



MADONNA DELLA GUARDIA SANCTUARY - Tortona - Italy
Products used: PRIMER G, ULTRAPLAN, ULTRAPLAN MAXI,
MAPETEX SYSTEM, KERAQUICK+LATEX PLUS,
MARMOCOLOR, MAPESIL AC



Tools



Trowels for levelling compounds



American.
Extralong.

Trowels for adhesives



Notched metal trowel n. 3.
Notched metal trowel n. 4.
Notched metal trowel n. 5.
Notched trowel with wooden handle n. 5.
Notched trowel with wooden handle n. 6.
Notched trowel with wooden handle n. 10.
Trowel with wooden handle for **Kerafloor**.
Extralong notched metal trowel n. 5.
Extralong notched metal trowel n. 6.
Extralong notched metal trowel n. 10.
Metal trowel for **Adesilex P4**.

Gun for soft cartridges



Gun for 600 ml soft-cartridges.

Gun for sealants

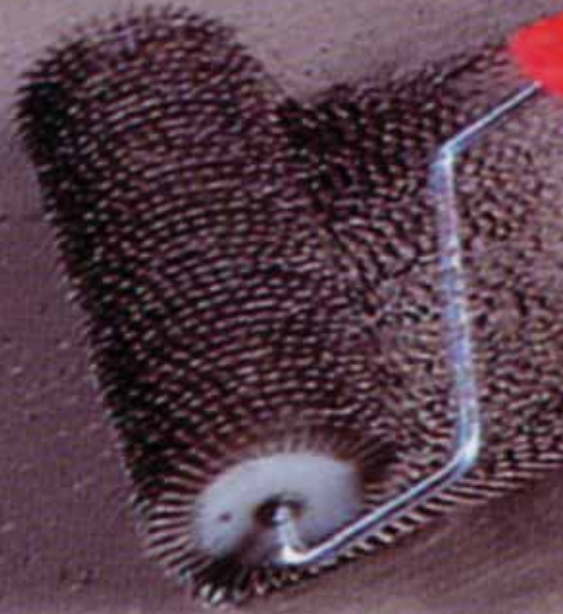


Gun for 310 ml cartridges.

Grouting tools



Rubber float for grouting joints.
Special sponge for cleaning grouts.



Carbide hygrometer



Chemical instrument for measuring the humidity in the substrates. The water reacts with the calcium carbide in the hygrometer and forms acetylene that increases the pressure. The water content is determined by the pressure on the manometer. The hygrometer comes in a plastic suitcase containing:

- a steel container with a stopper and a manometer;
 - 20 glass phials containing calcium carbide;
 - 2 aluminium marbles;
 - 1 scale with support, scale pan and 20 g and 10 g weights;
 - 1 syringe;
 - 1 spoon and 1 steel plate.
- Boxes with 20 glass phials containing calcium carbide are available.

Electronic hygrometer



Electronic instrument that rapidly indicates the % of humidity contained in cement based screeds (A scale), Mapecem based screeds (B scale), and anhydrite based screeds (C scale).

The hygrometer is powered by 9 V batteries and comes in a case containing:

- a cable with a uniaxial connector and connecting terminals with the electrodes that are driven into the screed;
- two steel nails that are used as electrodes;
- an instruction leaflet.

Spiked roller



Plastic roller with handle (23 cm width, 8 cm diameter). To be used to improve the application of levelling compounds in thicknesses from 2 to 15 mm, to eliminate air bubbles and to improve the surface appearance of the MAPEI self-levelling compounds

Mapei solutions for the construction of swimming pools

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Mapei can boast over ten years of experience throughout the world both in the construction of new pools and in the restoration of existing ones. In fact, since the '50s on, Mapei products have been used for almost all the Olympic Game pools and for important international sports meetings, with large use made in structures for receiving and hosting athletes and visitors.

Mapei is therefore able to offer in this sector a complete range of products: products for the construction and waterproofing of reinforced concrete structures; special adhesives for the installation of ceramic tiles and glass mosaic; grouts for joints and sealants for expansion joints.

All specifications for the construction of new long-lasting pools and restoration of existing ones follow hereunder.

1) CONCRETE PREPARATION

In order to obtain a watertight concrete basin it is necessary that the cement mixture has the following characteristics:

- *Rck* 37 N/mm²
- Consistency class: S4/S5 (compliant with EN 206.1)
- Waterproofing compliant with EN 206.1
- Durability: in compliance with EN 206.1 (exposure class XD2*)
- Concrete cover thickness: no less than 3 cm

The concrete must be admixed with superplasticisers belonging to **Mapecfluid** line (from MAPEI) or with acrylic-based hyperplasticisers belonging to **Dynamon** line (from MAPEI) in compliance with EN 934-2 standard; the type must be selected on the basis of temperature and job-site conditions.

- *Wet curing*: for at least 7 days

* For pools containing seawater the XS2 exposure class requires a minimum *Rck* of 45 N/mm² for concrete.

2) TREATMENT OF CONSTRUCTION JOINTS BETWEEN FOUNDATION AND WALLS

Waterproof the construction joints between concrete foundation and walls by applying **Idrostop** (bentonite-free hydrophilic rubber profile) fixed by bonding with **Adesilex T Super** or by nailing. For concrete walls with thickness greater than 30 cm two parallel strips are required.

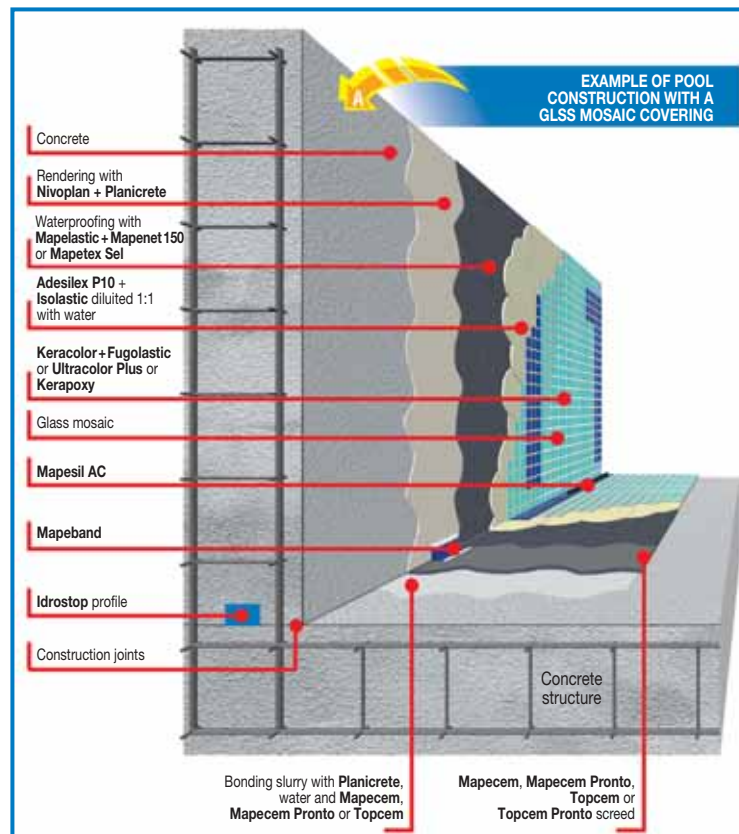
The material must have the following characteristics:

