 hours after installation. **TOPCEM PRONTO** is classified CT-C30-F6 A1_f according to EN 13813 and certified by GEV Insitute as EMICODE EC1 R Plus (very low emission of volatile organic compounds).

4.4 HEATED SCREEDS

With heated screeds, follow the instructions normally applied when installing screeds and follow the guidelines given by the manufacturer of the heating system. It is also important to commission the heating system before installing the screed, as prescribed by EN 1264-4.

The length of time to wait before commencing the commissioning of the heating system depends on the material used to form the screed:

- screeds formed from **MAPECEM** or **MAPECEM PRONTO**: 24 hours;
- screeds formed from **TOPCEM** or **TOPCEM PRONTO**: 4 days;
- conventional screeds with plasticiser: approximately 21 days.

The adhesive used on heated screeds must be an improved (C2) highly flexible (S2) type according to European Standard EN 12004 (see section 7.1.2).

4.5 ANHYDRITE SCREEDS

Before laying the floor covering, the surface laitance to the screed must be mechanically abraded, all dust must be removed by vacuum and the surface must be primed (for example with **PRIMER G** or **ECO PRIM T**). The screed must also be completely dry: the maximum acceptable level of moisture measured by carbide hygrometer is 0.5%. Always follow the instructions given by the manufacture of the anhydrite screed.

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4.6 OLD FLOORS

In order to lay directly onto an existing ceramic, terrazzo or stone floor, make sure it is solid, well bonded to the substrate, has no cracks and that all traces of oil, wax, polish and grease have been thoroughly cleaned off using water and caustic soda or a special de-waxing product. All old paint and leading on marble must be eliminated.

Cracked tiles and tiles which are not well bonded must be removed and the surface void repaired with a suitable smoothing and levelling compound, such as **ADESILEX P4**, **NIVORAPID** or **PLANITOP FAST 330**.

4.7 CONCRETE WALLS

Concrete must be well cured (for at least 3 months at normal temperature). Concrete substrates must be free of laitance and surface treatments which could potentially compromise the bond (such as stripping compound, anti-vapour treatment, old paint, etc.).

4.8 CEMENT-BASED RENDER

The render must be well cured. If pre-blended products are used, follow the manufacturer's instructions. When laying in external environments, the tensile adhesion strength of cement-based render must be at least 1 N/mm².

4.9 GYPSUM PLASTER

Gypsum substrates must be perfectly dry (with a maximum residual humidity level of 0.5% by weight), sufficiently sound and free of dust. It is necessary to treat this type of substrate with **PRIMER G** or **ECO PRIM T** and fix the tile only after it has completely dried. This type of application is only suitable for internal surfaces.

4.10 WALLS IN LIGHTWEIGHT CONCRETE BLOCKS

Because of the wide variety of products available on the market, different manufacturers must be contacted before deciding which product has the most suitable characteristics. Thin porcelain tiles may only be fixed

to this type of substrate in internal environments (after applying a coat of **PRIMER G** diluted at a rate of 1:2 with water). When installing on external surfaces, a layer of render made from **NIVOPLAN + PLANICRETE** or **PLANITOP FAST 330** reinforced with zinc-plated mesh must then be applied.

If porcelain is to be laid on particularly flexible surfaces, such as metal or wood, each single case must be carefully assessed by the MAPEI Technical Services Department.



5. CREATING FLAT SURFACES

As mentioned previously, the flatness of the surface is the most important characteristic of the substrate when laying thin tiles. If there are gaps under the tiles, they would represent a weak point in the finish.

Irregularities in the surface, therefore, must be eliminated before laying the tiles with a suitable levelling mortar.



5.1 LEVELLING CONCRETE SUBSTRATES AND CEMENTITIOUS AND SPECIAL BINDER-BASED SCREEDS

Levelling internal surfaces may be carried out using:

- **ULTRAPLAN**, self-levelling, ultra-quick hardening levelling compound for internal surfaces applied at a thickness from 1 to 10 mm. Class CT-C30-F7-A2_{fl}-s1 according to EN 13813 and certified Blue Engel and by GEV Institut as EMICODE EC1 R Plus (very low emission of volatile organic compounds).
- **ULTRAPLAN MAXI**, self-levelling, ultra-quick hardening levelling compound for internal surfaces applied at a thickness from 3 to 30 mm. Class CT-C35-F7-A2_{fl}-s1 according to EN 13813, certified

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Blue Engel and by GEV Institut as EMICODE EC1 R Plus (very low emission of volatile organic compounds).

- **NIVORAPID**, ultra-quick hardening, thixotropic cementitious smoothing compound for internal surfaces applied at a thickness from 1 to 20 mm. Class CT-C40-F10-A2_{fl}-s1 according to EN 13813 standards, certified by GEV Institut as EMICODE EC1 R Plus (very low emission of volatile organic compounds).

5.2 LEVELLING OLD CERAMIC, TERRAZZO AND STONE FLOORS

Levelling this type of internal and external surface may be carried out using the same products indicated in section 5.1 after carefully cleaning and de-waxing the surface and then applying a suitable primer, such as **ECO PRIM GRIP** or **ECO PRIM T**.

5.3 LEVELLING ANHYDRITE SCREEDS

Anhydrite screeds (with a maximum residual moisture content of 0.5%) may be levelled using the same products indicated in section 5.1 after applying a suitable primer, such as **PRIMER G** or **ECO PRIM T**.

5.4 LEVELLING CONCRETE WALLS AND CEMENTITIOUS RENDER

Substrates described in sections 4.7 and 4.8 may be levelled with the following products:

- **NIVOPLAN + PLANICRETE**, levelling mortar for internal and external walls, applied at a thickness from 2 to 30 mm, class GP-CS IV according to EN 998-1, used in combination with **PLANICRETE** synthetic latex rubber to improve the performance of cementitious mortar at a rate of 2 kg per bag of **NIVOPLAN**.



Fig. 5.1 - Application of PRIMER G diluted at a rate of 1:1 with a roller on a cementitious screed before levelling the surface



Fig. 5.2 - Levelling the surface of a cementitious screed with ULTRAPLAN



Fig. 5.3 - Application of ECO PRIM T with a roller on an old terrazzo floor before levelling the surface



Fig. 5.4 - Levelling the surface of an old terrazzo floor with ULTRAPLAN



Fig. 5.5 - Evening out a concrete wall with NIVOPLAN+PLANICRETE



Fig. 5.6 - Evening out a wall with PLANITOP FAST 330

- **PLANITOP FAST 330**, quick-setting, fibre-reinforced cementitious mortar applied at a thickness from 3 to 30 mm for levelling internal and external vertical and horizontal surfaces. Class GP-CS IV according to EN 998-1 and MC-IR according to EN 1504-2 (C).



