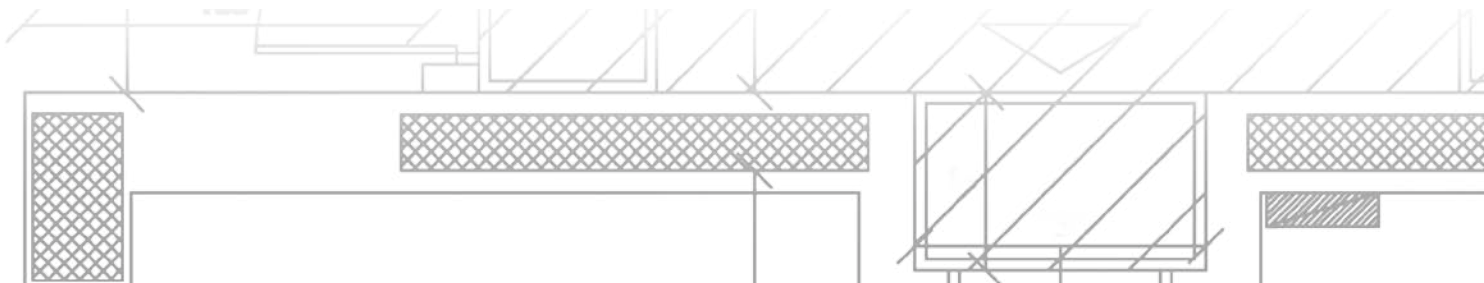




Technical Notebook

WATERPROOFING TERRACES AND BALCONIES



Technical Notebook

WATERPROOFING

TERRACES AND BALCONIES

Front Cover Image:

RESIDENTIAL CENTRE "ZELENE MESTO" - PRAGUE - CZECH REPUBLIC

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WATERPROOFING TERRACES AND BALCONIES

1. INTRODUCTION

The issues dealt with in this technical notebook regarding waterproofing terraces, balconies and flat roofs, and will consider both old structures and new structures. We will commence with a brief history of the structural elements analysed in the notebook, and then continue with an analysis of the physical and mechanical stresses which act upon them during their useful service life. There will also be an analysis of the characteristics, performances and advantages of MAPEI waterproofing products for structures above ground level.

The aim of this notebook is to reduce the frequency of problems which may be traced back to incorrect design specifications and problems caused by incorrect or shoddy installation techniques. According to recent figures, more than 50% of claims for damages involve infiltration, while more than 60% of these claims are due to problems with the waterproofing layer.

It is quite clear, therefore, that the principal type of difficulty which needs to be addressed is the waterproofing of old structures. MAPEI, as experts in this field, has a range of quality systems available, not only for waterproofing and decorating floors, but also for repairing substrates (in concrete and brick) deteriorated by the aggressive action of water.

In the second part, dedicated to a description of various installation techniques, we will carry out an in-depth analysis of waterproofing solutions for new constructions, starting with the installation of screeds, followed by the application of waterproofing solutions and finishing with the laying of tiles and the grouting and sealing of joints.

2. A BRIEF HISTORY OF TERRACES, BALCONIES AND ROOFING TERRACES

If we were to define the difference between a balcony and a terrace, we could generally define a balcony as an added element to the main body



Fig. 2.1 - Juliet's Terrace - Verona - Italy
Repairing of the terrace with: ADESILEX P4,
MAPELASTIC, GRANIRAPID, ULTRACOLOR PLUS



of a building which usually juts out from its vertical face, while a terrace is an integral part of the building itself.

Balconies were not very widely used during the Classical period. Homes for the gentry were usually single-storey buildings around internal porticoes. The living quarters for the masses during Roman times, on the other hand, were several storeys high with external wooden galleries used to connect the various areas of the buildings.

In Medieval times, wooden galleries started appearing on the façades of castles, along with hanging stone balconies supported on wooden or stone stays. One of the most well-known examples is a small balcony in the heart of Verona, where according to legend Romeo courted his beloved Juliet as she looked out from the balcony.

It was not until the Renaissance period that the concept of space and perspective started to evolve in architecture. This period witnessed the appearance of the first urban terraces and splendid gardens typical of palaces and mansion houses.

Roof terraces, on the other hand, were developed during the Modernist movement, a period in the history of architecture between the First and Second World War, aimed at modernising design and architectural principles. It was this period which witnessed the appearance of the first flat roofs, because of the improvements in the technical characteristics of new building materials. It is thanks to Le Corbusier that terraces became an architectural space to be lived in - Villa Savoye and Unité d'Habitation are the most significant examples of how a space, which had previously been considered to be of secondary importance or superfluous, became more vital and multi-purpose, a pleasant space to spend one's spare time. So flat roofs became solariums (such as the one at Villa Savoye), or meeting places for social functions (in Unité d'Habitation, for example). Continuing with our brief detour into the evolution of terraces tied to the design features of the great maestros of the Modernist Movement, it would be impossible not to mention the impressive hanging terraces designed by Frank Lloyd Wright in his famous house overlooking a waterfall (Fallingwater) which

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project out for a breathtaking view over a mountain creek, one of the most remarkable examples of modern architecture.

In order for terraces and balconies to become a space where everybody may enjoy their spare time, we must not limit our attention to simply applying a waterproofing system; we must also consider a number of other aspects such as structural stresses, the correct slope, the way they blend in and particular care for the joints. These and other items will be discussed in the following pages.



3. MECHANICAL AND PHYSICAL STRESSES



3.1 STRUCTURAL DEFORMATION AND JOINTS

The cementitious conglomerate in use since ancient times is still today one of the most widely used construction materials in the building industry. The combination of cement, inert material and water in the right proportions forms a strong, compact composition which, when used in conjunction with steel bars, forms an excellent construction system: **reinforced concrete**.

As with all materials, a cementitious conglomerate has certain chemical and physical characteristics directly connected to particular types of deformation, some of which are manifested immediately, while others only show up with time, generated especially by the curing of the conglomerate itself. Structures are subjected to various types of deformation (thermal, dynamic, shrinkage, etc.) during their working life and every type of deformation must be carefully assessed during the design phase.

As far as the behaviour of terraces and balconies is concerned, it is common knowledge that these structures are subjected to all the types of deformation mentioned above, which act both on the structure of the balcony itself and on the superstructure, the

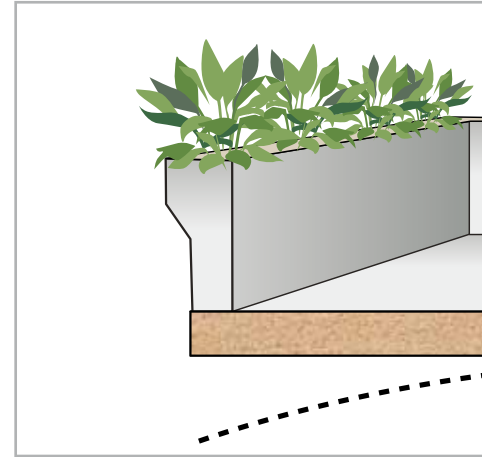


Fig. 3.1 - Diagram of the deformations of a suspended floor slab subjected to point loads

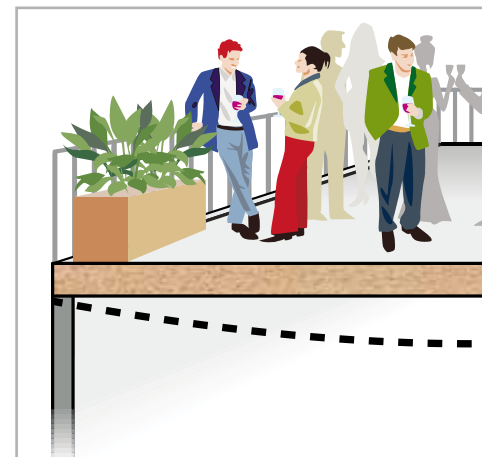


Fig. 3.2 - Diagram of the deformations of a supported beam subjected to evenly-distributed loads

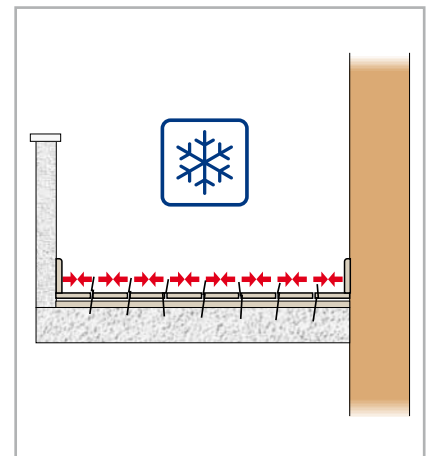


Fig. 3.3 - Diagram of the deformations induced by drops in temperature

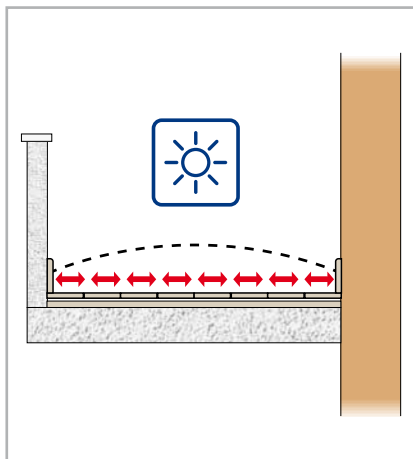
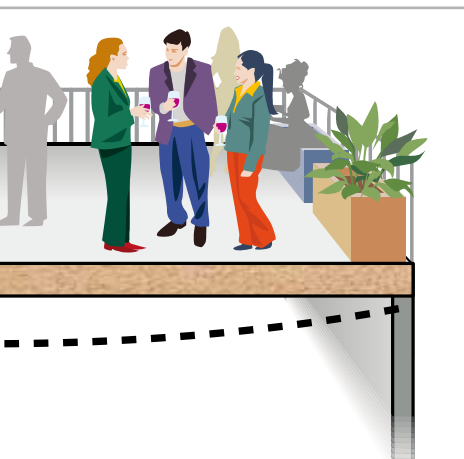
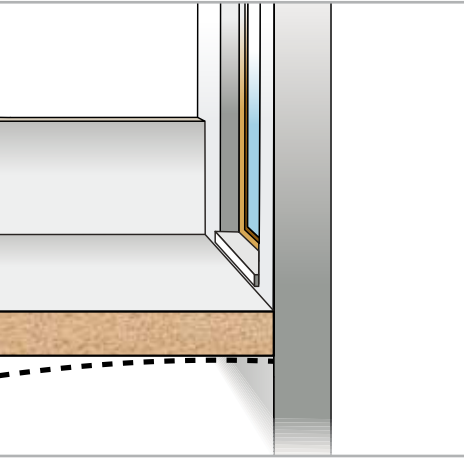


Fig. 3.4 - Diagram of the deformations induced by increases in temperature

screed and floor, and on which structural joints, control joints and expansion joints must be created.

Structural joints are interruptions in the structural continuity of manufactured pieces made by placing a physical separation piece between two adjacent bodies. They are the same depth as the manufactured piece and several centimetres wide. Their function is to absorb structural stresses (subsidence of the ground, winds, seismic activity, etc.), functional stresses (vibrations, transitory oscillations, etc.) and thermal stresses (expansion and contraction of the materials). The depth of **control joints** or **contraction joints** is generally around 1/3 of the thickness of the cementitious conglomerate and are made by cutting into the surface with a diamond-tipped disk after the conglomerate has hardened (usually 24-48 hours). They do not eliminate cracks caused by hygrometric shrinkage, but help to contain their formation and width so that any cracks that form do not provoke functional or aesthetic problems. **Expansion joints** are interruptions in the continuity of the surface, created to absorb thermal expansion in ceramic floors or floors in other materials, for example.



3.2 CREATING SLOPING LAYERS

In this section, we will describe good working practices to form cementitious screeds suitable for use on balconies and terraces.