- Dimensions: 20x10 mm or 20x15 mm
- Water swelling: 45% (after 24 hours)
70% (after 2 days)
120% (after 7 days)

3) LEVELLING THE WALLS

Remove from the concrete surface any cement laitance, form release agent residues, powder or grease that may hinder the adhesion. Level the surfaces by applying **Nivoplan** mixed with **Planicrete**, diluted 1:4 with water. The mortar must have the following performance characteristics:

- Workability time: 2-3 hours
- Applicable thickness per layer: 2-30 mm
- Flexural strength: 3.5 N/mm²
- Compressive strength: 6.0 N/mm²

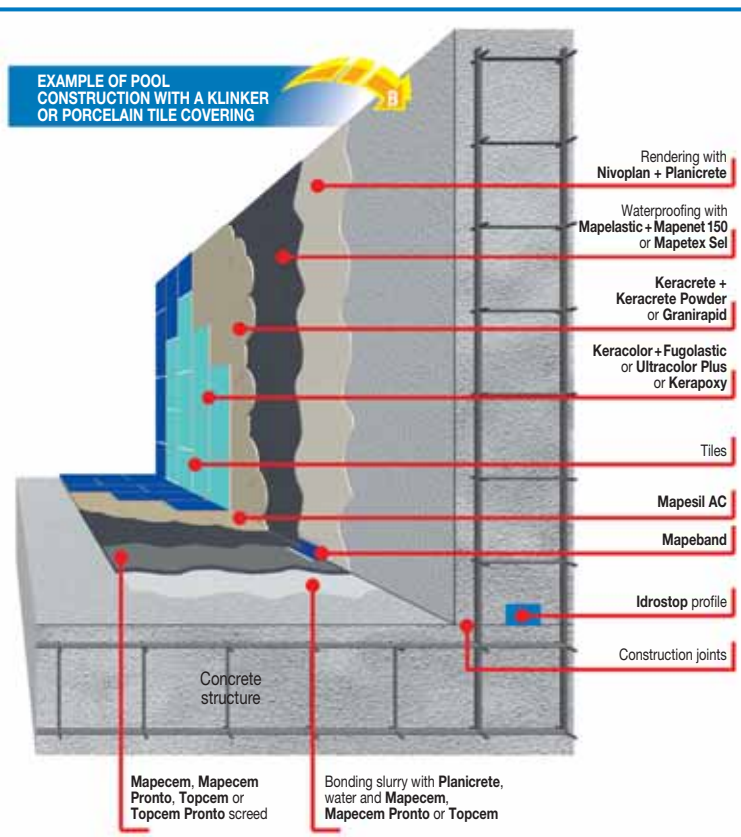


4) LEVELLING THE FLOOR

Remove from the surface cement laitance, loose particles and every traces of powder or grease. Therefore level the substrate by applying screeds made with **Topcem**, **Topcem Pronto**, **Mapecem**, **Mapecem Pronto** binders.

In any case, a perfect adhesion requires a preventive application of a bonding slurry obtained by mixing **Planicrete** with the same binder used to prepare the mortar. The most suitable product type for the screed must be chosen depending on the time in which the pool must be ready for use, considering that the screed is ready for tile application after 24 hours if **Topcem** or **Topcem Pronto** are used, after 3-4 hours if **Mapecem** or **Mapecem Pronto** are used.

- The screed must have the following performance characteristics:
- Compressive strength: 25 N/mm²
 - Waterproofing or installation of ceramic tiles: after only 24 hours



5) WATERPROOFING (OPTIONAL)

Generally, this operation is not necessary if the concrete is prepared, cast and cured correctly according to the above mentioned instructions. In any case, if this operation is necessary, it must be done by applying with a trowel two coats of **Mapelastic** reinforced with **Mapenet 150** resistant to alkali, with mesh size of 4.5 x 5 mm, or **Mapetex Sel** up to a final thickness of at least 2 mm. All the corners must be waterproofed with **Mapeband**.

The material must have the following performances:

- Adhesion to concrete: 0.8 N/mm²
- Waterproofing: up to 3 atm for positive pressure and 1 atm for negative pressure (DIN 1048)
- Resistance to freeze/thaw cycles: greater than 300 cycles (UNI 7087)
- Ultimate elongation (DIN 53504) after 28 days at +23°C and 50% R.H.: 18%

6a) TILE INSTALLATION

Klinker or porcelain tile installation must be carried out with **Keracrete** adhesive mixed with **Keracrete Powder** belonging to class C2T in compliance with EN 12004. The adhesive must have the following performances at a temperature of +23°C:

- Open time: 10-15'
- Adjustability time: 30'
- Joint grouting: after 24 hours
- Basin ready for use: after 3 weeks

6b) GLASS MOSAIC INSTALLATION

The installation of glass mosaic must be done with **Adesilex P10**, an adhesive belonging to C2TE class, mixed with **Isolastic** (elastic latex) diluted 1:1 with water. The adhesive must have the following performances at a temperature of +23°C:

- Open time: 30'
- Adjustability time: 60'
- Joint grouting: after 24 hours
- Basin ready for use: after 3 weeks

7) RAPID INSTALLATION

The rapid installation of klinker or porcelain tiles, or glass mosaic must be done with **Granirapid** or **Elastorapid**, adhesives belonging to C2F/S1 class (in compliance with EN 12004).

The adhesive must have the following performances at a temperature of +23°C:

- Open time: ~20'
- Adjustability time: 45'
- Joint grouting: after 3-4 hours
- Basin ready for use: 3 days

8) JOINT GROUTING

Fill joints by applying **Keracolor** mixed with **Fugolastic** or **Ultracolor Plus** (ready-mix cementitious grouts) belonging to CG2 class, in compliance with EN 13888. Furthermore **Ultracolor Plus** allows to fill the basin 48 hours after its application. As an alternative, if the basin contains seawater or thermal water, the grouting has to be carried out with **Kerapoxy**, **Kerapoxy Design** and **Kerapoxy CQ** (acid resistant epoxy grout), belonging to RG class (in compliance with EN 13888).