6. WATERPROOFING INTERNAL FLOORS AND WALLS

If internal surfaces where thin porcelain tiles are to be installed need to be waterproofed, one of the following products may be used:

- **MAPELASTIC**, two-component flexible cementitious mortar for waterproofing cementitious surfaces, class PI-MC-IR according to EN 1504-2 (C) and CM02P according to EN 14891.
- **MAPELASTIC TURBO**, two-component, rapid-drying elastic cementitious mortar for waterproofing terraces and balconies, including at low temperatures and on substrates not completely dry.
- **MAPELASTIC SMART**, two-component, highly-flexible cementitious mortar applied by brush or with a roller for waterproofing concrete surfaces, class PI-MC-IR according to EN 1504-2 (C) and CM01P according to EN 14891.
- **MONOLASTIC**, one-component, flexible cementitious mortar for waterproofing balconies, terraces and bathrooms.
- **MAPELASTIC AQUADEFENSE**, ready-to-use, ultra-quick drying, flexible liquid membrane for waterproofing internal and external surfaces.

Waterproofing using **MAPELASTIC**, **MAPELASTIC TURBO**, **MAPELASTIC SMART** and **MONOLASTIC** must be guaranteed by applying an even layer 2 mm thick.

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Waterproofing using **MAPELASTIC AQUADEFENSE** must be guaranteed by applying an even layer at least 1 mm thick.

If the substrate has micro-cracks, it must be reinforced using **MAPETEX SEL** micro-perforated non-woven polypropylene fabric for reinforcing waterproofing membranes.

MAPELASTIC, **MAPELASTIC TURBO**, **MAPELASTIC SMART**, **MAPELASTIC AQUADEFENSE** and **MONOLASTIC** systems may be used on all types of substrate normally used in the building industry, as long as they are sound, well-bonded to the existing substrate and there are no foreign objects on the surface. A coat of **PRIMER G** must be applied beforehand on gypsum-based substrates.

- **MAPEGUM WPS**, quick-drying flexible liquid membrane for waterproofing internal surfaces. It is certified by GEV Institut as EMICODE EC1 Plus (very low emission of volatile organic compounds).

Waterproofing using **MAPEGUM WPS** must be guaranteed by applying an even layer 1 mm thick.

If the substrate has micro-cracks, the **MAPEGUM WPS** system must be reinforced with **MAPENET 150** or **MAPETEX SEL**. The **MAPEGUM WPS** system may be applied directly on the following surfaces: plasterboard, gypsum plaster and cement-based render, marine plywood and cement and anhydrite-based screeds. Existing ceramic and stone finishes must be treated beforehand by applying a coat of **ECO PRIM T**.



Fig. 6.1 - Application of MAPELASTIC+MAPENET 150 on a floor



Fig. 6.2 - Application of MAPELASTIC AQUADEFENSE with a roller on a floor



Fig. 7.1 - Laying on floors: spreading the adhesive with a round-toothed 9 mm radius notched trowel



Fig. 7.2 - Laying on floors: spreading the adhesive on the back of the tile



Fig. 7.3 - Laying on floors: laying and tamping the tiles in place

7. INSTALLING, SEALING AND GROUTING THIN PORCELAIN TILES

7.1 FIXING ONTO INTERNAL SURFACES

The adhesive used for fixing thin porcelain tiles must be chosen carefully to ensure that it remains perfectly bonded over the years, to avoid deformation and to guarantee the highest level of reliability under all conditions (on internal and external walls and floors).

Below is a check-list of essential precautions which must be taken when designing the installation system and when actually installing the tiles.

1. Laying tiles with joints at least 2-3 mm wide, is extremely important for this type of tile in particular for the following reasons:

- reduces the impact of dimensional differences between the tiles;
- helps to reduce the modulus of elasticity and, therefore, the rigidity of the tiled surface. When fixing tiles butted up against each other, the tiled finish is more or less comparable to a continuous slab and is as rigid as a single tile. If tiles are laid with a small joint instead, the modulus of elasticity of the tiled surface is reduced since the modulus of elasticity of the grout is much lower than that of porcelain. As a result, grouted joints help a surface follow the different movements between the substrate and the tiled finish due to settling of the structure, hygrometric shrinkage, thermal expansion, etc., thus helping avoid stresses and, potential detachment of the tiles.

2. Create movement joints: apart from following the exact pattern of the structural joints, perimeter deformation and movement joints must be created every 25 m².

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3. The adhesive must be applied with a notched trowel using the back-buttering technique, that is, the adhesive must be applied on both the back of the tile and on the substrate, to guarantee that the tile received 100% average. Double spreading is necessary and essential to avoid leaving voids on the back of the tile.

4. Choosing the right adhesive: choosing the right adhesive is fundamental in guaranteeing the soundness and reliability of tiled surfaces over the years. This is why it is important to determine at the offset exactly which type of thin porcelain tiles are to be installed (with or without reinforcement mesh), the dimensions of the tiles, the substrate on which they are to be installed, their final use, etc.

We must also take into consideration that the material's negligible absorbency rate, and that reinforcement mesh may also be used, imposes the use of moderately deformable class C2 adhesive according to EN 12004 standards, or sometimes class S1 deformable adhesive when installing medium format tiles. When large tiles are installed we strongly recommend using two-component, high-flexibility class S2 adhesive according to EN 12004.



Fig. 7.4 - Fixing to walls: spreading the adhesive with a N° 6 notched trowel



Fig. 7.5 - Fixing to walls: applying the adhesive on the back of a tile



Fig. 7.6 - Fixing to walls: positioning a tile



Fig. 7.7 - An example of laying thin porcelain tiles on an internal floor



Fig. 7.8 - An example of laying thin porcelain tiles on an internal floor



Fig. 7.9 - An example of laying thin porcelain tiles on a heated screed

7.1.1 INSTALLING TILES WITHOUT GLASS FIBRE REINFORCEMENT MESH ON INTERNAL FLOORS AND WALLS

All types of thin porcelain tiles (without glass fibre mesh) may be installed on the following types of internal substrate, designed to withstand light residential and commercial foot traffic, once they have been prepared as specified in section 5, above: cementitious screeds, anhydrite screeds with a moisture content of < 0.5% in weight (after applying a coat of **PRIMER G**), existing flooring and high-performance screeds such as those made using **TOPCEM**, **TOPCEM PRONTO**, **MAPECEM** and **MAPECEM PRONTO**.

Thin porcelain tiles (without reinforcement mesh) may also be installed on internal walls over cementitious render, gypsum-based render (after applying a coat of **PRIMER G**), plasterboard, cement-fibre panels and old ceramic or stone.