Firstly, it would be useful to analyse the various types of screeds:

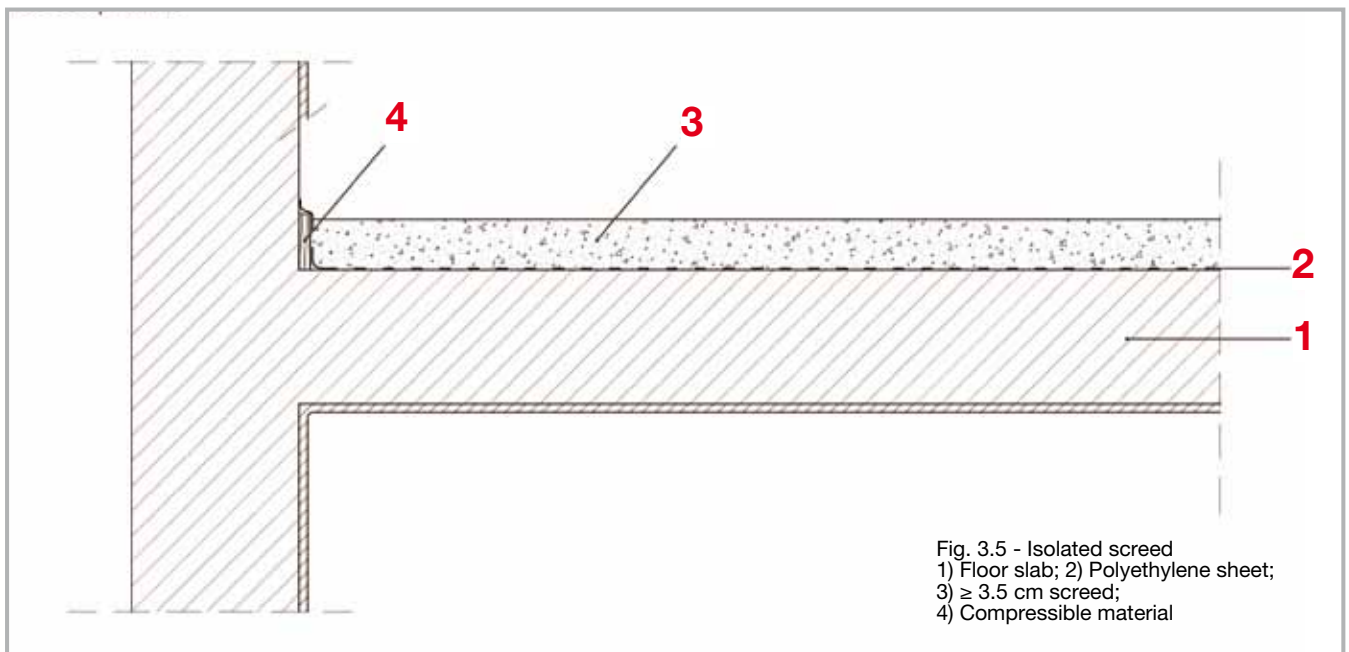
- isolated (unbonded);
- floating;
- bonded.

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Isolated (unbonded) screeds

They are minimum 35 mm thick and are used for pedestrian traffic. They are formed by installing a horizontal separation layer (e.g. sheets of polyethylene or PVC) between the screed and substrate (e.g. reinforced concrete capping layer) and by positioning a 1 cm thick compressible layer, such as closed cell polyethylene foam, around the perimeter of the walls and around the pillars. The sheets must be turned up against the pillars and walls. The sheets of the separation layer must also overlap by at least 20 cm and be taped. The advantage of this technique is that the screed and floor are isolated from any deformation which occurs in the structure (e.g. subsidence, hygrometric shrinkage, thermal expansion, etc.). It is fundamental that cuts to a depth of 1/3 of the thickness of the screed are made in the screed (**control joints**) to form crack control joint to limit for future cracking due to hygrometric shrinkage.

With conventional sand and cement screeds, control joints must be made in correspondence with door thresholds, between pillars and every 9-16 m² for external screeds, by cutting to a depth of 1/3 of the thickness, taking care not to cut the electro-welded reinforcement mesh, if present.



Floating screeds

They are comparable to unbonded screeds, but are laid on a layer of soundproofing or insulating material (e.g. cork, polythene mattress, sheets of expanded polyurethane, etc.). In these cases, because of the high compressibility and low mechanical strength of the substrate, the size of the screed must be calculated accordingly and electro-welded reinforcement mesh must be inserted at the mid-point of the screed to provide even load distribution and to prevent compression.

Table 1 indicates the thickness and reinforcement of screeds for residential use according to the compressibility and thickness of the isolating layer.

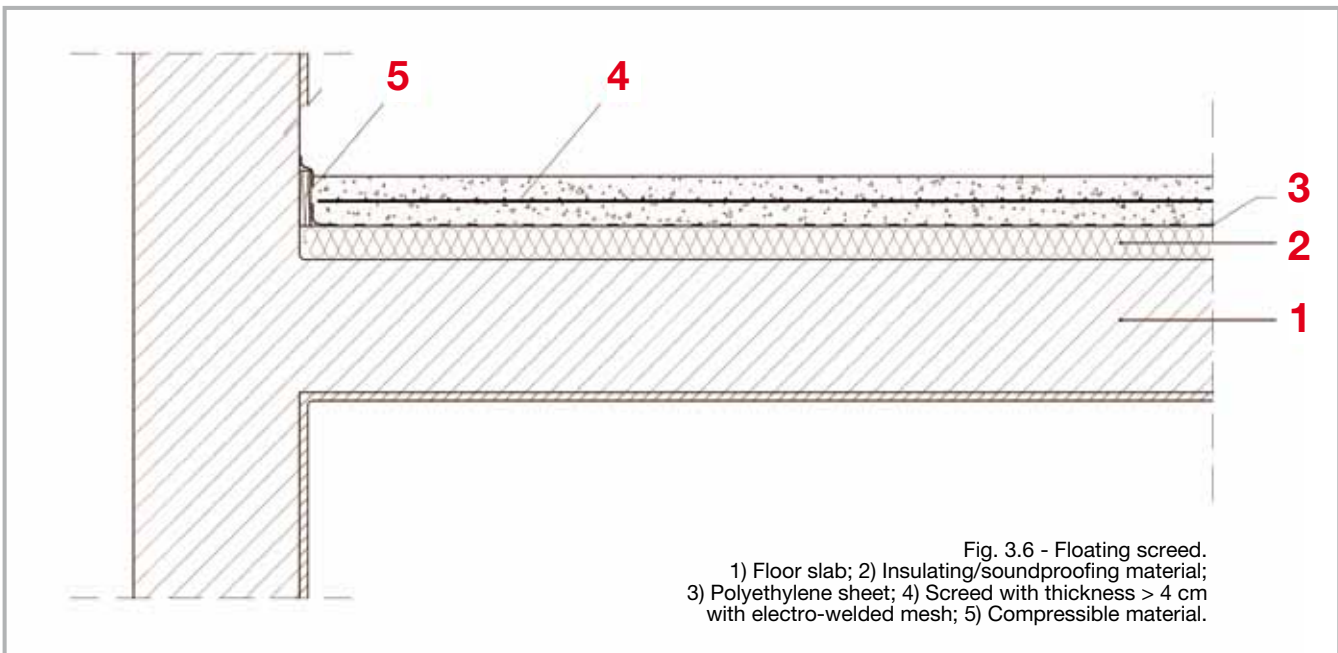


Fig. 3.6 - Floating screed.
1) Floor slab; 2) Insulating/soundproofing material;
3) Polyethylene sheet; 4) Screed with thickness > 4 cm
with electro-welded mesh; 5) Compressible material.

	THICKNESS OF SCREED	REINFORCEMENT
I: Thickness <3 mm	4 cm	Including non-reinforced
I: Crushing* <0,5 mm and thickness >3 mm	4 cm 5 cm	50x50 mm mesh, $\phi = 2$ mm Including non-reinforced
II: Crushing* >0,5 mm and ≤ 3 mm	4 cm 5 cm	50x50 mm mesh, $\phi = 2$ mm Including non-reinforced
III: Crushing* >3 mm and <12 mm	4 cm 5 cm	100x100 mm mesh, $\phi = 5$ mm 50x50 mm mesh, $\phi = 2$ mm

*Crushing refers to the reduction in thickness of the insulating layer following the compressive force from a "standard" load

Tab. 1 – Minimum thickness of floating screeds and characteristics of reinforcement according to the compressibility class of the insulating layer.

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Bonded screeds

If there is not enough space available (less than 35 mm) to install an unbonded screed, a screed bonded to the underlying substrate must be installed, adopting the following precautions:

- Make sure that the floor slab is well cured, sufficiently strong, free from dust and loose parts and that it has a rough surface.
- To guarantee the bond of the screed, spread on a layer of bonding slurry made from **PLANICRETE**, water and the same binder used to make the screed.
- If layers only a few centimetres thick need to be applied on concrete floors or if the screed is installed in areas subjected to high mechanical stresses, use **EPORIP** epoxy adhesive instead of bonding slurry made from **PLANICRETE**. Whatever type of bonding promoter is used, the new mix must be applied using the “fresh on fresh” technique. Perimeter joints must be made around the room and pillars by inserting 1 cm thick compressible material, such as closed cell polyethylene foam. The pattern of structural joints in the floor slab, if present, must also be followed.
- To avoid water collecting on the surface and making tiled surfaces slippery, balconies and terraces must have a minimum of slope towards the collector points for rain water.

If a suitable slope was not created when installing the capping layer of the floor slab, a sloping screed must be formed under the waterproofing layer to encourage water to run off.

Composition of screeds

N.B. It is very risky to apply waterproofing systems on screeds which have not been well cured (at least 28 days). Any cracks which form due to hygrometric shrinkage after laying will lead to cracks in the waterproofing system and compromise its efficiency.

On site, especially in the case of renovation work, there is often limited time available, to allow floor-layers to respect the minimum time required to cure conventional cementitious screeds: 7-10 days per cm of thickness at around +20°C (and never less than 28 days). Binders are required, therefore, which allow mortar with long workability times to be prepared for substrates and which are easy to apply, while at the same time allow waterproofing layers and coating materials to be laid quickly.

In these cases, MAPEI proposes the use of:

TOPCEM, special normal-setting, quick-drying (4 days), controlled-shrinkage hydraulic binder for screeds.

TOPCEM PRONTO, ready-to-use, pre-blended, normal-setting, quick-drying (4 days), controlled-shrinkage mortar, class CT-C30-F6-A1_{fl} according to EN 13813 standards, with very low emission levels of volatile organic compounds (EMICODE EC1 R Plus). Since this product is ready-to-use and only requires mixing with water, it offers the following advantages:

- there is no longer the problem of having to use good quality aggregates with the right grain size, which are often hard to find;
- dosage errors and problems due to poor workmanship are avoided;
- the ideal solution where storage of raw materials (inert materials, cement, etc.) is a problem, when carrying out renovation work in ancient town centres, for example.

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*Unlike conventional sand and cement screeds, screeds made using **TOPCEM** and **TOPCEM PRONTO** are characterised by their quick-drying and controlled-shrinkage properties. As a result, waterproofing layers or ceramic tiles may be laid on balconies and terraces after just 24 hours.*

If capping layers on floor slabs are installed without forming a suitable slope, or if they need to be modified before installing an isolating screed, the products mentioned above may be used after spreading a layer of bonding slurry on the base by mixing **PLANICRETE** with water and the same binder or pre-blended mortar used to make the screed (recommended dose **PLANICRETE**-water-cement = 1:1:2 parts by weight, **PLANICRETE**-water-**TOPCEM** = 1:1:3 parts by weight and **PLANICRETE**-water-**TOPCEM PRONTO** = 1:1:12 parts by weight).

As an alternative to the products mentioned above, if the thickness foreseen for the slope is low, MAPEI proposes the use of:

ADESILEX P4, quick-hardening cementitious smoothing and levelling compound for thicknesses from 3 to 20 mm or, alternately: **PLANITOP FAST 330**, quick-setting, fibre-reinforced cementitious mortar for evening out irregularities from 3 to 30 mm on internal and external walls, floors and uneven substrates.

ADESILEX P4 or **PLANITOP FAST 330** may also be used for smoothing and levelling old screeds which need to be evened out. At normal temperatures, balconies and terraces may be waterproofed 3-4 hours after applying **ADESILEX P4** or **PLANITOP FAST 330**.

***N.B.** We recommend evening out only the capping layer. In those cases where the unbonded screed also forms the slope (quite common when the screed is installed on a bituminous membrane), make sure the minimum thickness of 35 mm.*



Fig. 3.7 - Applying TOPCEM PRONTO with a special pump



Fig. 3.8 - Levelling the surface of a TOPCEM PRONTO screed with a straight-edge



3.3 DIMENSIONS AND DESIGN OF COLLECTOR SYSTEMS FOR RAINWATER

The architectural features discussed in this technical notebook have to face up to the rigours of atmospheric agents, such as wind, snow and rain. The first precaution to be adopted is undoubtedly to design and create the correct slope to encourage rainwater to flow into dedicated outlets to avoid the formation of pools of water.