9) EXPANSION JOINT SEALING

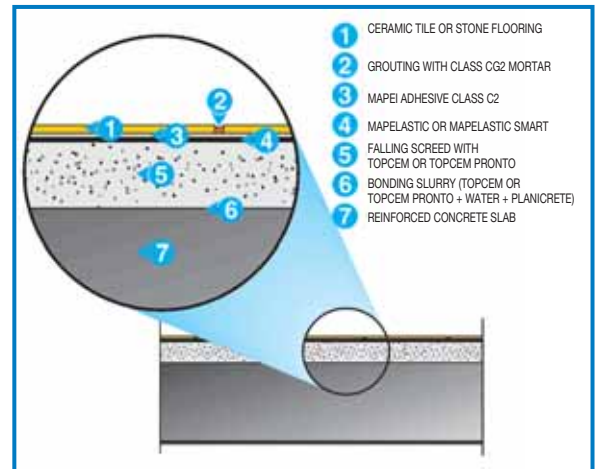
Expansion joint sealing must be done in all the corners of the coverings and in the changes of slope of the floor. They must be positioned every 3x3 m, and must be done with **Mapesil AC** (one-component acetic-based silicone sealant), after applying **Primer FD** in the edges.

The sealant must have the same colour of the grout and must have the following performances:

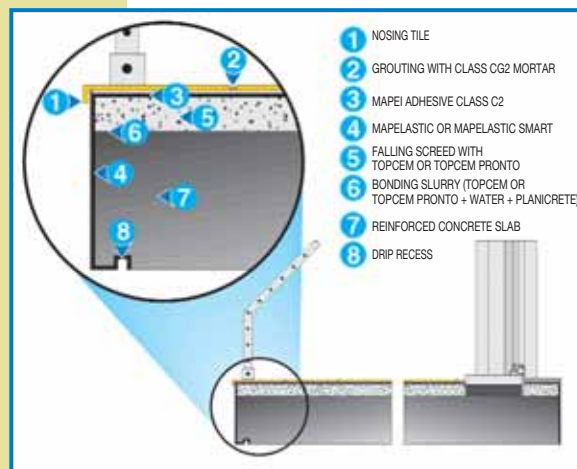
- Ultimate elongation: 800% (DIN 53504 S3A)
- Hardness: 20 (Shore A - DIN 53 505)
- Maximum movement in service: 20%
- Time required for skin formation: 10 minutes
- Cross linking speed: 4 mm in 1 day, 10 mm in 7 days

Mapei solutions for waterproofing terraces and balconies

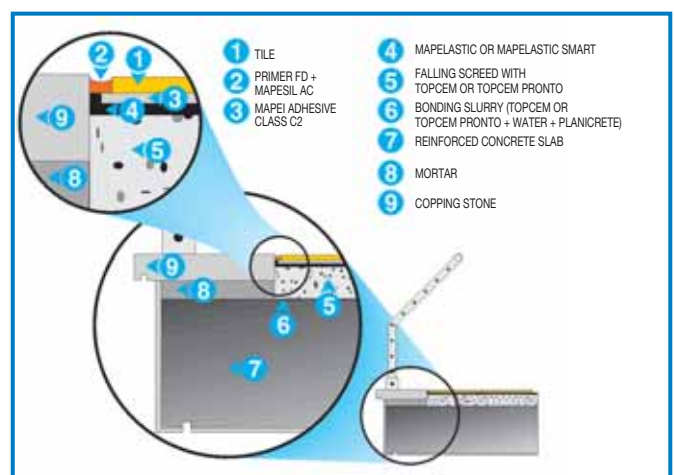
Waterproofing terraces and balconies is necessary in order to avoid the risk of water seepages, to prevent the deterioration of construction materials, improve comfort in living spaces and lower maintenance costs. Mapei developed a waterproofing system for terraces and balconies in new and existing building that even under severe conditions guarantees complete watertightness, excellent deformability (essential for structures subjected to vibrations and/or structural movement) and durability. The solution guaranteed by Mapei for the waterproofing of terraces and balconies is the use of **Mapelastic** or **Mapelastic Smart**, two-component flexible cementitious mortars, that thanks to their high quality polymer content, have excellent adhesion on concrete and existing terrazzo and ceramic tiles. Once hardened, it creates a flexible watertight membrane against the chemical aggression of deicing salts, sulphates, chlorides and carbon dioxide. The following pictures show some construction details that could become critical points if waterproofing is carried out incorrectly.



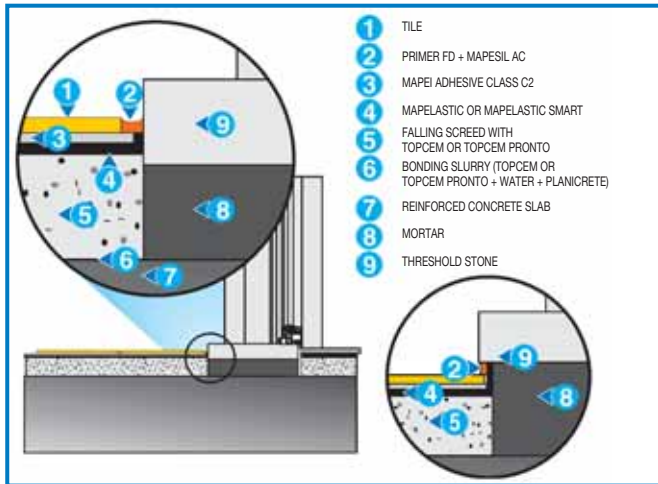
Detail: waterproofing directly on screed with slope



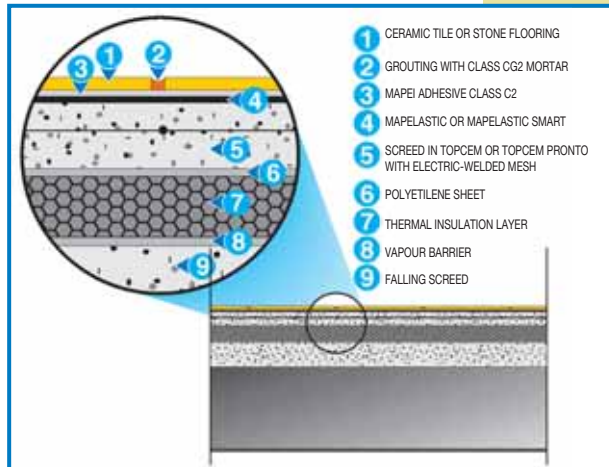
Detail: waterproofing of the front of a balcony