The following adhesives are recommended for this type of application:

RECOMMENDED ADHESIVES				
Tiles WITHOUT glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	ULTRALITE FLEX ⁽¹⁾	C2TE	KERAQUICK S1	C2FTS1
	KERAFLEX ⁽¹⁾	C2TE		
> 5000 cm ²	ULTRALITE S1 ⁽²⁾	C2TES1	ULTRALITE S1 QUICK	C2FTS1
	KERAFLEX MAXI S1 ⁽²⁾	C2TES1	GRANIRAPID	C2FS1

⁽¹⁾ On plasterboard or cement-fibre walls use Ultralite S1 or Keraflex Maxi S1

⁽²⁾ On plasterboard or cement-fibre walls use Ultralite S2 or Kerabond+Isolastic

7.1.2 INSTALLING TILES WITH GLASS FIBRE REINFORCEMENT MESH ON INTERNAL FLOORS AND WALLS

Similarly to section 7.1.1, when installing thin porcelain tiles with glass fibre reinforcement mesh on internal floors and walls, we recommend using the following adhesives:

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RECOMMENDED ADHESIVES				
Tiles WITH glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	KERAFLEX MAXI S1	C2TES1	GRANIRAPID	C2FS1
	ULTRALITE S1	C2TES1	ULTRALITE S1 QUICK	C2FES1
> 5000 cm ²	KERABOND + ISOLASTIC	C2ES2	ELASTORAPID	C2FTES2
	ULTRALITE S2	C2ES2	ULTRALITE S2 QUICK	C2FES2



Fig. 7.10 - An example of installing thin porcelain tiles on wall or floor internal

7.1.3. INSTALLING TILES ON INTERNAL HEATED FLOORS

Tiles may be installed on screeds with heating elements using the following MAPEI products, but only after running and testing the heating system:

RECOMMENDED ADHESIVES				
Tiles WITH and WITHOUT glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	KERABOND + ISOLASTIC	C2ES2	ELASTORAPID	C2FTES2
			ULTRALITE S1 QUICK	C2FES1
> 5000 cm ²	ULTRALITE S2	C2ES2	KERAQUICK S1 + LATEX PLUS	C2FES2
			ULTRALITE S2 QUICK	C2FES2



Fig. 7.11 - An example of laying thin porcelain tiles on internal wall or floor

7.2 FIXING TO EXTERNAL WALLS

General rules

The fixing of thin porcelain tiles on façades, as with conventional thickness clinker and porcelain tiles, needs to be evaluated correctly before starting. General rules: here are some of the fundamental rules that must be followed:

1. the adhesive chosen must be an improved class (C2), deformable (S1) or highly deformable (S2) type according to EN 12004;



Fig. 7.12 - An example of installing thin porcelain tiles on an external



Fig. 7.13 - An example of laying thin porcelain tiles on an external

2. the **back-buttering** technique must be used; the adhesive must be applied with a notched trowel on both the back of the tile and on the substrate, to guarantee that the tile is buttered 100% average. The back-buttering technique is necessary and essential to avoid problems caused by voids on the back of the tiles and the collection of rainwater which, in freezing weather, could create stresses and debonding of the tiles. Back-buttering is also necessary so that stresses, caused by different movements in the substrate and the tiled finish due to temperature change for example, are distributed evenly and over a larger area;

3. the tiles must be tamped down in position using a rubber trowel to eliminate air pockets between the back of the tiles and the substrate. This precaution will avoid the formation of stresses caused by water vapour during temperature variations;

4. particularly in hot climates and during inclement weather (such as strong winds), we recommend using class “E” adhesives (with a extended open time) according to EN 12004. Install tiles within the given open time of the adhesive to guarantee perfect transfer of the adhesive onto the back of the tiles;

5. when fixing during the winter or in cold climates, it is recommended to use quick-setting class “F” adhesives according to EN 12004 as these adhesives cure and reach a high bond strength within a few hours after application, thus avoiding subzero temperatures during the night cause the mixing water to freeze;

6. the tiles must be laid with a large joint between them. The width of the joint must be determined according to local climate conditions, the size of the tiles and the flexibility of the substrate. Most international standards state that laying tiles without a joint is unacceptable. Joints are particularly important when laying large tiles to help hide variations in flatness. The joints are sealed with ready-to-use cementitious, epoxy or polymer products which have lower elasto-mechanical

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characteristics than the tiles. Therefore, when deformation occurs in the substrate or in thin porcelain tiles (e.g due to high temperature variations), the joints avoid high stresses being transmitted to the adhesive and from causing debonding of the tiles;

7. flexible fraction joints around 1 cm wide must be included in line with corners and string-courses, and the surface must always be divided into bays of a maximum of 9-12 m²;

8. structural joints to the building must be followed.



Fig. 7.14 - An example of fixing thin porcelain tiles on a waterproofing system

7.2.1. MAPEI ADHESIVES FOR INSTALLING TILES ON FAÇADES WITHOUT GLASS FIBRE REINFORCEMENT MESH

RECOMMENDED ADHESIVES				
Tiles WITHOUT glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	KERAFLEX MAXI S1	C2TES1	ELASTORAPID	C2FTES2
	ULTRALITE S1	C2TES1	ULTRALITE S1 QUICK	C2FTS1
> 5000 cm ²	KERABOND + ISOLASTIC	C2ES2	KERAQUICK S1 + LATEX PLUS	C2FTS2
	ULTRALITE S2	C2ES2	ULTRALITE S2 QUICK	C2FES2



Fig. 7.15 - An example of fixing thin porcelain tiles on a waterproofing system

7.2.2 MAPEI ADHESIVES FOR INSTALLING TILES ON FAÇADES WITH GLASS FIBRE REINFORCEMENT MESH

RECOMMENDED ADHESIVES				
Tiles WITH glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	KERABOND + ISOLASTIC	C2ES2	ELASTORAPID	C2FTES2
	ULTRALITE S2	C2ES2	ULTRALITE S2 QUICK	C2FES2
> 5000 cm ²	KERALASTIC T	R2T	KERAQUICK S1 + LATEX PLUS	C2FTS2



Fig. 7.16- An example of fixing thin porcelain tiles on a waterproofing system



Fig. 7.17 - An example of fixing thin porcelain tiles on a marine plywood substrate



Fig. 7.18 - An example of fixing thin porcelain tiles on a wooden substrate



Fig. 7.19 - An example of laying thin porcelain tiles on a metal staircase

7.3 FIXING TO SPECIAL SUBSTRATES

7.3.1 MAPEI ADHESIVES FOR INSTALLING TILES ON INTERNAL WATERPROOFING SYSTEMS WITHOUT GLASS FIBRE REINFORCEMENT MESH

To install thin porcelain tiles without glass fibre reinforcement mesh on surfaces waterproofed with the products specified in section 6, MAPEI recommends the following adhesives:

RECOMMENDED ADHESIVES				
Tiles WITHOUT glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	ULTRALITE FLEX	C2TE	KERAQUICK S1	C2FTS1
	KERAFLEX	C2TE		
> 5000 cm ²	ULTRALITE S1	C2TES1	ULTRALITE S1 QUICK	C2FTS1
	KERAFLEX MAXI S1	C2TES1	GRANIRAPID	C2FS1