Systems to collect rainwater are regulated by the European Standard EN 12056, which replaced UNI 9184.

The size of drains for rainwater depends on the maximum amount of precipitation during intense rain storms. The average value of rain intensity (IP) is expressed in l/s·m² calculated over a period of 10 years.

Rain intensity values are available in the EN 12056 Standard, but the value generally used is IP=0.04 l/s·m² or 2.4 l/min·m², which corresponds to a rainwater height (HP) of 144 mm/h, where IP=HP/60 [l/min/m²].

The rainwater load (C) required to calculate the size of drainage systems depends on the total surface area exposed to rain and the slope and type of surface exposed. The surface considered when calculating the size of drains is defined as equivalent surface (ES), which is calculated by considering the horizontal surface area (or sloping up to 60°) and a part of the vertical surface (Tab. 2). The coefficient K (Tab. 3), reduces the effective intensity of rainwater according to the roughness and absorption capacity of the surfaces exposed to rain, in that they slow down the water running off the surface.

CASE	EQUIVALENT SURFACE (ES)
Horizontal surfaces or with a slope (up to 60°)	100% of the sum of all surfaces
vertical surfaces or with slope more than 60°: - ONE - TWO - THREE or MORE	50% of the surface 35% of the sum of the two surfaces 35% of the sum of the two larger surfaces

Tab. 2

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TYPES OF EXPOSED SURFACES	K
- Sloping roofs, corrugated plastic sheets, cement-fibre, plastic sheets - Flat roofs covered with plastic or similar material	1.0
- Flat roofs covered with cement or similar slabs - Courtyards, driveways, etc with a hard coating	1.0
- Flat roofs with a gravel coating - Courtyards, driveways, etc. with gravel or similar material	0.6
- Flat roofs covered with earth (roof gardens, for example)	0.6

Tab. 3

The formula to calculate rainwater load is as follows:

$$C = IP \times SE \times K \text{ [l/s]}$$

Table 4 establishes the diameter of rainwater drains according to the equivalent surface in m² and the coefficient K, considering rain intensity as IP = 0.04 l/s·m².

Table 5, on the other hand, shows the diameters of rainwater manifolds inside and outside buildings according to their flow-rate and slope, considering a filling rate of h/d=0.8 (80%).

Ø INTERNAL/ EXTERNAL	FLOW-RATE Q	MAXIMUM DRAINABLE SURFACE IN M ² PER I.P. = 0.04 l/s/M ²		
		K = 1.0	K = 0.6	K = 0.3
mm	l/s			
57/63	1.9	47	79	158
69/75	3.6	90	150	300
83/90	5.0	125	208	417
101/110	8.9	222	371	742
115/125	12.5	312	521	1042
147/160	25.0	625	1042	2083
187/200	47.0	1175	1958	3917
234/250	85.0	2125	3542	7083
295/315	157.0	3925	6542	13083

Tab. 4



Fig. 4.1 - Application of MAPELASTIC reinforced with MAPENET 150 on a substrate with crazed cracking



Fig. 4.2 - MAPELASTIC SMART applied with a roller on existing floor



Fig. 4.3 - MAPELASTIC SMART applied with a trowel on existing floor



Fig. 4.4 - Application of the first coat of MAPELASTIC AQUADEFENSE



Fig. 4.5 - MONOLASTIC applied by trowel on a screed



Fig. 4.6 - DRAIN VERTICAL and DRAIN LATERAL kit complete with accessories

 $h/d=0.8$	SLOPE IN %							
	0.5 %	1.0 %	1.5 %	2.0 %	2.5 %	3.0 %	4.0 %	5.0 %
Ø mm	flow-rate Q in l/s							
69/75	1.3	1.8	2.3	2.6	3.0	3.2	3.8	4.2
83/90	2.0	2.8	3.4	4.0	4.5	4.9	5.6	6.3
101/110	3.6	5.0	6.2	7.2	8.0	8.9	10.2	11.5
115/125	5.2	7.4	9.0	10.5	11.7	12.9	14.9	16.7
147/160	10.0	15.0	18.0	21.0	23.5	26.0	30.0	33.0
187/200	19.0	27.0	33.1	38.1	42.8	47.0	54.3	60.8
234/250	34.5	49.0	60.1	69.5	77.7	85.2	98.4	110.1
295/315	62.8	90.6	111.1	128.4	143.6	157.4	181.8	203.3

Tab. 5



4. MAPEI WATERPROOFING SYSTEMS FOR STRUCTURES ABOVE GROUND

The dynamic and physical stresses (see section 3) to which the structures in discussion are subjected imply that the waterproofing layer possesses high performance characteristics. Not only must it have the capacity to guarantee waterproofing, it must also increase the durability of the structure and follow it when it deforms.

In waterproofing applications, attention to details is imperative. The quality of the products used guarantees their water-tightness and meticulous laying of the products guarantees their continuity and full compliance with their relevant Technical Data Sheets. The points where railings are attached, drains, channels, fillet joints between horizontal and vertical surfaces, joints in general and the other critical points are fundamental elements which must correctly detailed. It is exactly in these points that an “attention to detail” improves the already excellent quality of MAPEI products. With their “attention to detail”, MAPEI clearly demonstrates its know-how, by offering simple, sure technical solutions. Therefore, it is incorrect to talk about a single waterproofing product. We should rather talk about **waterproofing systems**, comprising a group of indispensable

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products to ensure that a system is watertight, and which MAPEI offers with each and every one of their components.

The MAPEI products which form **waterproofing systems** for structures above ground are as follows:

TWO-COMPONENT WATERPROOFERS

- **MAPELASTIC**, two-component, flexible, cementitious mortar for protection against aggressive agents and for waterproofing concrete surfaces, balconies, terraces, bathrooms and swimming pools.

- **MAPELASTIC SMART**, two-component, highly-flexible cementitious mortar for waterproofing concrete surfaces, such as balconies, terraces, bathrooms and swimming pools, and for protection against aggressive agents.

ONE-COMPONENT WATERPROOFER

- **MONOLASTIC**, one-component, cementitious mortar for waterproofing balconies, terraces and bathrooms.

READY-TO-USE WATERPROOFER

- **MAPELASTIC AQUADEFENSE**, ready-to-use, ultra-quick drying, flexible liquid membrane for internal and external waterproofing applications.

STRENGTHENING REINFORCEMENTS

- **MAPENET 150**, alkali-resistant, glass fibre mesh for reinforcing protective waterproofing layers and cementitious smoothing and levelling compounds.

- **MAPETEX SEL**, non-woven, macro-holed reinforcing fabric for waterproofing membranes.



Fig. 4.7 - Example of application of MAPELASTIC: terrace



Fig. 4.8 - Example of application of MAPELASTIC: swimming pool



Fig. 4.9 - Example of application of MAPELASTIC: viaduct

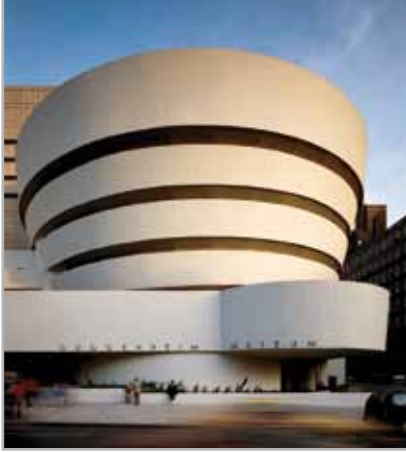


Fig. 4.10 - Example of application of MAPELASTIC: façade



Fig. 4.11 - Example of application of MAPELASTIC: dam



Fig. 4.12 - Example of application of MAPELASTIC: suspended storage tank

ACCESSORY COMPONENTS

- **MAPEBAND**, alkali-resistant rubber reinforcing tape for cementitious waterproofing systems and liquid membranes. To complete the system, MAPEI also offers gaskets for outlets, 90° and 270° angle pieces and T and cross profiles.
- **DRAIN VERTICAL** and **DRAIN LATERAL** kits for floor drains comprising: outlet drain (vertical or horizontal) in PP available in various diameters with a welded 400x400 mm PP drain cover, telescopic extension, “anti-odour” plug and a removable stainless steel grate. Ideal for draining off water from terraces, balconies, bathrooms, boiler rooms, wash-rooms, etc.
- **DRAIN FRONT**, TPE angular outlet (available in the colours ivory and copper) for balconies.
- **MAPEBAND TPE**, TPE tape for flexible sealing and waterproofing of structural joints, complete with “T” and cross profiles.

The waterproofing systems mentioned above allow preventative measures to be carried out on terraces and balconies:

- limiting the thickness of the protective layers;
- avoiding having to remove old floors, with clear undeniable advantages regarding the time required and the amount of waste material to dispose of, therefore a considerable saving on overall costs;

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- permits new tiles to be laid directly on the waterproofing layer. Compared with conventional waterproofing membranes placed between the floor slab and screed, this solution protects substrates to avoid the formation of efflorescence on porous tiles and joints and deterioration caused by freeze-thaw cycles.

4.1 TWO-COMPONENT WATERPROOFING

MAPELASTIC is a two-component flexible cementitious mortar.

MAPELASTIC is impermeable to water, thanks to the high content of synthetic resin in the composition, it guarantees permanent, flexible protection and impermeability to water up to a pressure of 1.5 bar (15 m of water head) of positive pressure.

MAPELASTIC is flexible, even at low temperatures: thanks to its flexibility and high elongation at failure, it guarantees protection and impermeability even on structures with cracks of 1 mm.

MAPELASTIC is easy to apply: thanks to its rheological properties which make the product very workable, it may be applied both manually with a flat metal trowel and by spray with suitable equipment, with the added advantage of reducing application times and creating a surface finish which requires no further treatment.

MAPELASTIC forms a barrier against aggressive agents: protects concrete structures from the aggressive action of carbon dioxide and, as a result, corrosion of steel reinforcement, the action of sodium chlorides in sea water, for example, and the presence of calcium chloride de-icing salts, which often cause deterioration of even high quality manufactured pieces.

MAPELASTIC is versatile: it may be used for an extremely wide range of applications, from waterproofing large infrastructures such as dams, channels and concrete basins for water storage, to the protection of viaduct piles and flexible waterproof protective layers on balconies, terraces and in bathrooms.

MAPELASTIC is long-lasting: its excellent bond strength, appropriate



Fig. 4.13 - Second layer of MONOLASTIC applied by trowel on MAPETEX SEL



Fig. 4.14 - Second layer of MONOLASTIC applied by trowel on MAPETEX SEL



Fig. 4.15 - MAPELASTIC AQUADEFENSE applied by brush on a floor-wall fillet joint before applying MAPEBAND

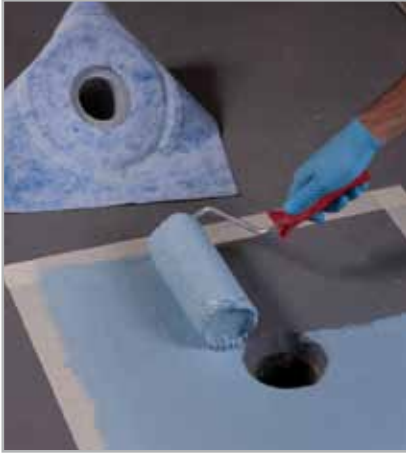


Fig. 4.16 - Applying MAPELASTIC AQUADEFENSE around a floor drain



Fig. 4.17 - Application of DRAIN VERTICAL on fresh MAPELASTIC AQUADEFENSE



Fig. 4.18 - Application with a roller of the second coat of MAPELASTIC AQUADEFENSE

flexibility which **does not vary with time** and elevated permeability leave surfaces treated with **MAPELASTIC** much more durable.

MAPELASTIC is a calibrated mix: with more than 70 years experience of MAPEI's Research & Development laboratories, you can be sure that the blend of components is perfectly calibrated, so nothing else needs to be added.