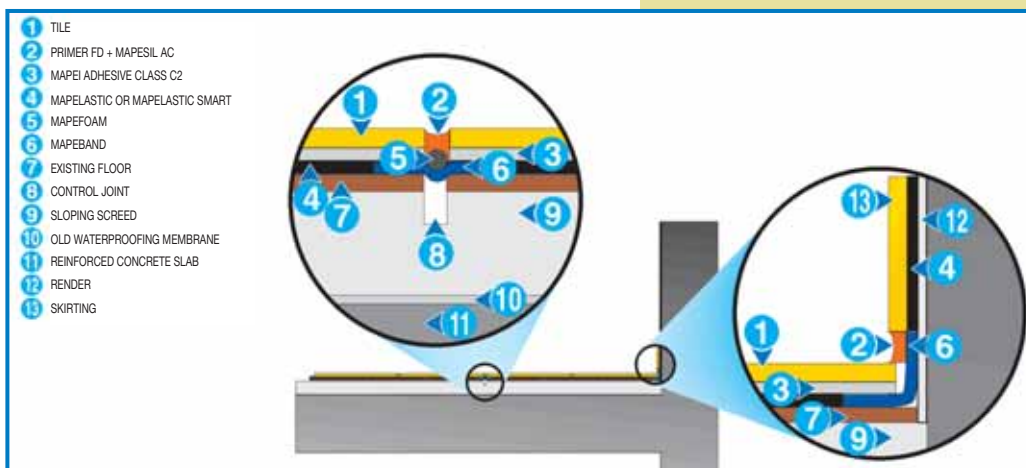
Detail: joint between perimeter and tile on balcony



Detail: joint between threshold stone and tile



Detail: waterproofing of a balcony with thermal insulation layer



Detail: waterproofing of a control joint

Mapei solutions for the installation of screeds for laying floors

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The service life and functionality of a floor covering, whether the material used is ceramic, stone, fabric, resilient or wood, is highly dependant on the physical and elastic-mechanical characteristics of the substrate on which it is laid.

These properties must be defined according to its final use and, therefore, according to the loads which act upon it, the environmental aggression conditions, the type of floor, the deformability of the underlying layers and the deflection of the concrete slab. This technical notebook aims at supplying useful guidelines regarding the techniques to be used and on the products which MAPEI offers for the installation of screeds which are durable over a long period of time.

A screed is a constructive element which, in general, is between 4 and 8 cm thick. It is made from mortars blended with cementitious binders or with an anhydrite base.

According to whether it is laid so that it adheres to a load-bearing substrate (for example a reinforced concrete slab), or it is laid onto an isolation layer (for example a vapour barrier) or onto a layer of thermal and/or acoustic insulation, it is known as "integral", "isolating" or "floating", respectively. When the latter type also includes embedded heating pipes, they are defined as "heating".

The screed forms a support which is suitable for any type of floor. Be it in ceramic, stone, wood or a resilient material. Also, it must guarantee that the laying operation is carried out in the time required and that its durability is not compromised when operating under various conditions (internal or external use, domestic, commercial or industrial use, etc).

The durability of a floor covering is influenced, therefore, by the characteristics of the substrate, which are tightly bound to those of the product used for the screed (special binders, pre-blended mortar or traditional mortar prepared on site), and also by the way it is prepared, how it is laid, its compactness and the curing of the mix.

To sum up, therefore, the choice of which product to use for the screed must take into consideration its final use, the particular site conditions (internal use, external use, thickness, etc), the type of floor to be laid and the time to wait before laying and before putting the floor covering into service.

TYPES OF SCREEDS

Screeds may be divided into the following categories:

- Isolating (Figs. 1 and 2)
- Floating (Fig. 3)
- Integral (Fig. 4)
- Heating (Fig. 5)

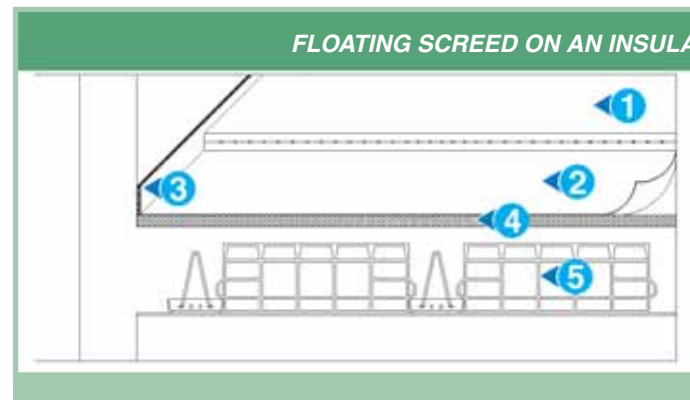
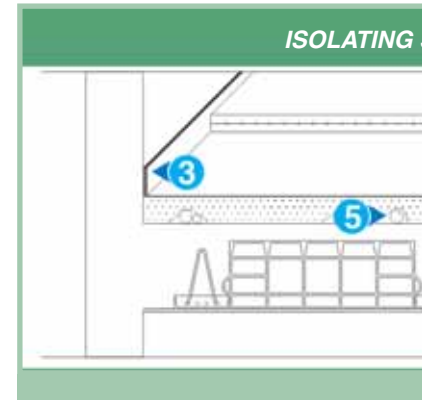
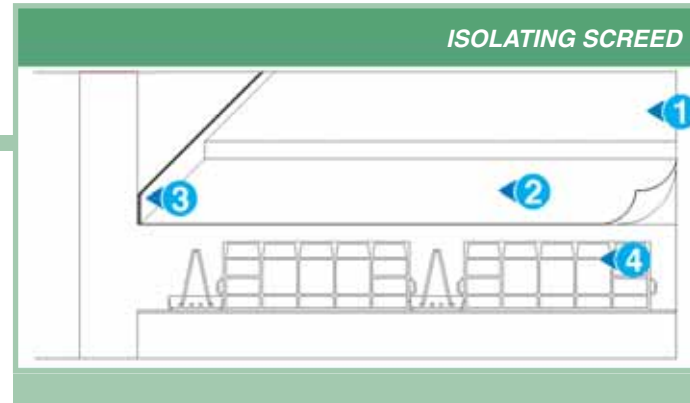


Table 1 - Minimum thickness of floating screed according to the deformability

INSULATION Deformability class

I:	Thickness < 3 mm
I:	Flattening* < 0.5 mm and thickness > 3 mm
II:	Flattening > 0.5 mm and < 3 mm included
III:	Flattening > 3 mm and < 12 mm



TOPCEM PRONTO and **MAPECEM PRONTO** pre-blended mortars for screeds conform to standard **EN 13813** and are **CE** marked.