7.3.2. MAPEI ADHESIVES FOR INSTALLING TILES ON INTERNAL WATERPROOFING SYSTEMS WITH GLASS FIBRE REINFORCEMENT MESH

To install thin porcelain tiles with glass fibre reinforcement mesh on surfaces waterproofed with the products specified in section 6, on the other hand, MAPEI recommends the following adhesives:

RECOMMENDED ADHESIVES				
Tiles WITH glass fibre reinforcement mesh				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	KERAFLEX MAXI S1	C2TES1	ELASTORAPID	C2FTES2
	ULTRALITE S1	C2TES1	ULTRALITE S1 QUICK	C2FTS1
> 5000 cm ²	KERABOND + ISOLASTIC	C2ES2	KERAQUICK S1 + LATEX PLUS	C2FTS2
	ULTRALITE S2	C2ES2	ULTRALITE S2 QUICK	C2FES2

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7.3.3. MAPEI ADHESIVES FOR INSTALLING TILES ON WORKTOPS, WOODEN FURNISHINGS AND FITTINGS, MARINE PLYWOOD AND METAL

The most appropriate installation system to use must be evaluated and chosen according to the type of substrate, the stability of the substrate and the conditions in which it will be used.

For the aforementioned stable substrates, which must be securely fixed and not subject to deformations, MAPEI recommends the following products:

RECOMMENDED ADHESIVES				
SIZE OF TILE	NORMAL SETTING		RAPID SETTING	
	ADHESIVE	CLASS ACCORDING TO EN 12004	ADHESIVE	CLASS ACCORDING TO EN 12004
< 5000 cm ² (the longest side must be no more than 100 cm)	KERALASTIC	R2	KERAQUICK S1 + LATEX PLUS	C2FTS2
> 5000 cm ²	KERALASTIC T	R2T		

7.4 EXPANSION AND MOVEMENT JOINTS

When fixing thin porcelain tiles, centre over all existing expansion joints to the substrate and on the walls.

Create 1 cm movement joints on particularly large surfaces dividing the surface as follows:

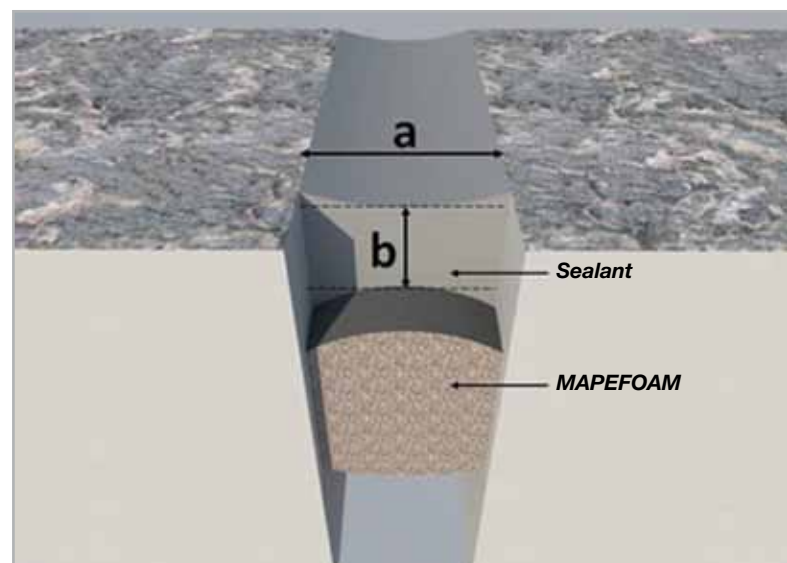
- a) on substrates subject to movement or flexing, form bays approximately 9-12 m²;
- b) on stable surfaces the joints may be formed approximately every 16-25 m²;
- c) fix the tiles leaving a gap of approximately 5 mm between walls, columns, sharp corners, etc.

Use **MAPESIL AC** to fill movement joints on internal walls and floors, while for external applications use **MAPESIL LM** for walls and **MAPESIL AC** for floors.

For particular mechanical strength requirements, **MAPEFLEX PU20**, **MAPEFLEX PU21**, **MAPEFLEX PU45** and **MAPEFLEX PU50 SL** must be used.

The sealant will only function correctly in terms of water-tightness and duration if the joints are the correct size. As a general rule, sealing must be carried out according to the recommendations in the table below:

a - width of joint	b - depth of joint
from 0 to 4 [mm]	make a wider joint
from 5 to 9 [mm]	$b = a$
from 10 to 20 [mm]	$b = 10$ [mm]
from 21 to 40 [mm]	$b = a/2$ [mm]
more than 40 [mm]	make a narrower joint



To calibrate the depth of the sealant (according to the indications in the table above) and prevent it adhering to the bottom of the joint, insert **MAPEFOAM** closed-cell polyethylene cord in the joint by pressing it down lightly with a specially shaped trowel or wooden slat.

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7.5 GROUTING

Before grouting the joints between each tile wait as follows:

- 2-3 hours if a quick setting adhesive has been used;
- 24 hours if a normal-setting or reactive resin adhesive has been used (such as **KERALASTIC**).

The joints may be grouted with the following products:

- **KERACOLOR FF**, pre-blended, high-performance, polymer-modified cementitious grout with water-repellent **DropEffect**[®] technology for (grouting) joints up to 6 mm wide, class CG2WA according to EN 13888 and certified by GEV Institut as EMICODE EC1 R Plus (very low emission of volatile organic compounds).
- **KERACOLOR GG**, pre-blended, high-performance, polymer-modified cementitious grout for joints from 4 to 15 mm wide, class CG2WA according to EN 13888 and certified by GEV Institut as EMICODE EC1 R Plus (very low emission of volatile organic compounds).
- **FUGOLASTIC**, liquid polymer admixture for **KERACOLOR FF**, **KERACOLOR GG** and **KERACOLOR SF**.
- **ULTRACOLOR PLUS**, special high-performance, anti-efflorescence, quick-setting and drying polymer-modified grout with water-repellent **DropEffect**[®] and mould-resistant **Bioblock**[®] technology for grouting joints from 2 to 20 mm wide, class CG2WA according to EN 13888 and certified by GEV Institut as EMICODE EC1 Plus (very low emission of volatile organic compounds).

When grouting joints wider than 2 mm, it is essential that **FUGOLASTIC** is added to **KERACOLOR FF** (without diluting it with water).

For grouting façade walls, we recommend using **FLEXCOLOR** ready-to use polymeric grout, with water-repellent **DropEffect**[®] and mould-



Fig. 7.20 - Grouting the joints with ULTRACOLOR PLUS



Fig. 7.21 - Cleaning with Scotch-Brite[®]



Fig. 7.22 - Finishing the grouted joints with a sponge



Fig. 7.23 - Grouting the tile joints on a wall with FLEXCOLOR



Fig. 7.24 - Cleaning with Scotch-Brite®



Fig. 7.25 - Finishing of the grouted joints with a sponge

resistant **Bioblock**® technology for grouting joints from 2 to 10 mm wide as an alternative of the products mentioned above. As mentioned previously, the use of these products allows the bay size to be increased and eliminate flexible expansion joints (on smaller façades). In such cases, contact the MAPEI Technical Services Department for information.