MAPELASTIC has been used for around 20 years to successfully waterproof and protect more than 300 million m² of surfaces. The product was developed to protect and waterproof large infrastructures such as viaduct piles, dams and channels, and over the years its outstanding quality has also become highly appreciated for waterproofing terraces, balconies and flat roofs, and for protecting façades and any other type of structure. Also, over the last few years, the MAPEI Research & Development laboratories have developed and perfected **MAPELASTIC SMART**, which is more fluid, has excellent workability when applied by trowel, brush or with a roller and is also highly flexible. **When reinforced with MAPETEX SEL, non-woven, macro-holed polypropylene fabric, the crack-bridging capacity of MAPELASTIC SMART exceeds 3 mm, which makes it particularly suitable for roofing terraces and terraces with a surface area of more than 50 m² or for substrates subjected to high dynamic stresses.**

4.2 ONE-COMPONENT WATERPROOFING

MAPEI's one-component waterproofing product is **MONOLASTIC**, waterproof cementitious mortar made from cementitious binders, selected fine-grained inert materials and highly flexible acrylic polymers. Once mixed with water, it forms a mix with excellent workability characteristics which is easy to apply with a trowel, roller or brush, and which may also be applied on vertical surfaces without running and without waste.

MONOLASTIC must be reinforced by laying **MAPETEX SEL** non-woven,

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macro-holed polypropylene fabric on the first layer of the product while still fresh.

4.3 READY-TO-USE WATERPROOFING

MAPELASTIC AQUADEFENSE is a totally solvent-free, ready-to-use, one-component, light blue synthetic resin paste in water dispersion which dries extremely quickly. **MAPELASTIC AQUADEFENSE** may be applied on: concrete, cementitious substrates and substrates made using special binders (**TOPCEM**, **TOPCEM PRONTO**, **MAPECEM** or **MAPECEM PRONTO**), plasterboard (internal applications only), internal anhydrite screeds (which must be treated beforehand with **PRIMER G**), existing ceramic, terrazzo and stone finishes, cementitious and gypsum-based plaster.

MAPELASTIC AQUADEFENSE is supplied ready-to-use and does not need to be mixed with a drill or mixer. It can be applied using a brush, long-haired roller or trowel in two even coats around 0.4 mm thick each, to obtain a final minimum thickness of 0.8 mm.

MAPELASTIC AQUADEFENSE dries very quickly to form a flexible membrane without a sticky surface. It is resistant to light pedestrian traffic after just 3 hours and forms an excellent grip with all types of adhesive for laying ceramic, stone and mosaic finishes. **MAPELASTIC AQUADEFENSE** does not need to be reinforced in that it has an inherent crack-bridging ability of 3.2 mm at +23°C and 1.6 mm at -5°C.

If **MAPELASTIC AQUADEFENSE** is applied on existing floors, we recommend inserting **MAPETEX SEL** reinforcement in the first coat of the product while it is still fresh.

MAPELASTIC AQUADEFENSE must always be covered by ceramic, stone or mosaic finishes, and ceramic tiles may be laid after just 4 hours.



Fig. 5.1 - Cracked screed



Fig. 5.2 - Floor drain with infiltrations



Fig. 5.3 - Deteriorated structural joint

5. REPAIRS TO WATERPROOFING LAYERS ON EXISTING STRUCTURES

5.1 PREVENTATIVE CHECKS

The first phase of installations on old structures is an in-depth analysis to determine the condition of the substrates to be repaired.

This phase is fundamentally important in order to define the most suitable type of waterproofing installation on the structure and the required decorative finish.

The initial checks include an analysis of:

- the strength of the floor and screed;
- the presence of dips and hollows;
- the correct fall.

On the basis of the results of the analysis, three main types of installations may be defined:

1. Waterproofing installed on top of existing floors;
2. Waterproofing after removing existing floors;
3. Demolition and complete repair of floors and screeds.

Also, before installing a waterproofing system, construction features which represent discontinuity in the waterproofing layer must be adequately protected:

- bodies which pass through horizontal surfaces;
- cracks;

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- attachment points for railings;
- drains;
- fillet joints between horizontal and vertical surfaces;
- structural and expansion joints.

A suitable method to protect each of these critical points will be illustrated in the following paragraphs.

5.2 WATERPROOFING SYSTEMS INSTALLED ON TOP OF EXISTING FLOORS

When the old floor is in good condition and well-bonded to the substrate, the system may be laid on top without having to carry out removal.

MAPEI waterproofing systems are suitable for waterproofing balconies and terraces, even if they are already tiled, without removing the old tiles, with a waterproofing layer-adhesive-tile system which is generally no more than 15 mm thick.

Before applying the waterproofing system, the skirting tiles need to be removed along with the first 10 cm of render above the floor. Detached and/or cracked tiles must be removed. Clean the old floor with a mixture of soap (caustic soda 30%) and rinse the floor thoroughly with water to remove all traces of caustic soda.

When the floor is clean and abraded to achieve a good bond with the layer of flexible cementitious mortar which is to be applied.

After the cleaning operation, seal all the **elements which pass through** the horizontal surface as follows:

- make a slit approximately 6 cm deep around each feature (Fig. 5.4);



Fig. 5.4 - Demolition around a drain-pipe



Fig. 5.5 - Extrusion of MAPEPROOF SWELL



Fig. 5.6 - Repairs to a substrate using MAPEGROUT 430



Fig. 5.7 - Applying MAPELASTIC or MAPELASTIC SMART around a floor drain



Fig. 5.8 - Application of DRAIN VERTICAL on fresh MAPELASTIC or MAPELASTIC SMART



Fig. 5.9 - Applying MAPELASTIC or MAPELASTIC SMART on DRAIN VERTICAL fabric

- Remove all the dust from inside the slit and apply a coat of **EPORIP** on the substrate, which should be dry or only slightly damp, making sure it penetrates into the particularly rough and porous areas to guarantee a perfect bond over the whole surface;
- Apply **MAPEPROOF SWELL** one-component, hydro-expanding paste for waterproof seals at the bottom of the slit (Fig. 5.5);
- Apply **MAPEGROUT 430** fine-grained, fibre-reinforced, shrinkage-compensated thixotropic mortar (Fig. 5.6) to the substrate while **EPORIP** is still fresh.

If there are **cracks** in the floor, remove the cracked tiles and open the cracks: vacuum to remove all traces of dust, seal the cracks with **EPORIP** and sprinkle the surface with quartz (fresh on fresh) to create a good gripping surface. The cracks in the floor must be carefully analysed to check if they have formed as the result of a control joint made in the underlying screed whose pattern has not been traced on the floor, a joint created naturally in the substrate due to the lack of control joints when installing the screed or a structural joint whose pattern has not been traced in the superstructure. In such cases, after removing the area of floor involved, the crack must be opened up with a hand grinder and sealed as described below and according to the type of joint. If the problem is due to a structural joint whose pattern has not been traced on the screed or floor, they must be demolished locally to bring the structural joint to the surface. The joint must then be sealed as described below. If the **correct fall** needs to be restored, dips and hollows need to be eliminated and the voids formed after removing the tiles need to be filled, use **ADESILEX P4** quick-hardening, cementitious smoothing and levelling compound for internal and external applications, for layers of from 3 to 20 mm. Apply the mix using a long, metal trowel. If necessary, several layers may be applied one after the other in rapid succession, as soon as the previous layer is set to light foot traffic. If thicknesses of more than

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3 cm need to be applied, use **TOPCEM PRONTO** pre-blended, ready-to-use, normal-setting, controlled-shrinkage mortar for quick-drying screeds after applying a bonding slurry made from **PLANICRETE**, water and **TOPCEM PRONTO** at a ratio of 1:1:12 (parts by weight). In this case, the remainder of the screed must be applied using the fresh on fresh technique, that is, by spreading on the required thickness of mortar immediately after applying the bonding slurry.

After completing the substrate as described above, or directly on the substrate if there are no hollows or other defects to be repaired, the construction features, such as attachment points for railings, drains, channels and fillets between horizontal surfaces, vertical surfaces and joints, must be treated. Where there are **attachment points for railings** and, therefore, metallic fittings which pass through the horizontal substrate, the continuity of the waterproofing layer must be guaranteed. We recommend sanding all metallic fittings to remove traces of loose material or material which is not well bonded, and applying a coat of **EPORIP** two-component, solvent-free epoxy adhesive. While the resin is still fresh, sprinkle quartz on the surface to create a rough surface to form a good bond with the flexible cementitious waterproofing mortar which will be applied later. Waterproofing around **drains** must be carried out using the special kits and components from the **DRAIN** range as described below:

- Even out the surface with **PLANITOP FAST 330**.
- Around the drain (Fig. 5.7) apply the first coat of the chosen waterproofing product (see section 4) to cover a larger area than that of the non-woven fabric.
- Position **DRAIN VERTICAL** or **DRAIN LATERAL** and press the fabric on to the waterproofing layer while it is still fresh (Fig. 5.8).



Fig. 5.10 - Application of DRAIN FRONT on fresh ADESILEX PG4



Fig. 5.11 - Application of ADESILEX PG4 to completely cover DRAIN FRONT



Fig. 5.12 -Sprinkling quartz on fresh ADESILEX PG4



Fig. 5.13 - Boundary around the zone where ADESILEX PG4 is to be applied



Fig. 5.14 - Applying the first layer of ADESILEX PG4



Fig. 5.15 - Applying MAPEBAND TPE on fresh ADESILEX PG4

- Cover the fabric with the waterproofing product and blend it in with the previous layer (Fig. 5.9).

Waterproofing in correspondence with drains in parapets must be carried out using **DRAIN FRONT**, TPE angular pipe unions for balconies, applied as follows:

- Make a hole in the parapet and floor large enough to insert **DRAIN FRONT**.
- Spread on an even layer of **ADESILEX PG4** two-component, thixotropic epoxy adhesive with a smooth trowel on the clean, dry substrate.
- Place **DRAIN FRONT** in position and press down lightly so that it is embedded in **ADESILEX PG4** (Fig. 5.10).
- Spread on a second coat of **ADESILEX PG4** fresh on fresh to completely cover **DRAIN FRONT** (Fig. 5.11).
- Smooth over the surface with a flat trowel and, while the product is still fresh, sprinkle on a layer of 0.5 spheroid quartz (Fig. 5.12) to create a substrate which is rough enough to form a good bond with the waterproofing product.
- Once the curing process of **ADESILEX PG4** has been completed, remove any loose quartz.

Flexible waterproofing of the **fillets between horizontal and vertical surfaces** must be carried out using **MAPEBAND**, alkali-resistant rubber reinforcing tape. Firstly, even out the masonry where the render has been removed using **NIVOPLAN**, levelling mortar with added synthetic latex, such as **PLANICRETE** at a rate of 2 litres per bag of

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mortar (used to partially replace the mixing water). The masonry may also be evened out using **PLANITOP FAST 330**, quick-setting, fibre-reinforced cementitious mortar for evening out irregularities from 3 to 30 mm on uneven substrates.

Once this layer has dried, bond **MAPEBAND** to the substrate as follows:

- Apply an even coat of the waterproofing product chosen (see section 4) with a smooth trowel on the clean, dry substrate.
- Lay **MAPEBAND** by pressing along the sides, making sure there are no creases or air bubbles.
- Lay another layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

In the corners, use the special components from the **MAPEBAND** range (**90° ANGLES** and **270° ANGLES**), while the joints between the strips and special pieces must be made using a double-buttering polychloroprenic contact adhesive in solvent such as **ADESILEX LP**. Apply **MAPEBAND** on the **control joints** in the substrate using the same technique as described above, making sure the strips are turned towards the inside of the joint in an upside-down “Ω” shape.

The **structural joints** must be waterproofed by bonding **MAPEBAND TPE** 1.2 mm thick tape with borders reinforced with polyester fabric. Bond in position using **ADESILEX PG4** two-component thixotropic epoxy adhesive as follows:

- Apply an even layer (Fig. 5.14) approximately 1-2 mm thick of **ADESILEX PG4** with a smooth trowel on the clean, dry substrate.

Try to avoid the adhesive running into the joint.