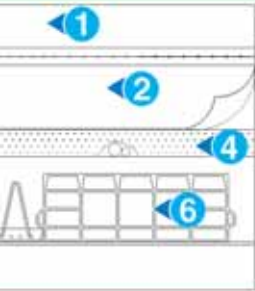
A Statement of Compliancy, to certify the performance characteristics of these mortars as required for the **CE** brand, is available upon request.



- 1 SCREED 3.5 cm THICK
- 2 POLYTHENE SHEET
- 3 DEFORMABLE MATERIAL
- 4 CONCRETE SLAB

Fig. 1

SCREED OVER LIGHTWEIGHT LAYER



- 1 SCREED 3.5 cm THICK WITH ELECTRIC-WELDED MESH
- 2 POLYTHENE SHEET
- 3 DEFORMABLE MATERIAL
- 4 LAYER OF LIGHTWEIGHT
- 5 CONCRETE PIPE-WORK
- 6 CONCRETE SLAB

Fig. 2

INSULATION LAYER

- 1 SCREED > 4 cm THICK WITH ELECTRIC-WELDED MESH
- 2 POLYTHENE SHEET
- 3 DEFORMABLE MATERIAL
- 4 THERMAL/ACOUSTIC INSULATION LAYER
- 5 CONCRETE SLAB

Fig. 3



Needs and characteristics of the reinforcement
by class of the insulation layer

SCREED
Thickness Reinforcement

4 cm	Also without reinforcement
4 cm	50x50 mm mesh, $\phi = 2$ mm
5 cm	Also without reinforcement
4 cm	50x50 mm mesh, $\phi = 2$ mm
5 cm	Also without reinforcement
4 cm	100x100 mm mesh, $\phi = 5$ mm
5 cm	50x50 mm mesh, $\phi = 2$ mm



* Flattening - the reduction in thickness of the insulation layer due to the compressive force of a "standard" load according to French norms.

Mapei solutions for the installation of screeds for laying floors

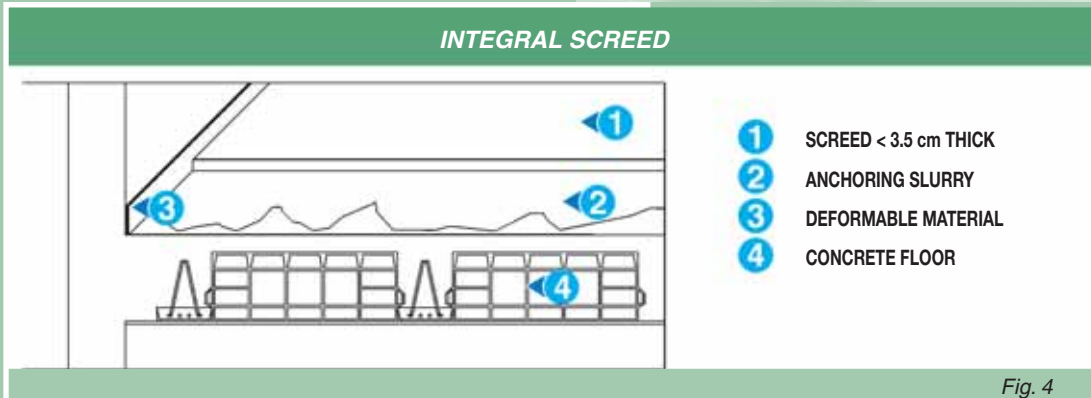


Table 2 - Recommended dosages for slurries to improve the anchorage of the screed to the substrate

	Slurry* base material:				
	CEMENT	TOPCEM	TOPCEM PRONTO	MAPECEM	MAPECEM PRONTO
PLANICRETE (parts in weight)	1	1	1	1	1
WATER (parts in weight)	1	1	1	1	1
PRE-PACKED BINDER or MORTAR (parts in weight)	2	3	12	2	8

* For structures subject to heavy mechanical stress, use EPORIP to anchor the screed to the reinforced concrete structure.

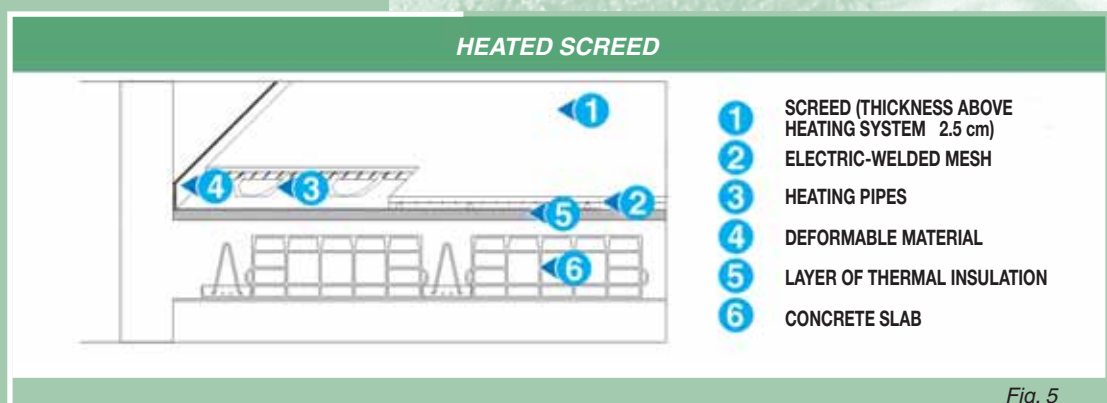


Table 3 - Waiting times according to the type of binder used in the screed (approx. 4 cm) before carrying out the testing cycle of the under-floor heating system

Cement + aggregates + water + MAPEFLUID N200	Cement + aggregates + water + MAPEFLUID PZ500	TOPCEM PRONTO + water	TOPCEM + aggregates + water	MAPECEM + aggregates + water	MAPECEM PRONTO + water
21 days	14 days	4 days	4 days	1 day	1 day

Table 4 - Performance characteristics* of screeds manufactured with MAPEI special binders and mortars

	Screeds made with:			
	TOPCEM	TOPCEM PRONTO	MAPECEM	MAPECEM PRONTO
Recommended dosage (kg/m³)	200-250	-	350-450	-
Residual moisture (%)				
- after 24 hours	< 3.5	< 3.5	< 2	< 2
- after 3 days	-	-	< 1.6	< 1.6
- after 4 days	< 2	< 2	-	-
Waiting time before applying smoothing compounds	1 ÷ 4 days	1 ÷ 4 days	4 hours	4 hours
Waiting time before laying				
- ceramic tiles	24 hours+	24 hours	3-4 hours+	3 ÷ 4 hours
- marble	2 days+	2 days	3-4 hours+	3 ÷ 4 hours
- wood**	4 days+	4 days	24 hours+	24 hours
Compressive/flexural strength (N/mm²)				
- after 24 hours	> 8/3	> 8/3	> 30/5	> 40/6
- after 3 days	-	-	> 40/6.5	> 50/7
- after 4 days	> 15/4	> 15/4	-	-
- after 7 days	> 22/5	> 22/5	-	-
- after 28 days	> 30/6	> 30/6	> 45/7	> 62/10
+ These waiting times could be extended if when making the screeds, aggregates graded less than suggested (8 mm) are erroneously used or more mixing water is added.				
* At +23°C and 50% R.H.				
** When laying wooden floor coverings, check the level of moisture with a carbide hygrometer to make sure that it is lower than the value recommended by the manufacturer of the wood.				