When high strength and high chemical resistance combined with a decorative, attractive finish are required the following epoxy grouts may be used:

- **KERAPOXY**, two-component, acid resistant epoxy mortar available in 23 different colours for joints at least 3 mm wide, class RG according to EN 13888, certified by GEV Institute as EMICODE EC1 R Plus (very low emission of volatile organic compounds).
- **KERAPOXY DESIGN**, two-component, acid resistant, decorative epoxy mortar available in 25 different colours (for joints), class RG according to EN 13888, certified by GEV Institute as EMICODE EC1 R Plus (very low emission of volatile organic compounds).

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8. MAPEI TECHNICAL SPECIFICATIONS FOR THE INSTALLATION OF THIN PORCELAIN TILES

8.1 INSTALLATION OF INTERNAL FLOORING

8.1.1 INSTALLATION WITH NORMAL-SETTING ADHESIVE ON CEMENTITIOUS SCREEDS, ANHYDRITE SCREEDS (AFTER PRIMING) AND CONCRETE OR OVERLAYING EXISTING FLOORING

- Supply and installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats up to 5,000 cm² on cementitious screeds, anhydrite screeds with residual humidity lower than 0.5% after applying primer diluted 1:1 in water, (such as **PRIMER G** produced by MAPEI S.p.A.), concrete substrates and existing ceramic, terrazzo or stone flooring with the following adhesives:

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

- Supply and installation of thin porcelain tiles up to 5,000 cm² (without glass fibre reinforcement mesh) on cementitious screeds, anhydrite screeds with a residual moisture content lower than 0.5% (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by





MAPEI S.p.A.), concrete substrates or existing ceramic, terrazzo or stone flooring using the following adhesives:

1. high-performance, slightly deformable cementitious adhesive with no vertical slip, extended open time and very low emission of volatile organic compounds, class C2TE according to EN 12004 standards (such as **KERAFLEX** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, slightly deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE according to EN 12004 standards (such as **ULTRALITE FLEX** produced by MAPEI S.p.A.).

- **Supply and installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats larger than 5,000 cm²** on cementitious screeds, anhydrite screeds with residual humidity lower than 0.5% after applying primer diluted 1:1 in water (such as **PRIMER G** produced by MAPEI S.p.A.), concrete substrates and existing ceramic, terrazzo or stone flooring with the following adhesives:

1. high-performance, highly-deformable, cementitious adhesive with extended open time, class C2E S2 according to EN 12004 standards (such as **KERABOND + ISOLASTIC** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high back-buttering capacity, class C2E S2 according to EN 12004 standards (such as **ULTRALITE S2** produced by MAPEI S.p.A.).

- **Supply and installation of thin porcelain tiles larger than 5,000 cm² (without glass fibre reinforcement mesh)** on cementitious screeds, anhydrite screeds with a residual moisture content lower than 0.5% (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by



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MAPEI S.p.A.), concrete substrates or existing ceramic, terrazzo or stone flooring using the following adhesives:

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);
2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting.

8.1.2 INSTALLATION WITH RAPID-SETTING ADHESIVE ON CEMENTITIOUS SCREEDS, ANHYDRITE SCREEDS (AFTER APPLYING PRIMER) AND CONCRETE OR OVERLAYING EXISTING FLOORING

- Supply and rapid installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats up to 5,000 cm² on cementitious screeds, anhydrite screeds with residual humidity lower than 0.5% after applying primer diluted 1:1 in water (such as **PRIMER G** produced by MAPEI S.p.A.), concrete substrates and existing ceramic, terrazzo or stone flooring with the following adhesives:

1. two-component, high-performance, rapid-setting and hydrating, deformable cementitious adhesive with very low emission of volatile organic compounds, class C2F S1 according to EN 12004 standards (such as **GRANIRAPID** produced by MAPEI S.p.A.);





2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).

- **Supply and rapid installation of thin porcelain tiles up to 5,000 cm² (without glass fibre reinforcement mesh)** on cementitious screeds, anhydrite screeds with a residual moisture content lower than 0.5% (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by MAPEI S.p.A.), concrete substrates or existing ceramic, terrazzo or stone flooring using the following adhesive:

1. high-performance, rapid-setting, deformable cementitious adhesive with no vertical slip and very low emission of volatile organic compounds, class C2FT S1 according to EN 12004 standards (such as **KERAQUICK S1** produced by MAPEI S.p.A.).

- **Supply and rapid installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats larger than 5,000 cm²** on cementitious screeds, anhydrite screeds with residual humidity lower than 0.5% after applying primer diluted 1:1 in water (such as **PRIMER G** produced by MAPEI S.p.A.), concrete substrates and existing ceramic, terrazzo or stone flooring with the following adhesives:

1. two-component, high-performance, highly-deformable, hydrating and rapid-setting cementitious adhesive with extended open time and no vertical slip, class C2FTE S2 according to EN 12004 standards (such as **ELASTORAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high wetting

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capacity, class C2FE S2 according to EN 12004 standards (such as **ULTRALITE S2 QUICK** produced by MAPEI S.p.A.).

- **Supply and rapid installation of thin porcelain tiles larger than 5,000 cm² (without glass fibre reinforcement mesh)** on cementitious screeds, anhydrite screeds with a residual moisture content lower than 0.5% (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by MAPEI S.p.A.), concrete substrates or existing ceramic, terrazzo or stone flooring using the following adhesives:

1. two-component, high-performance, rapid-setting and hydrating, deformable cementitious adhesive with very low emission of volatile organic compounds, class C2F S1 according to EN 12004 standards (such as **GRANIRAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable smoothing product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting.

8.1.3 INSTALLATION WITH NORMAL-SETTING ADHESIVE ON INTERNAL CEMENTITIOUS HEATED SCREEDS

- **Supply and installation of all formats of thin porcelain tiles (with or without glass fibre reinforcement mesh)** on heated screeds with the following adhesives:

1. high-performance, highly-deformable cementitious adhesive with extended open time, class C2E S2 according to EN 12004 standards (such as **KERABOND + ISOLASTIC** produced by MAPEI S.p.A.);





2. one-component, high-performance, lightweight, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high back-buttering capacity, class C2E S2 according to EN 12004 standards (such as **ULTRALITE S2** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting.