Fig. 5.16 - Applying the second layer of ADESILEX PG4



Fig. 5.17 - Sprinkling quartz on the second fresh layer



Fig. 5.18 - Removing the quartz not bonded after complete cure of ADESILEX PG4



Fig. 5.19 - Applying MAPETEX SEL on fresh



Fig. 5.20 - Embedding MAPETEX SEL in the first layer of MAPELASTIC SMART



Fig. 5.21 - Applying the second layer of MAPELASTIC SMART

- Lay on the upside-down “Ω” shaped **MAPEBAND TPE** so that only the polyester felt bonds to **ADESILEX PG4**. Press down along the sides, making sure there are no creases or air bubbles (Fig. 5.15).
- Apply a second layer of **ADESILEX PG4** fresh on fresh, and completely cover the sides of the tape with the second coat (Fig. 5.16).
- Smooth over the surface with a flat trowel and while the product is still fresh, sprinkle on a layer of 0.5 spheroid quartz (Fig. 5.17) to create a substrate which is rough enough to form a good bond with the waterproofing product.
- Once the curing process of the **ADESILEX PG4** has been completed, remove any loose quartz (Fig. 5.18).

The joints between the strips of **MAPEBAND TPE** may be made with a hot-air welding gun or by cold welding by overlapping the TPE part by at least 5 cm and bonding them together with a double-buttering polychloroprenic contact adhesive in solvent such as **ADESILEX LP**. We recommend laying **MAPEBAND TPE** inside the joint to form an upside-down “Ω” shape. After waterproofing and sealing the interruptions and critical points as described above, apply the waterproofing product chosen.

FOR TWO-COMPONENT PRODUCTS

Mixing of **MAPELASTIC** or **MAPELASTIC SMART** is carried out by pouring component B (liquid) into a suitable clean container and slowly adding component A (powder) while mixing. Mix the two components together for several minutes. Remove all traces of powder from the sides and bottom of the container and keep mixing until it is perfectly blended. Never carry out this operation manually. Use a low-speed mixer (to avoid air being dragged in) or a mortar mixer, which is generally supplied with

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rendering machines. If a mortar mixer is used, before pouring the mix out of the hopper, make sure that it is well mixed and that there are no lumps. **MAPELASTIC** and **MAPELASTIC SMART** must be applied within 60 minutes after mixing.

Spread two coats of **MAPELASTIC** on the clean, dry substrate using a smooth or notched trowel to form a total thickness of at least 2 mm.

Insert **MAPENET 150** (alkali-resistant glass fibre mesh) between the first and second coat to increase flexibility and its capacity to cover cracks up to 1.5 mm wide. After applying the first layer, insert **MAPENET 150** while it is still fresh.

Overlap adjacent strips of mesh at least 10 cm, and press it into the first coat with a flat trowel to ensure bond. Note that the first layer of **MAPELASTIC** must be applied in areas wider than 1.2 metres, so that when **MAPENET 150** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC** to ensure that it forms a continuous layer when the next area of product is applied, approx. 4-5 hours after applying the first layer in good weather, and in all cases before the first layer has completely dried, the second layer may be applied.

Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.

If a more flexible product is required, such as when the surfaces to be waterproofed has particularly large areas (between one control joint and another) and are subject, therefore, to high dynamic stresses, we recommend the use of **MAPELASTIC SMART**. The product may be applied by trowel or with a roller, making sure that the layer is even and at least 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene, non-woven fabric). Overlap adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to make sure it is perfectly embedded. Please note that the first layer of **MAPELASTIC SMART** must be applied in areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC SMART** to ensure that it forms a continuous layer when the next area of **MAPELASTIC SMART**



Fig. 5.22 - Second layer of MONOLASTIC applied by trowel on MAPETEX SEL



Fig. 5.23 - Second layer of MONOLASTIC applied by trowel on MAPETEX SEL



Fig. 5.24 - MAPELASTIC AQUADEFENSE applied by brush on a floor-wall fillet joint before applying MAPEBAND



Fig. 5.25 - Embedding the white fabric of MAPEBAND in fresh MAPELASTIC AQUADEFENSE



Fig. 5.26 - Complete covering of the non-woven DRAIN VERTICAL fabric with MAPELASTIC AQUADEFENSE



Fig. 5.27 - Application with a roller of the second coat of MAPELASTIC AQUADEFENSE

is applied. 4-5 hours after applying the first layer in good weather, and in all cases before the first layer has completely dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.

After applying **MAPELASTIC** or **MAPELASTIC SMART**, let it cure for at least 4-5 days (according to weather conditions; in low temperatures more time is required) before laying the ceramic tiles.

FOR ONE-COMPONENT PRODUCT

Pour the water required for mixing into a suitable clean container. Then slowly add **MONOLASTIC** while mixing, and continue mixing carefully for a further 3 minutes until it is completely blended, making sure that all the product is also removed from the sides and bottom of the container. A low-speed mechanical mixer is recommended for this operation, to avoid too much air being trapped in the mix. Avoid mixing the product manually.

MONOLASTIC must be applied with a brush, roller or by trowel, making sure that the layer is even and at least 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene non-woven fabric). Overlap adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to make sure it is embedded. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of the **MONOLASTIC** to ensure that it forms a continuous layer when the next pitch of product is applied approx. 2 hours after applying the first layer in good weather, and in all cases before the first layer has completely dried, the second layer may be applied. Make sure the second layer completely covers the **MAPETEX SEL**, and finish off the surface with a flat trowel. After completing the application cycle of **MONOLASTIC** wait at least 2 days before laying the ceramic tiles.

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FOR READY-TO-USE PRODUCT

MAPELASTIC AQUADEFENSE is supplied ready to use and does not need to be mixed. On existing floors, after carrying out the checks mentioned in section 5.1, carefully check the condition of the tile joints. If the joints are empty, deteriorated or are not flush with the surface of the floor, fill all the gaps with **ADESILEX P4**, quick-hardening cementitious smoothing and levelling compound for internal and external layers from 3 to 20 mm thick. Apply **MAPELASTIC AQUADEFENSE** with a longhaired roller, brush or trowel in an even layer minimum 0.4 mm thick. Approximately 1 hour after applying the first layer in good weather, and in all cases before the first layer has completely dried, the second layer may be applied and the surface finished off with a flat trowel. The final thickness of **MAPELASTIC AQUADEFENSE** must be minimum 0.8 mm in order to create a robust, flexible continuous film. Make sure there are no interruptions in the film caused by imperfections in the substrate. After applying **MAPELASTIC AQUADEFENSE** wait approximately 4 hours for curing and then lay the ceramic tiles.

The render removed (as described in section 5.2) to make space for an upstand of waterproofing product directly on the masonry, must be repaired with **PLANITOP FAST 330** or **NIVOPLAN + PLANICRETE**, reinforced with metallic mesh. For indications regarding tiling and grouting and sealing joints, please refer to sections 8 and 9.

Note: If flat roofs are not required to accept foot traffic, **MAPELASTIC** and **MAPELASTIC SMART** may be left exposed in that they are resistant to UV rays. If a coloured finish is required, **MAPELASTIC** and **MAPELASTIC SMART** may be painted over with **ELASTOCOLOR PAINT**, protective and decorative flexible acrylic resin paint in water dispersion.

MONOLASTIC and **MAPELASTIC AQUADEFENSE** on the other hand, must always be covered with a flooring material.



Fig. 5.28 - Removing the existing floor not bonded to the substrate



Fig. 5.29 - Sanding the substrate to remove the old adhesive from the screed



Fig. 5.30 - Applying PRIMER 3296 to consolidate the screed with a sprinkling of sand on the surface



Fig. 5.31 - Opening the cracks in the screed with a grinder



Fig. 5.32 - Sealing the cracks with EPORIP



Fig. 5.33 - Sprinkling quartz on fresh EPORIP

5.3 WATERPROOFING AFTER REMOVING EXISTING FLOORS

If the floor is in a poor state and is not well bonded to the substrate, it must be removed and the substrate must be scarified (with a singlehead brush with a carbide disk or other suitable means) to eliminate the layer of hardened adhesive on the old screed.

The skirting also needs to be removed along with the first 10 cm of render above the floor finish level.

Check the compactness and mechanical characteristics of the screed. If it is compact with just a light layer of dust on the surface, before proceeding with the next steps of the renovation, treat the surface with **PRIMER 3296** diluted 1:1 with water, applied on the clean, dry substrate with a roller, large brush or watering can.

After the cleaning operation, seal all the **elements which pass through** the horizontal surface as follows:

- Make a chase approximately 6 cm deep around each penetration;
 - Remove all the dust from inside the chase and apply a coat of **EPORIP**, solvent-free, two-component, epoxy adhesive on the surface of the chase.
- Apply **EPORIP** on the substrate, which should be dry or only slightly damp, making sure it penetrates into the particularly rough and porous areas to guarantee a perfect bond over the whole surface;
- Apply **MAPEPROOF SWELL**, one-component hydro-expanding paste for waterproof seals at the bottom of the chase;
 - Repair the substrate, while **EPORIP** is still fresh, with **MAPEGROUT 430**, fine-grained, fibre-reinforced, shrinkage compensated, thixotropic mortar.

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Before continuing, if there are **cracks**, in the screed, open them up (Fig. 5.31) with a hand grinder for example, and vacuum all traces of dust, seal the cracks with **EPORIP** (Fig. 5.32) and, sprinkle a layer of quartz on the surface (Fig. 5.33) fresh on fresh to form a good bond. As with the case examined previously, the cracks in the screed must be analysed carefully. If the cracks are caused by structural joints whose pattern has not been traced on the screed, it must be demolished locally to bring the structural joint into the open. The joint must then be sealed as described below.

If the **correct slope** needs to be restored and dips and hollows have to be filled, apply **ADESILEX P4**, quick-hardening, cementitious smoothing and levelling compound for internal and external applications, for layers from 3 to 20 mm, or **PLANITOP FAST 330**, fibre-reinforced, quick-setting, cementitious mortar to even out thicknesses from 3 to 30 mm of irregular, uneven substrates. If thicknesses of more than 3 cm need to be applied, make up the difference using **TOPCEM PRONTO**, pre-blended, ready-to-use, normal-setting, shrinkage-controlled mortar for quick-drying screeds after applying bonding slurry made from **PLANICRETE**, water and **TOPCEM PRONTO**, at a ratio of 1:1:12 (parts by weight).

In this case the screed must be applied using the fresh on fresh technique, that is, by spreading on the required thickness of mortar immediately after applying the bonding slurry.

After completing the substrate as described above, or directly on the substrate if there are no hollows or other defects to be repaired, the construction features, such as attachment points for railings, drains, channels and fillets between horizontal surfaces, vertical surfaces and joints, must be treated. Where there are **attachment points for railings** and, therefore, metallic fittings which pass through the horizontal substrate, the continuity of the waterproofing layer must be guaranteed. We recommend sanding all metallic fittings to remove traces of loose material or material which is not well bonded, and applying a coat of



Fig. 5.34 - Applying MAPELASTIC or MAPELASTIC SMART around a floor drain



Fig. 5.35 - Application of DRAIN VERTICAL on fresh MAPELASTIC or MAPELASTIC SMART



Fig. 5.36 - Applying MAPELASTIC or MAPELASTIC SMART on DRAIN VERTICAL fabric



Fig. 5.37 - Application of DRAIN FRONT on fresh ADÉSILEX PG4



Fig. 5.38 - Application of ADÉSILEX PG4 to completely cover DRAIN FRONT



Fig. 5.39 - Sprinkling quartz on fresh ADÉSILEX PG4

EPORIP two-component, solvent-free epoxy adhesive. While the resin is still fresh, sprinkle quartz on the surface to create a rough surface to form a good bond with the flexible cementitious waterproofing mortar which will be applied later. Waterproofing around **drains** must be carried out using special kits and components from the **DRAIN** range as described below:

- Even out the surface where required with **PLANITOP FAST 330**.
- Around the drain (Fig. 5.34) apply the first coat of the chosen waterproofing product (see section 4) to cover a larger area than that of the non-woven fabric.
- Position **DRAIN VERTICAL** or **DRAIN LATERAL** and press the fabric onto the waterproofing layer while it is still fresh (Fig. 5.35).
- Cover the fabric with the waterproofing product and blend it in with the previous layer (Fig. 5.36).

Waterproofing in correspondence with drains in parapets must be carried out using **DRAIN FRONT**, TPE angular pipe unions for balconies, applied as follows:

- Make a hole in the parapet and floor large enough to insert **DRAIN FRONT**.
- Spread on an even layer of **ADÉSILEX PG4**, two-component, thixotropic, epoxy adhesive with a smooth spatula on the clean, dry substrate.
- Place **DRAIN FRONT** in position and press down lightly so that it is embedded in **ADÉSILEX PG4** (Fig. 5.37).