Mapei solutions for laying ceramic tiles in the renovation of residential buildings

When renovating old buildings, the laying of new ceramic tile floors and coverings presents a series of specific problems which differ from those encountered in the construction of new buildings.

Mapei is also involved in this sector, with a series of consolidated systems based on the use of a wide range of screeds, levelling compounds, adhesives, grouting mortars and sealants, which are capable of brilliantly solving the numerous problems which are encountered on site.

Although there may be a large number of specific problems which have to be solved when laying ceramic tiles, they may be classified into two distinct groups (Graphic 1).

The first group concerns the laying of new floors without having to completely remove the existing one (Graphic 2). The second group, on the other hand, concerns the laying of completely new floors (Graphic 3).

ANALYSIS OF FLOOR COVERING

Floor covering with well-bonded tiles

Floor covering with well-bonded tiles

Removal of any loose tiles
 Cleaning with water and soda, and abrasion where required
 Filling of hollows and gaps with **NIVORAPID** or **ADESILEX P4**
 Laying ceramic tiles on the floor covering with:

Existing tiles cracked

MAPETEX bonded to existing floor covering with:

ELASTORAPID
KERAQUICK+LATEX PLUS
 or **KERABOND/KERABOND T**
+ISOLASTIC

New tiles bonded to MAPETEX with:

ELASTORAPID
KERAQUICK+LATEX PLUS
KERABOND/KERABOND T+ISOLASTIC
ULTRAFLEX S2 MONO
ULTRAFLEX S2 QUICK

Existing tiles without cracks

New tiles bonded with:

ADESILEX P10+ISOLASTIC diluted 1:1 with water (mosaic)
ADESILEX P9 (double-fired, single-fired and "cotto" tiles < 30x30 cm)
KERAFLEX (porcelain tiles < 30x30 cm)
KERAFLEX EASY
KERAFLEX MAXI S1, ULTRALITE S1 (> 30x30 cm)
ULTRAFLEX S2 MONO (> 30x30 cm)
ULTRAFLEX S2 QUICK
GRANIRAPID
KERAQUICK
ELASTORAPID

Graphic 2

**OF THE OLD
COVERING**

Floor covering with large areas of loose tiles

Graphic 1

Floor covering with large areas of loose tiles

Remove the tiles
Check the quality of the existing screed

Screed is solid

Dust down
Apply **PRIMER G**
diluted 1:2-1:3 with water

If required, smooth off with:

**NIVORAPID, ADESILEX P4,
ULTRAPLAN or
ULTRAPLAN MAXI**

Screed is mechanically weak or unsound

Remove the screed and rebuild with:

**TOPCEM
or
TOPCEM PRONTO**

Consolidate with:

**PROSFAS
or
PRIMER MF**
Smooth off if required

Lay new tiles on the screed

With heating element

KERAFLEX ($\leq 30 \times 30$ cm) - **KERAFLEX EASY**
KERAFLEX MAXI S1, ULTRALITE S1
KERABOND/KERABOND T + 50%
ISOLASTIC ($\geq 30 \times 30$ cm)
KERAQUICK + 50% LATEX PLUS
ELASTORAPID
ULTRAFLEX S2 MONO - ULTRAFLEX S2 QUICK

Without heating element

ADESILEX P10 (mosaic)
KERABOND/KERABOND T
(double-fired, single-fired and "cotto" tiles $< 30 \times 30$ cm)
ADESILEX P9 (porcelain tiles $< 30 \times 30$ cm)
KERAFLEX, KERAFLEX EASY ($> 30 \times 30$ cm)
GRANIRAPID, KERAQUICK

Graphic 3

Mapei solutions for the installation of stone material

The choice of which type of adhesive to use when installing stone material must be made according to their dimensional stability and their sensitivity to water and thermal variations. On the contrary to ceramic tiles, stone material may curl considerably due to the presence of humidity which rises up from the adhesive layer or mortar bed. Furthermore, in the presence of water rising up from the substrate, screed or adhesive, stone materials may be stained and/or present unsightly efflorescence.

Mapei has studied and developed a system, the only one of its kind in the world, to analytically classify stone material according to their sensibility to water, and which is based on the following test procedure:

A damp felt is placed on the reverse side of the stone slab (Fig. 1) to simulate the humidity which rises up from the substrate (sand and cement mortar bed or traditional adhesive); by means of a series of high-precision, digital sensors a real-time recording of the deformation of the stone slab due to the humidity given off from the felt is carried out.

According to the amount of deformation (δ), measured after 6 hours after applying the damp felt, the stone material is divided into three classes (Tab. 1):

- a) Class A: $\delta < 0.3 \text{ mm}$
- b) Class B: $0.3 \leq \delta < 0.6 \text{ mm}$
- c) Class C: $\delta \geq 0.6 \text{ mm}$

For slabs in class A, the choice of adhesive will depend on factors other than the characteristics of the stone material (the size of the slab, type of substrate, service conditions of the material).

For the materials in class B or class C, the test must be repeated, but a layer of fast-setting cementitious adhesive (Fig. 2) is used instead of the damp felt, to establish if the use of a fast-setting adhesive that blocks the movements in the first drying hours is sufficient for laying these particularly moisture sensitive materials, or it is necessary to use a water-free adhesive (epoxy or polyurethane). Table 2 lists the recommended Mapei adhesives for laying natural stone material or agglomerates, based on the dimensional stability for sensitivity to water and thermal variations in relation to their tendency to stain.