8.1.4 INSTALLATION WITH RAPID-SETTING ADHESIVE ON HEATED SCREEDS

- Supply and rapid installation of thin porcelain tiles (with or without glass fibre reinforcement mesh) in formats up to 5,000 cm² on heated screeds with the following adhesives:

1. two-component, high-performance, highly-deformable, rapid-setting cementitious adhesive with extended open time and no vertical slip, class C2FTE S2 according to EN 12004 standards (such as **ELASTORAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).

- Supply and rapid installation of thin porcelain tiles (with or without glass fibre reinforcement mesh) in formats larger than 5,000 cm² on heated screeds with the following adhesives:

1. two-component, high-performance, highly-deformable, rapid-setting cementitious adhesive with no vertical slip, class C2FT S2

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according to EN 12004 standards (such as **KERAQUICK S1 + LATEX PLUS** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high wetting capacity, class C2FE S2 according to EN 12004 standards (such as **ULTRALITE S2 QUICK** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting.

8.2 INSTALLATION OF INTERNAL WALL TILES

8.2.1 INSTALLATION WITH NORMAL-SETTING ADHESIVE ON CONCRETE, EXISTING CERAMIC, TERRAZZO, STONE MATERIAL, CEMENT OR GYPSUM-BASED RENDER (AFTER PRIMING), PLASTERBOARD OR CEMENT-FIBRE PANELS

- Supply and installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats up to 5,000 cm² on concrete, existing ceramic, terrazzo, stone material, cement or gypsum-based render after applying primer diluted 1:1 in water, (such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels with the following adhesives:

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);





2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

• **Supply and installation of thin porcelain tiles up to 5,000 cm² (without glass fibre reinforcement mesh)** on concrete, old ceramic, terrazzo, stone or cementitious or gypsum-based render (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by MAPEI S.p.A.) using the following adhesives:

1. high-performance, slightly deformable cementitious adhesive with no vertical slip, extended open time and very low emission of volatile organic compounds, class C2TE according to EN 12004 standards (such as **KERAFLEX** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, slightly deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE according to EN 12004 standards (such as **ULTRALITE FLEX** produced by MAPEI S.p.A.).

• **Supply and installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats larger than 5,000 cm²** on concrete, existing ceramic, terrazzo, stone backgrounds, cement or gypsum-based render after applying primer diluted 1:1 in water, (such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels with the following adhesives:

1. high-performance, highly-deformable cementitious adhesive with

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extended open time, class C2E S2 according to EN 12004 standards (such as **KERABOND + ISOLASTIC** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high back-buttering capacity, class C2E S2 according to EN 12004 standards (such as **ULTRALITE S2** produced by MAPEI S.p.A.).

• **Supply and installation of thin porcelain tiles larger than 5,000 cm² (without glass fibre reinforcement mesh) on concrete, old ceramic, terrazzo, stone, cementitious or gypsum-based render (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels using the following adhesives:**

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting.





8.2.2 INSTALLATION WITH RAPID-SETTING ADHESIVE ON CONCRETE, EXISTING CERAMIC, TERRAZZO, STONE MATERIAL, CEMENT OR GYPSUM-BASED RENDER (AFTER PRIMING), PLASTERBOARD OR CEMENT-FIBRE PANELS

- Supply and rapid installation of thin porcelain tiles (with glass fibre reinforcement mesh) in formats up to 5,000 cm² on concrete, existing ceramic, terrazzo, stone backgrounds, cement or gypsum-based render after applying primer diluted 1:1 in water, (such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels with the following adhesives:

1. two-component, high-performance, rapid-setting and hydrating, deformable cementitious adhesive with very low emission of volatile organic compounds, class C2F S1 according to EN 12004 standards (such as **GRANIRAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).

- Supply and rapid installation of thin porcelain tiles up to 5,000 cm² (without glass fibre reinforcement mesh) on concrete, old ceramic, terrazzo, stone, cementitious or gypsum-based render (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels using the following adhesive:

1. high-performance, rapid-setting, deformable cementitious adhesive with no vertical slip and very low emission of volatile organic compounds, class C2FT S1 according to EN 12004 standards (such as **KERAQUICK S1** produced by MAPEI S.p.A.).

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• **Supply and rapid installation of porcelain tiles (with glass fibre reinforcement mesh) in formats larger than 5,000 cm²** on concrete, existing ceramic, terrazzo, stone backgrounds, cement or gypsum-based render after applying primer diluted 1:1 in water, (such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels with the following adhesives:

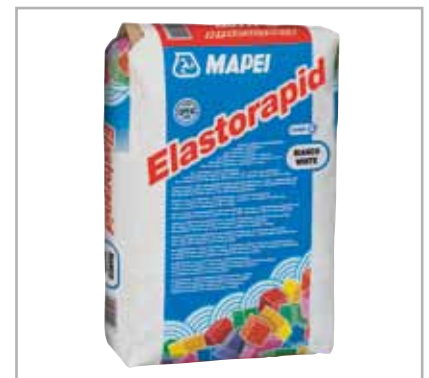
1. two-component, high-performance, highly-deformable, rapid-setting cementitious adhesive with extended open time and no vertical slip, class C2FTE S2 according to EN 12004 standards (such as **ELASTORAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high wetting capacity, class C2FE S2 according to EN 12004 standards (such as **ULTRALITE S2 QUICK** produced by MAPEI S.p.A.).

• **Supply and rapid installation of thin porcelain tiles larger than 5,000 cm² (without glass fibre reinforcement mesh)** on concrete, old ceramic, terrazzo, stone, cementitious or gypsum-based render (after applying primer diluted 1:1 with water, such as **PRIMER G** produced by MAPEI S.p.A.), plasterboard or cement-fibre panels using the following adhesives:

1. two-component, high-performance, rapid-setting and hydrating, deformable cementitious adhesive with very low emission of volatile organic compounds, class C2F S1 according to EN 12004 standards (such as **GRANIRAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).





8.3 INSTALLATION OF EXTERNAL WALL TILES

8.3.1 INSTALLATION OF THIN PORCELAIN TILES WITHOUT GLASS FIBRE REINFORCEMENT MESH WITH NORMAL-SETTING ADHESIVE ON CONCRETE OR CEMENT-BASED RENDER ON FAÇADES

- Supply and installation of tiles without glass fibre reinforcement mesh in formats up to 5,000 cm² on concrete or render (after verifying their mechanical strength) with the following adhesives:

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

- Supply and installation of tiles without glass fibre reinforcement mesh in formats larger than 5,000 cm² on concrete or render (after verifying their mechanical strength) with the following adhesives:

1. high-performance, highly-deformable cementitious adhesive with extended open time, class C2E S2 according to EN 12004 standards (such as **KERABOND + ISOLASTIC** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high back-buttering capacity, class C2E S2 according to EN 12004 standards (such as **ULTRALITE S2** produced by MAPEI S.p.A.).

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After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable MAPEI levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints (sealed) using an appropriate silicone sealant at a maximum of 12 m² intervals.