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- Spread on a second coat of **ADESILEX PG4**, fresh on fresh, to completely cover **DRAIN FRONT** (Fig. 5.38).
- Smooth over the surface with a flat trowel and, while the product is still fresh, sprinkle on a layer of angular quartz (Fig. 5.39) to create a substrate which is rough enough to form a good bond with the waterproofing product.
- Once the curing process of the **ADESILEX PG4**, has been completed, remove any loose quartz.

Flexible waterproofing of the **fillets between horizontal and vertical surfaces** must be carried out using **MAPEBAND**, alkali-resistant rubber tape with felt. Even out the masonry where the render has been removed using **NIVOPLAN**, levelling render with added synthetic rubber latex, **PLANICRETE** at a rate of 2 litres per bag of mortar (used to partially replace the mixing water) or the masonry may be evened out using **PLANITOP FAST 330**, quick-setting, fibre-reinforced, cementitious mortar for evening out irregularities from 3 to 30 mm on irregular, uneven substrates. Once this layer has dried, bond **MAPEBAND** to the substrate as follows:

- Apply an even coat of the waterproofing product chosen (see section 4) with a smooth trowel on the clean, dry substrate.
- Lay **MAPEBAND**, by pressing along the sides, making sure there are no creases or air bubbles.
- Lay another layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

In the corners, use the special components from the **MAPEBAND**



Fig. 5.40 - Spreading ADESILEX LP on MAPEBAND T



Fig. 5.41 - Spreading ADESILEX LP on MAPEBAND



Fig. 5.42 - Bonding MAPEBAND T and MAPEBAND together by overlapping their ends



Fig. 5.43 - Applying the first layer of ADESILEX PG4



Fig. 5.44 - After laying MAPEBAND TPE on fresh ADESILEX PG4 apply the second layer



Fig. 5.45 - Sprinkling quartz on the second fresh layer

range (**90° ANGLES** and **270° ANGLES**) while the joints between the strips and special pieces must be made using a double-buttering polychloroprenic contact adhesive in solvent solution such as **ADESILEX LP**.

Apply **MAPEBAND** in the control joints in the substrate using the same technique as described above, making sure the strips are turned towards the inside of the joint in an upside-down “Ω” shape. Structural joints must be waterproofed by bonding **MAPEBAND TPE**, in the upside-down “Ω” shape, taking care to bond only the polyester felt of the 1.2 mm thick TPE tape reinforced along the edges with polyester fabric. Bond in position using **ADESILEX PG4**, two-component thixotropic epoxy adhesive as follows:

- Apply an even layer (Fig. 5.43) approximately 1-2 mm thick of **ADESILEX PG4**, with a smooth trowel on the clean, dry substrate. Avoid the adhesive running into the joint.
- Lay on the upside-down “Ω” shaped **MAPEBAND TPE**, so that only the polyester felt bonds to the **ADESILEX PG4**, Press down along the sides, making sure there are no creases or air bubbles.
- Apply a second layer of **ADESILEX PG4**, fresh on fresh, and completely cover the sides of the tape with the second coat (Fig. 5.44).
- Smooth over the surface with a flat trowel and, while the product is still fresh, sprinkle on a layer of 0.5 angular quartz (Fig. 5.45) to create a substrate which is rough enough to form a good bond with the waterproofing product.
- Once the reticulation process of the **ADESILEX PG4**, has been completed, remove any loose quartz.

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The joints between the strips of **MAPEBAND TPE** may be made with a hot-air welding gun or by cold welding by overlapping the TPE part by at least 5 cm and bonding them together with a double-buttering polychloroprenic contact adhesive in solvent solution, such as **ADESILEX LP**. We recommend laying **MAPEBAND TPE** inside the joint to form an upside-down “Ω” shape.

After waterproofing and sealing the interruptions and critical points as described above, apply the waterproofing product chosen.

FOR TWO-COMPONENT PRODUCTS

Mixing of **MAPELASTIC** or **MAPELASTIC SMART** is carried out by pouring component B (liquid) into a suitable clean container and slowly adding component A (powder) while mixing. Mix the two components together for several minutes. Remove all traces of powder from the sides and bottom of the container and keep mixing until it is perfectly blended. Never carry out this operation manually. Use a low-speed mixer (to avoid air being dragged in) or a mortar mixer. Make sure that the mortar is well mixed and that there are no lumps before pouring the mix out of the hopper **MAPELASTIC** or **MAPELASTIC SMART** must be applied within 60 minutes after mixing.

Spread two coats of **MAPELASTIC** on the clean, dry substrate using a smooth or notched trowel to form a total thickness of at least 2 mm. Insert **MAPENET 150** (alkali-resistant glass fibre mesh) between the first and second coat to increase flexibility and ensure its capacity to cover cracks up to 1.5 mm wide. After applying the first coat, insert **MAPENET 150** (alkali-resistant glass fibre mesh) on the product while it is still fresh, overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to embed **MAPENET 150**. Note that the first layer of product must be applied in areas wider than 1.2 metres, so that when **MAPENET 150** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC** to guarantee that



Fig. 5.46 - Spreading the first coat of MAPELASTIC starting from the structural joint



Fig. 5.47 - Impregnating MAPENET 150 in the first fresh layer of MAPELASTIC



Fig. 5.48 - Application of the second coat of MAPELASTIC



Fig. 5.49 - Application of the first coat of MAPELASTIC



Fig. 5.50 - Embedding MAPENET 150 in the first fresh layer of MAPELASTIC



Fig. 5.51 - Application of the second layer of MAPELASTIC SMART

it forms a continuous layer when the next area of product is applied. Approx. 4-5 hours after applying the first layer in good weather, and in all cases when the first layer hasn't completely dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel. If a more flexible product is required, such as when the surfaces to be waterproofed has particularly large areas (between one control joint and another) and are subject, therefore, to high dynamic stresses, we recommend the use of **MAPELASTIC SMART**.

The product may be applied by trowel or with a roller, making sure that the layer is even and at least 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene, non-woven fabric). Overlap adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to make sure it is perfectly embedded. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC SMART** to ensure that it forms a continuous layer when the next area of **MAPELASTIC** is applied. Approx. 4-5 hours after applying the first layer in good weather, and in all cases before the first layer has completely dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.

FOR ONE-COMPONENT PRODUCT

Pour the water required for mixing into a suitable clean container. Then slowly add **MONOLASTIC**, while mixing, and continue mixing carefully for a further 3 minutes until it is completely blended, making sure that all the product is also removed from the sides and bottom of the container. A low-speed mechanical mixer is recommended for this operation, to avoid too much air being entrapped in the mix. Avoid mixing the product manually.

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MONOLASTIC must be applied with a brush, roller or by trowel, making sure that the layer is even and minimum 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene, non-woven fabric). Overlay adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to ensure it is embedded. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MONOLASTIC** to guarantee that it forms a continuous layer when the next area of product is applied. Approx. 2 hours after applying the first layer in good weather, and in all cases before the first layer has completely dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel. After completing the application cycle of **MONOLASTIC** wait at least 2 days before laying the ceramic tiles.

FOR READY-TO-USE PRODUCT

MAPELASTIC AQUADEFENSE is supplied ready to use and does not need to be mixed. Apply with a long-haired roller, brush or trowel in two even layers at minimum 0.4 mm thick per coat for a final thickness of at minimum 0.8 mm in order to create a robust, flexible continuous film. Make sure there are no interruptions in the membrane caused by imperfections in the substrate.

After applying **MAPELASTIC AQUADEFENSE** wait approximately 4 hours for curing and then lay the ceramic.

The render removed (as described in section 5.3) to make space for a skirt of waterproofing product directly on the masonry, must be repaired with **MAPEGROUT 430**, fine-grained, fibre-reinforced, shrinkage-controlled thixotropic mortar. For indications regarding laying coatings and grouting and sealing joints, please refer to sections 8 and 9.



Fig. 5.52 - Second layer of MONOLASTIC applied by trowel on MAPETEX SEL



Fig. 5.53 - Second layer of MONOLASTIC applied by trowel on MAPETEX SEL



Fig. 5.54 - Spreading ADESILEX LP on the ends of MAPEBAND and MAPEBAND 90° ANGLE



Fig. 5.55 - Application of MAPEBAND on fresh MAPELASTIC AQUADEFENSE



Fig. 5.56 - Application with a roller of the first coat of MAPELASTIC AQUADEFENSE



Fig. 5.57 - Application with a roller of the second coat of MAPELASTIC AQUADEFENSE

Note: If flat roofs are not to accept foot traffic, **MAPELASTIC** and **MAPELASTIC SMART** may be left exposed as they are resistant to UV rays. If a coloured finish is required, **MAPELASTIC** and **MAPELASTIC SMART** may be painted over with **ELASTOCOLOR PAINT** protective and decorative flexible acrylic resin paint in water dispersion.

MONOLASTIC and **MAPELASTIC AQUADEFENSE**, on the other hand, must always be covered with a flooring material.

5.4 DEMOLITION AND COMPLETE REPAIR OF FLOORS AND SCREEDS

If the mechanical properties and other characteristics (see Technical Notebook for the installation of screeds) of the screed are considered to be unsuitable for the installation of a waterproofing system and floor, the floor must be demolished and the underlying screed must be removed. The skirting also needs to be removed along with the first 10 cm of render above the floor. After the above operations, seal all the **penetrations through** the floor slab as follows:

- make a chase approximately 6 cm deep around each element;
- remove all the dust from inside the chase and apply a coat of **EPORIP**, solvent-free, two-component epoxy adhesive on the surface of the chase. Apply **EPORIP** on the substrate, which should be dry or only slightly damp, making sure it penetrates into the particularly rough and porous areas to guarantee a perfect bond over the whole surface;
- apply **MAPEPROOF SWELL**, one-component, hydro-expanding paste for waterproof seals at the bottom of the chase;
- repair the substrate while **EPORIP** is still fresh with **MAPEGROUT 430**, fine-grained, fibre-reinforced, shrinkage-compensated thixotropic mortar.

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If there are structural joints on the floor slab, their pattern must be traced on the screed and floor and sealed as described below.

The new screed must be installed according to the guidelines in section 3.2, making sure that the correct fall is installed to permit rainwater to flow off. If a stone or marble kerb is to be formed around the external perimeter of the balcony or terrace, a drop must be formed in the screed in correspondence with the kerb. The waterproofing layer will then be able to be installed under the kerb to guarantee a complete, continuous waterproofing layer. The step created when installing the screed will help to perfectly align the floor and kerb, which often have different thicknesses. Once the screed has completely cured (usually 1 week per cm of thickness, or at least 28 days for sand and cement screeds, 24 hours for **TOPCEM** and **TOPCEM PRONTO** and 4 hours for **MAPECEM** and **MAPECEM PRONTO**), the construction elements, such as attachment points for railings, drains, channels and fillets between horizontal and vertical surfaces may be prepared. Where there are **attachment points for railings** and, therefore, metallic fittings which pass through the horizontal substrate, the continuity of the waterproofing layer must be guaranteed. We recommend sanding all metallic fittings to remove traces of loose material or material which is not well bonded, and applying a coat of **EPORIP**, two-component, solvent-free, epoxy adhesive. While the resin is still fresh, sprinkle quartz on the surface to create a rough surface to form a good bond with the flexible cementitious waterproofing mortar which will be applied later. Waterproofing around drains must be carried out using special kits and components from the **DRAIN** range as described below:

- Even out the surface where required with **PLANITOP FAST 330**.
- Around the drain (Fig. 5.58) apply the first coat of the chosen waterproofing product (see section 4) to cover a larger area than that of the non-woven fabric.



Fig. 5.58 - Applying MAPELASTIC or MAPELASTIC SMART around a floor drain



Fig. 5.59 - Positioning DRAIN VERTICAL



Fig. 5.60 - Inserting DRAIN VERTICAL on fresh MAPELASTIC or MAPELASTIC SMART



Fig. 5.61 - Press the non-woven DRAIN VERTICAL fabric on MAPELASTIC or MAPELASTIC SMART



Fig. 5.62 - Application of MAPELASTIC or MAPELASTIC SMART on DRAIN VERTICAL fabric



Fig. 5.63 - Accessory pieces for DRAIN VERTICAL: telescopic extension, anti-odour plug and removable stainless steel grate

- Position **DRAIN VERTICAL** or **DRAIN LATERAL** (Fig. 5.60) and press the fabric on to the waterproofing layer while it is still fresh.
- Cover the fabric with the waterproofing product and blend it in with the previous layer (Fig. 5.62).