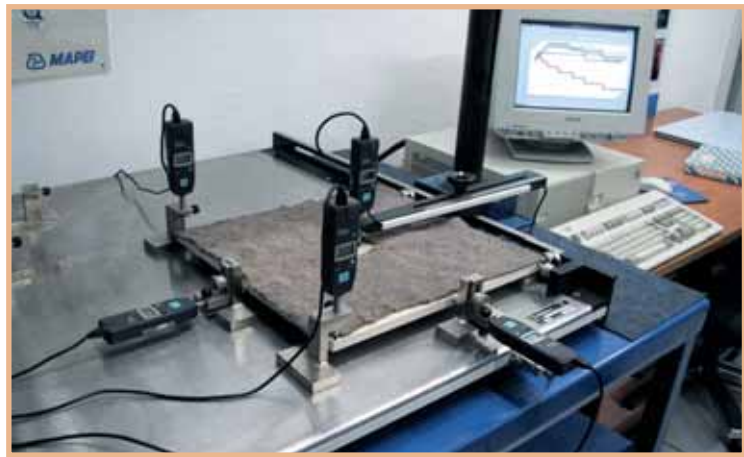


Fig.1 Simulation test with humid felt



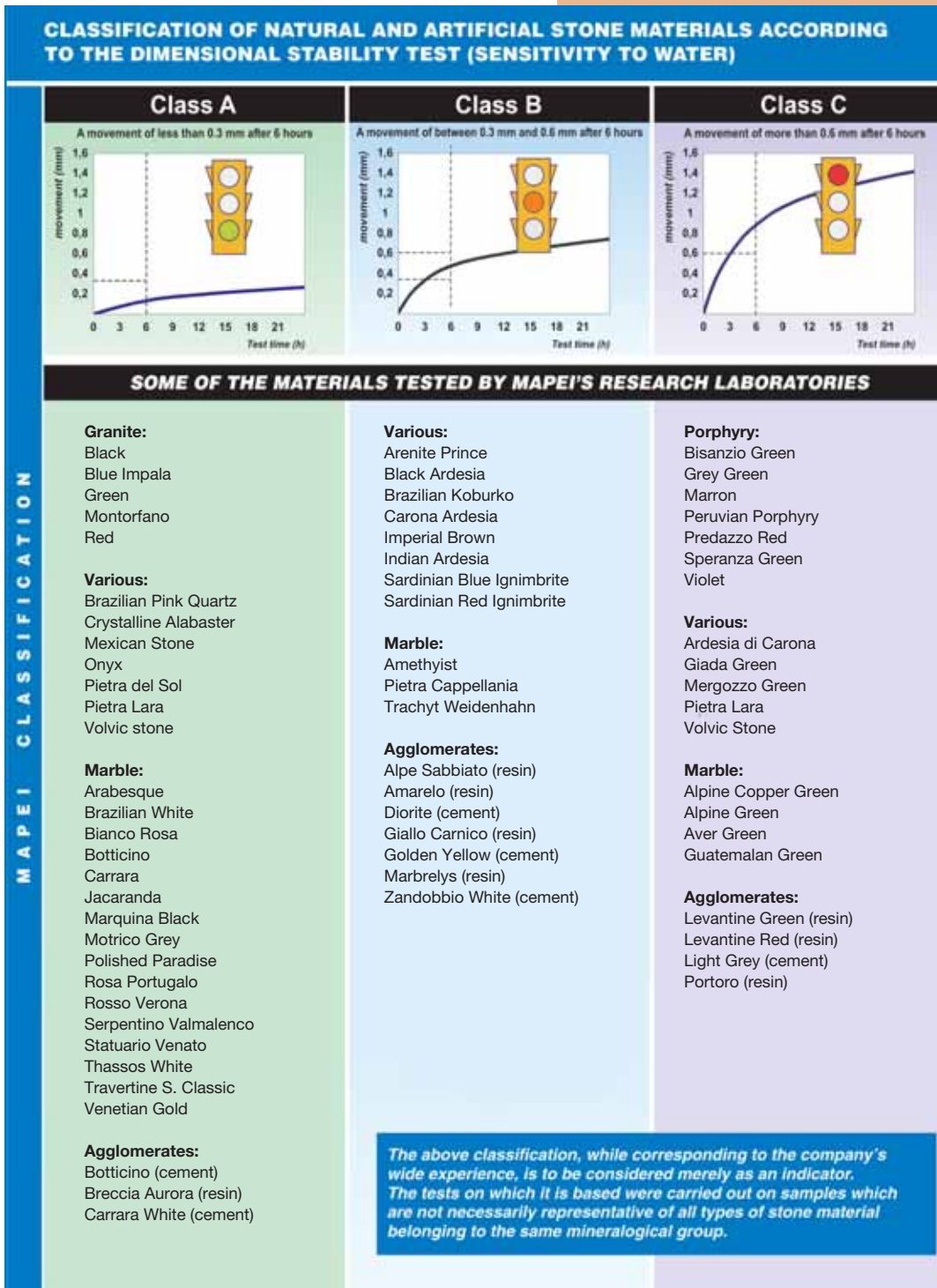
Fig.2 Bonding test with an adhesive



MAPEI'S PRODUCTS	MAPEI ADHESIVES FOR LAYING STONE MATERIAL ON CEMENT-B		
	STONE MATERIAL	STAINING	A
Natural stone materials Cement-based agglomerates LOCATION: Internal/External	not sensitive	KERAFLEX, KERAFLEX EASY ADESILEX P4 KERABOND/KERABOND T+ISOLASTIC	
	sensitive	GRANIRAPID KERAQUICK ELASTORAPID KERAQUICK + LATEX PLUS	
Resin-based agglomerates* LOCATION: Internal use only	not sensitive	KERAFLEX MAXI S1 KERACRETE + KERACRETE POWDER	
	sensitive	GRANIRAPID KERAQUICK - ELASTORAPID	

* Because of the high coefficient of thermal expansion ($> 25 \times 10^{-6} \text{ C}^{-1}$) of slabs in resin-based artificial material, this type of material is not recommended for external dressings due to the very high risk of it coming unstuck from the support material. Also, when resin-based artificial material is used for internal applications, if it is laid in areas subject to direct sunlight (close to large shop windows, for example), whatever the stain sensitivity or deformation class of the material, it is necessary to use KERALASTIC.

** Materials belonging to classes B and C which, af
*** Materials belonging to classes B and C which, af



Tab. 1

BASED PLASTER AND SCREEDS

DEFORMATION CLASS	
B**	C***
GRANIRAPID KERAQUICK ELASTORAPID KERAQUICK + LATEX PLUS	KERALASTIC KERAPOXY
GRANIRAPID KERAQUICK ELASTORAPID KERAQUICK + LATEX PLUS	KERALASTIC KERAPOXY
GRANIRAPID KERAQUICK ELASTORAPID	KERALASTIC KERAPOXY
GRANIRAPID KERAQUICK - ELASTORAPID	KERALASTIC KERAPOXY

After repeating the dimensional stability test with **GRANIRAPID**, **KERAQUICK** or **ELASTORAPID**, enter into class A ($\delta < 0.3$ mm).
 After repeating the dimensional stability test with **GRANIRAPID**, **KERAQUICK** or **ELASTORAPID**, remain in classes B or C.