8.3.2 RAPID INSTALLATION OF THIN PORCELAIN TILES WITHOUT GLASS FIBRE REINFORCEMENT MESH WITH RAPID-SETTING ADHESIVE ON CONCRETE OR CEMENT-BASED RENDER ON FAÇADES

- Supply and rapid installation of tiles without glass fibre reinforcement mesh in formats up to 5,000 cm² on concrete or render (after verifying their mechanical strength) with the following adhesives:

1. two-component, high-performance, highly-deformable, rapid-setting and hydrating cementitious adhesive with extended open time and no vertical slip, class C2FTE S2 according to EN 12004 standards (such as **ELASTORAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).

- Supply and rapid installation of tiles without glass fibre reinforcement mesh in formats larger than 5,000 cm² on concrete or render (after verifying their strength) with the following adhesives:

1. two-component, high-performance, highly-deformable, with low emission of volatile organic compounds, rapid-setting cementitious adhesive with no vertical slip, class C2FT S2 according to EN 12004 standards (such as **KERAQUICK S1 + LATEX PLUS** produced by MAPEI S.p.A.);





2. one-component, high-performance, lightweight, rapid-setting and hydrating, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high wetting capacity, class C2FE S2 according to EN 12004 standards (such as **ULTRALITE S2 QUICK** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable MAPEI levelling product, install tiles using the double-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints sealed using an appropriate silicone sealant at a maximum of 12 m² intervals.

8.3.3 INSTALLATION OF THIN PORCELAIN TILES WITH GLASS FIBRE REINFORCEMENT MESH WITH NORMAL-SETTING ADHESIVE ON CONCRETE OR CEMENT-BASED RENDER

- Supply and installation of tiles with glass fibre reinforcement mesh in formats up to 5,000 cm² on concrete or render (after verifying their mechanical strength) with the following adhesives:

1. high-performance, highly-deformable cementitious adhesive with extended open time, class C2E S2 according to EN 12004 standards (such as **KERABOND + ISOLASTIC** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high back-buttering capacity, class C2E S2 according to EN 12004 standards (such as **ULTRALITE S2** produced by MAPEI S.p.A.).

- Supply and installation of tiles with glass fibre reinforcement mesh in formats larger than 5,000 cm² on concrete or render (after verifying their strength) with two-component, high-performance, polyurethane adhesive with no vertical slip, class R2T according to EN 12004 standards (such as **KERALASTIC T** produced by MAPEI S.p.A.).

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After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable MAPEI levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints (sealed) using an appropriate silicone sealant at a maximum of 12 m² intervals.

8.3.4 INSTALLATION OF THIN PORCELAIN TILES WITH GLASS FIBRE REINFORCEMENT MESH WITH RAPID-SETTING ADHESIVE ON CONCRETE OR CEMENT-BASED RENDER

- Supply and installation of tiles with glass fibre reinforcement mesh in formats up to 5,000 cm² on concrete or render (after verifying their mechanical strength) with the following adhesives:

1. two-component, high-performance, highly-deformable, rapid-setting and hydrating cementitious adhesive with extended open time and no vertical slip, class C2FTE S2 according to EN 12004 standards (such as **ELASTORAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high wetting capacity, class C2FE S2 according to EN 12004 standards (such as **ULTRALITE S2 QUICK** produced by MAPEI S.p.A.).

- Supply and installation of tiles with glass fibre reinforcement mesh in formats larger than 5,000 cm² on concrete or render (after verifying their mechanical strength) with the following adhesives:

1. two-component, high-performance, highly-deformable, with low emission of volatile organic compounds, rapid-setting cementitious adhesive with no vertical slip, class C2FT S2 according to EN 12004 standards (such as **KERAQUICK S1 + LATEX PLUS** produced by MAPEI S.p.A.);





After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable MAPEI levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints (sealed) using an appropriate silicone sealant at a maximum of 12 m² intervals.

8.4 SPECIAL INSTALLATION CASES

8.4.1 INSTALLATION OF THIN PORCELAIN TILES ON INTERNAL WATERPROOFING SYSTEMS (SUCH AS MAPELASTIC, MAPELASTIC AQUADEFENSE OR MAPEGUM WPS)

- Supply and installation of thin porcelain tiles (with glass reinforcement mesh) in formats up to 5000 cm² on waterproofing systems (such as **MAPELASTIC** or **MAPEGUM WPS** produced by MAPEI S.p.A.) with the following adhesives:

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

- Supply and installation of thin porcelain tiles up to 5,000 cm² (without glass fibre reinforcement mesh) on waterproofing systems (such as **MAPELASTIC** or **MAPEGUM WPS** produced by MAPEI S.p.A.) using the following adhesives:

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1. high-performance, slightly deformable cementitious adhesive with no vertical slip, extended open time and very low emission of volatile organic compounds, class C2TE according to EN 12004 standards (such as **KERAFLEX** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, slightly deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE according to EN 12004 standards (such as **ULTRALITE FLEX** produced by MAPEI S.p.A.).

• **Supply and installation of all types of tile (with glass reinforcement mesh) in formats larger than 5000 cm² on waterproofing systems (such as MAPELASTIC or MAPEGUM WPS produced by MAPEI S.p.A.) with the following adhesives:**

1. high-performance, highly-deformable, cementitious adhesive with extended open time, class C2E S2 according to EN 12004 standards (such as **KERABOND + ISOLASTIC** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high back-buttering capacity, class C2E S2 according to EN 12004 standards (such as **ULTRALITE S2** produced by MAPEI S.p.A.).

• **Supply and installation of thin porcelain tiles larger than 5,000 cm² (without glass fibre reinforcement mesh) on waterproofing systems (such as MAPELASTIC or MAPEGUM WPS produced by MAPEI S.p.A) using the following adhesives:**

1. high-performance, deformable cementitious adhesive with no vertical slip, extended open time, considerably lower dust emission during mixing and very low emission of volatile organic compounds,





class C2TE S1 according to EN 12004 standards (such as **KERAFLEX MAXI S1** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, deformable cementitious adhesive with no vertical slip, extended open time, very high yield, good trowelability, high wetting capacity, considerably lower dust emission during mixing and very low emission of volatile organic compounds, class C2TE S1 according to EN 12004 standards (such as **ULTRALITE S1** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling of the surface with a suitable MAPEI levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints (sealed) using an appropriate silicone sealant at a maximum of 12 m² intervals.

8.4.2 RAPID INSTALLATION OF THIN PORCELAIN TILES ON INTERNAL WATERPROOFING SYSTEMS (SUCH AS MAPELASTIC, MAPELASTIC AQUADEFENSE OR MAPEGUM WPS)

• Supply and rapid installation of thin porcelain tiles (with glass reinforcement mesh) in formats up to 5000 cm² on waterproofing systems (such as **MAPELASTIC** or **MAPEGUM WPS** produced by MAPEI S.p.A.) with the following adhesives:

1. two-component, high-performance, highly-deformable, rapid-setting and hydrating cementitious adhesive with extended open time and no vertical slip, class C2FTE S2 according to EN 12004 standards (such as **ELASTORAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).