Waterproofing in correspondence with drains in parapets must be carried out using **DRAIN FRONT**, TPE angular pipe unions for balconies, applied as follows:

- Make a hole in the parapet and floor large enough to insert **DRAIN FRONT**.
- Spread on an even layer of **ADESILEX PG4**, two-component, thixotropic, epoxy adhesive with a smooth trowel on the clean, dry substrate.
- Place **DRAIN FRONT** in position and press down lightly so that it is embedded in **ADESILEX PG4** (Fig. 5.64).
- Spread on a second coat of **ADESILEX PG4**, fresh on fresh to completely cover **DRAIN FRONT** (Fig. 5.65).
- Smooth over with a flat trowel and, while the product is still fresh, sprinkle on a layer of 0.5 angular quartz to form a rough layer to help the waterproofing product to form a good bond.
- Once the curing process of the **ADESILEX PG4**, has been completed, remove any loose quartz.

Flexible waterproofing of the **fillets between horizontal and vertical** surfaces must be carried out using **MAPEBAND**, alkali-resistant rubber tape with felt. Even out the masonry where the render has been removed

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using **NIVOPLAN**, levelling mortar with added synthetic rubber latex, **PLANICRETE** at a rate of 2 litres per bag of mortar (used to partially replace the mixing water). The masonry may also be evened out using **PLANITOP FAST 330**, quick-setting, fibre-reinforced, cementitious mortar for evening out irregularities from 3 to 30 mm on uneven substrates. Once this layer has dried, bond **MAPEBAND** to the substrate as follows:

- Apply an even coat of the waterproofing product chosen (see section 4) with a smooth trowel on the clean, dry substrate.
- Lay **MAPEBAND**, by pressing along the sides, making sure there are no creases or air bubbles.
- Apply another layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

In the corners, use the special components from the **MAPEBAND (90° ANGLES and 270° ANGLES)** while the joints between the strips and special pieces must be made using a double-buttering polychloroprenic contact adhesive such as **ADESILEX LP**. Apply **MAPEBAND** in the **control joints** in the substrate using the same technique as described above, making sure the strips are turned towards the inside of the joint in an upside-down “Ω” shape. The structural joints must be waterproofed by bonding **MAPEBAND TPE**, 1.2 mm thick tape with borders reinforced with polyester fabric. Bond in position using **ADESILEX PG4**, two-component, thixotropic epoxy adhesive as follows:

- Apply a 1-2 mm thick layer of **ADESILEX PG4**, with a smooth trowel on the clean, dry substrate. Avoid the adhesive running into the joint.
- Lay on the upside-down “Ω” shaped **MAPEBAND TPE**, so that only



Fig. 5.64 - Application of DRAIN FRONT on fresh ADESILEX PG4



Fig. 5.65 - Application of ADESILEX PG4 to completely cover DRAIN FRONT



Fig. 5.66 - Application of MAPELASTIC or MAPELASTIC SMART in the wall-floor fillet joint to apply MAPEBAND around DRAIN FRONT



Fig. 5.67 - Insertion of upside-down “Ω” shaped MAPEBAND CROSS in the control joint and application of MAPELASTIC or MAPELASTIC SMART around the joint



Fig. 5.68 - Embedding the white fabric of MAPEBAND in fresh MAPELASTIC or MAPELASTIC SMART



Fig. 5.69 - Application of MAPELASTIC or MAPELASTIC SMART on white MAPEBAND fabric

the polyester felt bonds to **ADESILEX PG4**. Press down along the sides, making sure there are no creases or air bubbles.

- Apply a second layer of **ADESILEX PG4**, fresh on fresh, and completely cover the sides of the tape with the second coat.
- Smooth over with a flat trowel and, while the product is still fresh, sprinkle on a layer of 0.5 angular quartz to form a rough layer to help the waterproofing product form a good bond.
- Once the curing process of **ADESILEX PG4** has been completed, remove any loose quartz.

The joints between the strips of **MAPEBAND TPE** to be made with a hot-air welding gun or by cold welding by overlapping the TPE part by at least 5 cm and bonding them together with a double-buttering polychloroprenic contact adhesive in solvent **ADESILEX LP**. We recommend laying **MAPEBAND TPE** inside the joint to form an upside down “Ω” shape. After waterproofing and sealing the joints and critical points as described above, apply the waterproofing product chosen.

FOR TWO-COMPONENT PRODUCTS

Mixing of **MAPELASTIC** or **MAPELASTIC SMART** is carried out by pouring component B (liquid) into a suitable clean container and slowly adding component A (powder) while mixing. Mix the two components together for several minutes. Remove all traces of powder from the sides and bottom of the container and keep mixing until it is perfectly blended. Never carry out this operation manually. Use a low-speed mixer (to avoid air being dragged in) or a mortar mixer. If a mortar mixer is used, before pouring the mix out of the hopper, make sure that it is well

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mixed and that there are no lumps. **MAPELASTIC** and **MAPELASTIC SMART** must be applied within 60 minutes after mixing.

Spread 2 coats of **MAPELASTIC** on the clean, dry substrate using a smooth or notched trowel to form a total thickness of at least 2 mm. Insert **MAPENET 150** (alkali-resistant, glass fibre mesh) between the first and second coat to increase flexibility and guarantee its capacity to cover cracks up to 1.5 mm wide. Insert **MAPENET 150** on **MAPELASTIC** while it is still fresh, overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to ensure embedding. Note that the first layer of product must be applied in areas wider than 1.2 metres, so that when **MAPENET 150** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC** to guarantee that it forms a continuous layer when the next pitch of product is applied approx. 4-5 hours after applying the first layer in good weather conditions, and in all cases only when the first layer has dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.

If a more flexible product is required, such as when the surfaces to be waterproofed has particularly large areas (between one control joint and another) and are subject, therefore, to high dynamic stresses, we recommend the use of **MAPELASTIC SMART**. The product may be applied by trowel or with a roller, making sure that the layer is even and minimum 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene, non-woven fabric). Overlap adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to make sure it is perfectly buttered. Please note that the first layer of product must be applied in areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC SMART** to ensure that it forms a continuous layer when the next area of product is applied. Approx.4-5 hours after applying the first layer in good weather, and in



5.70 - Spreading the first coat of MAPELASTIC starting from the control joint



5.71 - Application of MAPENET 150 starting from the control joint followed by embedding MAPENET 150 in the first fresh layer of MAPELASTIC



5.72 - Application of the second coat of MAPELASTIC, being careful not to let it run into the control joint



5.73 - Laying MAPETEX SEL on fresh MAPELASTIC SMART



5.74 - Embedding MAPETEX SEL in the first fresh layer of MAPELASTIC SMART



5.75 - Application of the second coat of MAPELASTIC SMART

all cases only when the first layer has dried, the second layer may be applied. Make sure the second layer completely covers the fabric, and finish off the surface with a flat trowel.

FOR ONE-COMPONENT PRODUCT

Pour the water required for mixing into a suitable clean container. Then slowly add **MONOLASTIC** while mixing, and continue mixing carefully for a further 3 minutes until it is completely blended, making sure that all the product is also removed from the sides and bottom of the container. A low-speed mechanical mixer is recommended for this operation, to avoid too much air being entrapped in the mix. Avoid mixing the product manually.

MONOLASTIC must be applied with a brush, roller or by trowel, making sure that the layer is even and minimum 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene, non-woven fabric). Overlay adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to make sure it is perfectly embedded. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MONOLASTIC** to ensure that it forms a continuous layer when the next area of product is applied ca. 2 hours after applying the first layer in good weather conditions, and in all cases before the first layer has completely dried, the second layer may be applied.

Make sure the second layer completely covers the fabric, and finish off the surface with a flat trowel. After completing the application cycle of **MONOLASTIC** wait at least 2 days before laying the ceramic tiles.

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FOR READY-TO-USE PRODUCT

MAPELASTIC AQUADEFENSE is supplied ready to use and does not need to be mixed. Apply with a long-haired roller, brush or trowel in 2 even layers at minimum 0.4 mm thick per coat for a final thickness of minimum 0.8 mm in order to create a robust, flexible continuous film. Make sure there are no interruptions in the film caused by imperfections in the substrate.

After applying **MAPELASTIC AQUADEFENSE** wait approximately 4 hours for curing and then lay the tiles.

The render removed (as described in section 5.4) to make space for a skirt of waterproofing product directly on the masonry, must be repaired with **MAPEGROUT 430**, fine-grained, fibre-reinforced, shrinkage-controlled thixotropic mortar. For indications regarding laying coatings and grouting and sealing joints, please refer to sections 8 and 9.

Note: If flat roofs are not to accept foot traffic, **MAPELASTIC** and **MAPELASTIC SMART** may be left exposed in that they are resistant to UV rays. If a coloured finish is required, **MAPELASTIC** and **MAPELASTIC SMART** may be painted over with **ELASTOCOLOR PAINT**, protective and decorative flexible acrylic resin paint in water dispersion. **MONOLASTIC** and **MAPELASTIC AQUADEFENSE** on the other hand, must always be covered with a flooring material.



Fig. 6.1 - Corner of the concrete expelled due to corrosion of the reinforcement steel



Fig. 6.2 - Deteriorated front edge of a balcony



Fig. 6.3 - MAPESHIELD I applied on the reinforcement steel of an element under repair



Fig. 6.4 - Cutting a self-bonding plate of pure zinc
MAPESHIELD E 25



Fig. 6.5 - Removing the protective backing from the
conductive adhesive gel



Fig. 6.6 - Detail of the connections leading from the
reinforcement steel

6. REPAIRS TO FRONT EDGES OF BALCONIES

When carrying out repairs to waterproofing layers on balconies and terraces, it will probably be necessary to repair the deteriorated front edges. In this case, all the render and the deteriorated concrete must be removed down to the reinforcement steel and all rust and foreign bodies must be removed mechanically from the reinforcement steel. The entire surface must be thoroughly cleaned to remove all dust and residues of loose concrete, to form a sound, strong, irregular substrate with a surface roughness of several mm. Isolate the reinforcement steel by applying **MAPEFER 1K**, one-component, anti-corrosion cementitious mortar for protecting steel.

As an alternative to **MAPEFER 1K**, when there are particularly aggressive agents present such as chlorides, **MAPESHIELD I**, pure zinc galvanic anodes coated with a special conductive paste may be applied in the layer of repair mortar. **MAPESHIELD I** is connected to the reinforcement rods using special metallic ties to fix them firmly in place so they do not move during the repair operations. Leave enough space around the anodes to allow the mortar to penetrate when it is applied.

After isolating the reinforcement rods (with **MAPEFER 1K** or **MAPESHIELD I**) repair the concrete layer as follows:

- saturate the surface with water so that the substrate is saturated with a dry surface;
- re-build the concrete layer removed during demolition with **MAPEGROUT 430**, fine-grained, fibre-reinforced, medium-strength, shrinkage compensated thixotropic mortar. **MAPEGROUT 430** may also include 0.25% of **MAPECURE SRA**, curing agent, which reduces plastic and hydraulic shrinkage and limits the formation of micro cracks;

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- protect and even out all the surface with **MAPELASTIC** or **MAPELASTIC SMART**, two-component, flexible cementitious mortar, applied in two coats by trowel, brush or roller. We recommend inserting a layer of 4 mm x 4.5 mm **MAPENET 150**, alkali-resistant, glass fibre, reinforcement mesh on the first layer while still fresh;
- apply a finishing coat of **ELASTOCOLOR PAINT**, flexible, protective and decorative synthetic resin-based paint in water dispersion for concrete.

If galvanic protection has been selected for the protection of reinforcement of rods and there is not enough space to apply **MAPESHIELD I**, use **MAPESHIELD E 25**, self-adhesive zinc plates which are placed directly on the external surface of the structure. Before re-building the demolished concrete, connect one or two electric cables to the reinforcement rods and join them to the anodes by welding or with mechanical fasteners. Then continue as follows:

- repair the section using **MAPEGROUT 430**, as described above;
- apply **MAPESHIELD E 25**;

seal the plates in the exposed ends and joints with **MAPEFLEX PU45**, flexible polyurethane sealant and adhesive after treating the edges with **PRIMER M**.