Tab. 2

Mapei solutions for fixing ceramics on façades

The fixing of ceramic tiles on façades must be carried out by respecting the following basic rules:

1) Choose an **improved adhesive** and, especially in the case of large-sized tiles, one which is flexible or highly flexible (class **C2S1** or **C2S2** according to EN 12004).

tures, dry wind classified as “E” EN 12004.

2) Tiles with a surface area of more than 100 cm² or with a highly ribbed back must be laid using the “**double-buttering**” method, that is, by spreading the adhesive on both the substrate and on the back of the tile. This guarantees that there are no voids at the dressing/substrate interface, where rainwater may seep in and stagnate. If the water freezes, dangerous stresses are generated which could cause detachment of the tiles. Double-buttering is also necessary to ensure that the stresses, generated by differential movement between the dressing and the substrate due to thermal changes, for example, are distributed uniformly over a wider area, and also to avoid efflorescence on the façade.

4) In **cold weather** fixing large-sized adhesives, class type of adhesive bonding strength the night-time transformation into ice and dete

3) Fix the tiles in the adhesive whilst it is still fresh and within the adhesive’s **open time**, in order to guarantee perfect transfer of the adhesive onto the back of the tiles. In **unfavourable environmental** conditions (high tempera-

5) The tiles must be joints must be conditions and recognised stan without joints. In fact, tile joints when laying larg a) the difference pronounced; b) the joints are product, both

The choice of the most suitable adhesive to use for fixing tiles on facades must be made according to the type and size of the tiles, as well as the type of substrate.

MAPEI recommends the following products for fixing ceramic tiles on vertical concrete or rendered substrates:

* For large-sized slabs laid at a height of more than 3 m, some international standards recommend the use of combined fixing with adhesive and mechanical means, selected according to the weight of the slab, the height of the dressing material and on-site conditions.

N.B. For particularly tall buildings, please consult the Technical Assistance Department.

SIZE	SUBSTRATE	RECOMMENDED ADHESIVE	
		NORMAL SETING	CLASSIFICATION ACCORDING TO EN 12004
Mosaic max 25 cm ²	Render/ concrete	ADESILEX P10	C2TE
Glass mosaic max 25 cm ²	Render/ concrete	ADESILEX P10 + ISOLASTIC (diluted with water at a ratio of 1:1)	C2TE S1
Max 400 cm ²	Render	ADESILEX P9	C2TE
	Concrete	KERAFLEX	C2TE
Max 900 cm ²	Render	KERAFLEX	C2TE
	Concrete	KERAFLEX MAXI S1	C2TE S1
Max 1600 cm ²	Render	KERAFLEX MAXI S1	C2TE S1
	Concrete	ULTRAFLEX S2 MONO	C2TE S2
> 1600 cm ² *	Render	ULTRAFLEX S2 MONO	C2TE S2
	Concrete	KERABOND+ISOLASTIC KERABOND T+ISOLASTIC	C2E S2 C2 S2

d, etc.), where possible, use adhesives " (long open time) according to Standard

r and during the winter, especially when ed tiles, it is better to use **fast-setting** sified as "F" according to EN 12004. This e ends its setting phase and reaches a high h within a few hours of fixing the tiles, before temperature drops to less than 0°C. The of water, used for preparing the adhesive, erioration of the adhesive is thus avoided.

e fixed with wide tile joints. The width of the e calculated according to local climatic the size of the tiles. Most internationally-dards agree that it is unacceptable to fix tiles

s are of fundamental importance, especially e-sized tiles, for the following reasons: e in flatness between each single tile is less

sealed with a cementitious or epoxy-based of which have lower elastic-mechanical

characteristics than those of the tiles ($E_{joints} = 14-21 \text{ GPa}$; $E_{tile} = 50-80 \text{ GPa}$). Therefore, in those cases in which there is deformation of the substrate or the ceramic dressing due to thermal distortion, for example, the joints avoid high stresses being transmitted to the adhesive and causing detachment of the tiles.

6) All of the **structural joints** must be **respected**, for both their size and their relative positions.

7) Movement **joints must be made** in correspondence with frontals, corners and sharp edges, and in all cases, every 9-12 m² (Fig. 3).

8) Protect the dressing material from the penetration of water and from potentially harmful freeze/thaw cycles, by using either a suitable sealing product or metallic flashing along the upper and lower parts of the entire dressing material, and also corresponding with windows and openings.

RAPID SETTING		MINIMUM WIDTH OF JOINTS	JOINTS
	CLASSIFICATION ACCORDING TO EN 12004		
KERAQUICK	C2FT S1	Distance of tiles assembled on paper or mesh	In correspondence with corners, sharp edges, frontals, joints in the substrate and around doors and windows
ELASTORAPID	C2FTE S2	Distance of tiles assembled on paper or mesh	In correspondence with corners, sharp edges, frontals, joints in the substrate and around doors and windows
KERAQUICK	C2FT S1	6 mm	Every 12 m ² , in correspondence with corners, sharp edges, frontals, joints in the substrate and around doors and windows
		8 mm	
ELASTORAPID	C2FTE S2	8 mm	Every 12 m ² , in correspondence with corners, sharp edges, frontals, joints in the substrate and around doors and windows
		10 mm	
ELASTORAPID	C2FTE S2	12 mm	Every 9 m ² , in correspondence with corners, sharp edges, frontals, joints in the substrate and around doors and windows
KERAQUICK+ LATEX PLUS or ULTRAFLEX S2 QUICK	C2FT S2		
KERAQUICK+ LATEX PLUS or ULTRAFLEX S2 QUICK	C2FT S2	12 mm	Every 9 m ² , in correspondence with corners, sharp edges, frontals, joints in the substrate and around doors and windows

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PRODUCT											
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KERAPOXY SP		RG									
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KERAQUICK + LATEX PLUS	C2FT S2										
KERASET	C1			EN 12004		●	●				
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MAPEFLUID N200				EN 934-2							
MAPEFLUID PZ500				EN 934-2							
MAPEFONIC GROUT		CG2			●		●		●	●	
MAPEFONIC MORTAR	C2FT S1			EN 12004	●		●				
MAPELASTIC				EN 1504-2							
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MAPESILENT BAND							●				
MAPESILENT DOOR							●				
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PRIMER G					●		●				
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