SYSTEMS FOR INSTALLING THIN PORCELAIN TILES

- **Supply and rapid installation of thin porcelain tiles up to 5,000 cm² (without glass fibre reinforcement mesh) on waterproofing systems (such as *MAPELASTIC* or *MAPEGUM WPS* produced by MAPEI S.p.A) using the following adhesive:**

1. high-performance, rapid-setting, deformable cementitious adhesive with no vertical slip and very low emission of volatile organic compounds, class C2FT S1 according to EN 12004 standards (such as *KERAQUICK S1* produced by MAPEI S.p.A.).

- **Supply and rapid installation of thin porcelain tiles (with glass reinforcement mesh) in formats larger than 5000 cm² on waterproofing systems (such as *MAPELASTIC* or *MAPEGUM WPS* produced by MAPEI S.p.A.) with the following adhesives:**

1. two-component, high-performance, highly-deformable, with low emission of volatile organic compounds, rapid-setting cementitious adhesive with no vertical slip, class C2FT S2 according to EN 12004 standards (such as *KERAQUICK S1 + LATEX PLUS* produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, highly-deformable cementitious adhesive with extended open time, very high yield, good trowelability and high wetting capacity, class C2FE S2 according to EN 12004 standards (such as *ULTRALITE S2 QUICK* produced by MAPEI S.p.A.).

- **Supply and rapid installation of thin porcelain tiles (without glass reinforcement mesh) in formats larger than 5000 cm² on waterproofing systems (such as *MAPELASTIC* or *MAPEGUM WPS* produced by MAPEI S.p.A.) with the following adhesives:**

1. two-component, high-performance, rapid-setting and hydrating, deformable cementitious adhesive with very low emission of volatile





organic compounds, class C2F S1 according to EN 12004 standards (such as **GRANIRAPID** produced by MAPEI S.p.A.);

2. one-component, high-performance, lightweight, rapid-setting and hydrating, deformable cementitious adhesive with no vertical slip, very high yield, good trowelability and high wetting capacity, class C2FT S1 according to EN 12004 standards (such as **ULTRALITE S1 QUICK** produced by MAPEI S.p.A.).



Install tiles using the back-buttering technique with a gap at least 5 mm wide (variable according to format) between each tile for grouting, and form elastic movement joints (sealed) using an appropriate silicone sealant at a maximum of 12 m² intervals.



8.4.3 INSTALLATION ON METAL OR WOODEN SUBSTRATES

• **Supply and installation of all types of tile (with or without glass fibre reinforcement mesh)** on horizontal metal or wooden substrates, if firmly anchored, with the following adhesives:

1. two-component, high-performance, polyurethane adhesive, class R2 according to EN 12004 standards (such as **KERALASTIC** produced by MAPEI S.p.A.);

2. two-component, high-performance, polyurethane adhesive with no vertical slip, class R2T according to EN 12004 standards (such as **KERALASTIC T** produced by MAPEI S.p.A.).



After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable MAPEI levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints at a maximum of every 12 m² sealed using an appropriate silicone sealant.

SYSTEMS FOR INSTALLING THIN PORCELAIN TILES

8.4.4 RAPID INSTALLATION ON METAL OR WOODEN SUBSTRATES

- Supply and installation of all types of tile (with or without glass fibre reinforcement mesh) on horizontal metal or wooden substrates, if firmly anchored, with:

1. two-component, high-performance polyurethane adhesive, class C2FT S2 according to EN 12004 standards (such as **KERAQUICK S1 + LATEX PLUS** produced by MAPEI S.p.A.).

After checking the flatness of the substrate and, where necessary, levelling the surface with a suitable MAPEI levelling product, install tiles using the back-buttering technique with a suitable gap between each tile for grouting, and form elastic movement joints (sealed) using an appropriate silicone sealant at a maximum of every 12 m².

8.5 PRODUCTS FOR GROUTING JOINTS

8.5.1 CEMENTITIOUS GROUT

Joints between tiles may be grouted with cementitious grouting mortar with the following characteristics:

- high-performance, anti-efflorescence, rapid-setting and drying, water-repellent, anti-mould grout, class CG2WA according to EN 13888 standards (such as **ULTRACOLOR PLUS** produced by MAPEI S.p.A.), followed by a thorough cleaning of the surface with a suitable detergent, rinsing of the surface and the removal of excess water with suitable equipment, and any other operations necessary to complete work according to specifications;
- high-performance, polymer-modified, water-repellent grout with **DropEffect**[®] technology for grouting tile joints up to 6 mm wide, class CG2WA according to EN 13888 standards (such as **KERACOLOR FF** produced by MAPEI S.p.A.), followed by a thorough cleaning of the surface with suitable detergent, rinsing of the surface and removal of excess





water with suitable equipment, and any other operations necessary to complete work according to specifications;

- high-performance, polymer-modified grout for tile joints up to 15 mm wide, class CG2WA according to EN 13888 standards (such as **KERACOLOR GG** produced by MAPEI S.p.A.), followed by a thorough cleaning of the surface with suitable detergent, rinsing of the surface and removal of excess water with suitable equipment, and any other operations necessary to complete work according to specifications.

8.5.2 READY-TO-USE GROUT

Joints between tiles may be grouted with ready-to-use, polymer filler grout with water-repellent **DropEffect®** and mould resistant **BioBlock®** technology for joints from 2 mm to 10 mm wide in ceramic tiles (such as **FLEXCOLOR** produced by MAPEI S.p.A.), followed by a thorough cleaning of the surface with suitable detergent, rinsing of the surface and removal of excess water with suitable equipment, and any other operations necessary to complete work according to specifications.

8.5.3 EPOXY GROUT

Joints between tiles may be grouted with:

- two-component, easy-application, easy-clean, anti-acid, epoxy grout for tile joints, class RG according to EN 13888 standards (such as **KERAPOXY CQ** produced by MAPEI S.p.A.), followed by a thorough cleaning of the surface with suitable detergent, rinsing of the surface and elimination of excess water with suitable equipment, and any other operations necessary to complete work according to specifications;
- two-component, anti-acid, epoxy grout, class RG according to UNi EN 13888 standards (such as **KERAPOXY** produced by MAPEI S.p.A.), followed by a thorough cleaning of the surface with suitable detergent, rinsing of the surface and elimination of excess water with suitable equipment, and any other operations necessary to complete work according to specifications.

Technical Notebook

SYSTEMS FOR INSTALLING

THIN PORCELAIN TILES

HEADQUARTERS

MAPEI SpA

Via Cafiero, 22 - 20158 Milan

Tel. +39-02-37673.1

Fax +39-02-37673.214

Internet: www.MAPEI.com

E-mail: MAPEI@MAPEI.it