Sealing the plates will stop water seeping in between the plates and substrate;

- protect and even out all the surface with two layers of **MAPELASTIC** or **MAPELASTIC SMART** two-component, flexible, cementitious mortar applied by trowel, brush or roller. We recommend inserting a



Fig. 6.7 - Fastening the metallic connectors of MAPESHIELD E 25 in place with clips



Fig. 6.8 - Protection and smoothing of the surface of MAPELASTIC



Fig. 6.9 - Embedding MAPENET 150 in the first fresh layer of MAPELASTIC



Fig. 7.1 - Applying MAPELASTIC or MAPELASTIC SMART around a floor drain



Fig. 7.2 - Application of DRAIN VERTICAL on fresh MAPELASTIC or MAPELASTIC SMART



Fig. 7.3 - Application of MAPELASTIC or MAPELASTIC SMART on DRAIN VERTICAL fabric

layer of 4 mm x 4.5 mm **MAPENET 150** alkali-resistant, glass fibre reinforcement mesh on the first layer while still fresh;

- apply a finishing coat of **ELASTOCOLOR PAINT**, flexible, protective and decorative synthetic resin-based paint in water dispersion for concrete.



7. WATERPROOFING NEW STRUCTURES

If the external render has already been applied while installing the waterproofing system, it is necessary to remove the render up to a ca. 10 cm height from the finished to be laid. This operation is necessary to ensure the possibility of turning the waterproofing system directly on the masonry and not on the render, in accordance with regulation.

If there are structural joints on the floor slab, their pattern must be traced on the screed and floor and sealed as described below. The screed must be installed according to the guidelines in section 3.2, making sure that the correct fall is installed to permit rainwater to flow off. If a stone or marble kerb is to be installed around the external perimeter of the balcony or terrace, a drop must be formed in the screed in correspondence with the kerb. The waterproofing layer will then be able to be installed under the kerb to guarantee a complete, continuous waterproofing layer. The step created when installing the screed will help to align the floor and kerb, which often have different thicknesses. Once the screed has completely cured (usually 1 week per cm of thickness, and never less than 28 days), the construction elements, such as attachment points for railings, drains, channels and fillets between horizontal and vertical surfaces may be prepared. Where there are **attachment points for railings** and, therefore, metallic fittings which pass through the horizontal substrate, the continuity of the waterproofing layer must

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be guaranteed. We recommend sanding all metallic fittings to remove traces of loose material and apply a coat of **EPORIP**, two-component, solvent-free epoxy adhesive. While the resin is still fresh, sprinkle quartz on the surface to create a rough surface to form a good bond with the flexible cementitious waterproofing mortar which will be applied later. Waterproofing around **drains** must be carried out using special kits and components from the **DRAIN** range as described below:

- Even out the surface where required with **PLANITOP FAST 330**.
- Around the drain, apply the first coat of the chosen waterproofing product (see section 4) to cover a larger area than that of the non-woven fabric.
- Position **DRAIN VERTICAL** or **DRAIN LATERAL** and press the fabric on to the waterproofing layer while it is still fresh.
- Cover the fabric with the waterproofing product and blend it in with the previous layer.

Waterproofing in correspondence with drains in parapets must be carried out using **DRAIN FRONT**, TPE angular pipe unions for balconies, applied as follows:

- Make a hole in the parapet and floor large enough to insert **DRAIN FRONT**.
- Spread on an even layer of **ADESILEX PG4**, two-component, thixotropic epoxy adhesive with a smooth trowel on the clean, dry substrate.



Fig. 7.4 - Application of DRAIN FRONT on fresh ADESILEX PG4



Fig. 7.5 - Application of ADESILEX PG4 to completely cover DRAIN FRONT



Fig. 7.6 - Sprinkling quartz on fresh ADESILEX PG4



Fig. 7.7 - Application of MAPELASTIC or MAPELASTIC SMART around a control joint and a wall-floor fillet joint



Fig. 7.8 - After embedding the white fabric of MAPEBAND T (special T-shaped piece) in the fresh product, apply MAPELASTIC or MAPELASTIC SMART on the white fabric part of MAPEBAND



Fig. 7.9 - Embedding the white fabric of MAPEBAND CROSS (special cross-shaped piece) in fresh MAPELASTIC or MAPELASTIC SMART

- Place **DRAIN FRONT** in position and press down lightly so that it is embedded in **ADESILEX PG4** (Fig. 7.3).
- Spread on a second coat of **ADESILEX PG4** fresh on fresh to completely cover **DRAIN FRONT**.
- Smooth over with a flat trowel and, while the product is still fresh, sprinkle on a layer of 0.5 angular quartz to form a rough layer to help the waterproofing product form a good bond.
- Once the curing process of **ADESILEX PG4** has been completed, remove any loose quartz.

Flexible waterproofing of the **fillets between horizontal and vertical surfaces** must be carried out using **MAPEBAND** alkali-resistant rubber tape with felt. Even out the masonry where the render has been removed using **NIVOPLAN** levelling mortar with added synthetic rubber latex, such as **PLANICRETE** at a rate of 2 litres per bag of mortar (used to partially replace the mixing water) or the masonry may also be evened out using **PLANITOP FAST 330**, quick-setting, fibre-reinforced, cementitious mortar for evening out irregularities from 3 to 30 mm on uneven substrates. Once this layer has dried, bond **MAPEBAND** to the substrate as follows:

- Apply an even coat of the waterproofing product chosen (see section 4) with a smooth trowel on the clean, dry substrate.
- Lay **MAPEBAND** by pressing along the sides, making sure there are no creases or air bubbles.
- Apply another layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

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In the corners, use the special components from **MAPEBAND (90° ANGLES and 270° ANGLES)**, while the joints between the strips and special pieces must be made using a double-buttering polychloroprenic contact adhesive such as **ADESILEX LP**. Apply **MAPEBAND** in the **control joints** in the substrate using the same technique as described above, making sure the strips are turned towards the inside of the joint in an upside-down “Ω” shape. The **structural joints** must be waterproofed by bonding **MAPEBAND TPE** 1.2 mm thick tape with borders reinforced with polyester fabric. Bond in position using **ADESILEX PG4** two-component thixotropic epoxy adhesive as follows:

- Apply a 1-2 mm thick layer of **ADESILEX PG4**, with a smooth trowel on the clean, dry substrate. Try to avoid the adhesive running into the joint.
- Lay on the upside-down “Ω” shaped **MAPEBAND TPE** so that only the polyester felt bonds to **ADESILEX PG4**. Press down along the sides, making sure there are no creases or air bubbles.
- Apply a second layer of **ADESILEX PG4** fresh on fresh, and completely cover the sides of the tape with the second coat.
- Smooth over with a flat trowel and, while the product is still fresh, sprinkle on a layer of 0.5 spheroid quartz to form a rough layer to help the waterproofing product form a good bond.
- Once the curing process of **ADESILEX PG4** has been completed, remove any excess quartz.

The joints between the strips of **MAPEBAND TPE** may be made with a hot-air welding pistol or by cold welding by overlapping the TPE part



Fig. 7.10 -Applying the first layer of ADESILEX PG4



Fig. 7.11 - After laying MAPEBAND TPE on fresh ADESILEX PG4 apply the second layer



Fig. 7.12 - Sprinkling quartz on the second fresh layer



Fig. 7.13 - Spreading the first coat of MAPELASTIC starting from the structural joint



Fig. 7.14 - Embedding MAPENET 150 in the first fresh layer of MAPELASTIC



Fig. 7.15 - Application of the second coat of MAPELASTIC

by at least 5 cm and bonding them together with a double-buttering polychloroprenic contact adhesive in solvent such as **ADESILEX LP**. We recommend laying **MAPEBAND TPE** inside the joint to form an upside down “Ω” shape.

After waterproofing and sealing the penetrations and critical points as described above, apply the waterproofing product chosen.

FOR TWO-COMPONENT PRODUCT

Mixing of **MAPELASTIC** or **MAPELASTIC SMART** is carried out by pouring component B (liquid) into a suitable clean container and slowly adding component A (powder) while mixing. Mix the two components together for several minutes. Remove all traces of powder from the sides and bottom of the container and keep mixing until it is perfectly blended. Never carry out this operation manually. Use a low-speed mixer (to avoid air being dragged in) or a mortar mixer. If a mortar mixer is used, before pouring the mix out of the hopper, make sure that it is well mixed and that there are no lumps. **MAPELASTIC** and **MAPELASTIC SMART** must be applied within 60 minutes after mixing.

Spread two coats of **MAPELASTIC** on the clean, dry substrate using a smooth or notched trowel to form a total thickness minimum 2 mm. We recommend inserting **MAPENET 150** (alkali-resistant, fibre glass mesh) between the first and second coat of **MAPELASTIC** to increase flexibility and ensure its capacity to cover cracks up to 1.5 mm wide. After applying the first coat, insert the glass fibre mesh by overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to ensure embedding. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when **MAPENET 150** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC** to ensure that it forms a continuous layer when the next area of product is applied. Approx. 4-5 hours after applying the first layer in good weather, and in all cases never before the first layer has completely dried, the second

WATERPROOFING TERRACES AND BALCONIES

layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.

If a more flexible product is required, such as when the surfaces to be waterproofed have particularly large pitch areas (between one control joint and another) and are subject, therefore, to high dynamic stresses, we recommend the use of **MAPELASTIC SMART**. The product may be applied by trowel or with a roller, making sure that the layer is even and minimum 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene, non-woven fabric). Overlap adjacent strips of fabric by at least 10 cm and press the fabric with a flat trowel to make sure it is embedded. Please note that the first layer of product must be applied in areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MAPELASTIC SMART** to ensure that it forms a continuous layer when the next area of product is applied. Approx. 4-5 hours after applying the first layer in good weather, and in all cases only when the first layer has dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.

FOR ONE-COMPONENT PRODUCTS

Pour the water required for mixing into a suitable clean container. Slowly add **MONOLASTIC** while mixing, and continue mixing carefully for a further 3 minutes until it is completely blended, making sure that all the product is also removed from the sides and bottom of the container. A low-speed mechanical mixer is recommended for this operation, to avoid too much air being entrapped in the mix. Avoid mixing the product manually.

MONOLASTIC must be applied with a brush, roller or by trowel, making sure that the layer is even and minimum 1 mm thick. While the product is still fresh, apply a layer of **MAPETEX SEL** (macro-holed, polypropylene non-woven fabric). Overlay adjacent strips of fabric by



Fig. 7.16 - Application of a second coat of MONOLASTIC by trowel on MAPETEX SEL



7.17 - Application of a second coat of MONOLASTIC by trowel on MAPETEX SEL



7.18 - MAPELASTIC AQUADEFENSE applied on a floor-wall fillet joint before applying MAPEBAND



7.19 - Application of MAPEBAND on fresh MAPELASTIC AQUADEFENSE



7.20 - Application with a roller of the first coat of MAPELASTIC AQUADEFENSE



7.21 - Application with a roller of the second coat of MAPELASTIC AQUADEFENSE

at least 10 cm and press the fabric with a flat trowel to make sure it is perfectly buttered. Please note that the first layer of product must be applied in areas wider than 1.2 metres, so that when **MAPETEX SEL** (width 1 metre) is applied, there will be at least 10 cm per side of **MONOLASTIC** to ensure that it forms a continuous layer when the next area of product is applied. 2 hours after applying the first layer in good weather conditions, and in all cases never before the first layer has completely dried, the second layer may be applied. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel. After completing the application cycle of **MONOLASTIC**, wait at least 2 days before installing the tiles.

FOR READY-TO-USE PRODUCT

MAPELASTIC AQUADEFENSE is supplied ready to use and does not need to be mixed. Apply with a long-haired roller, brush or trowel in two even layers minimum 0.4 mm thick per coat for a final thickness minimum 0.8 mm in order to create a robust, flexible, continuous film. Make sure there are no interruptions in the film caused by imperfections in the substrate.

After applying **MAPELASTIC AQUADEFENSE** wait approximately 4 hours for curing and then lay the ceramic tiles.

For indications regarding laying tiles and grouting and sealing joints, please refer to sections 8 and 9.

Note: *If flat roofs are not accessible to foot traffic, **MAPELASTIC** and **MAPELASTIC SMART** may be left exposed in that they are resistant to UV rays. If a coloured finish is required, **MAPELASTIC** and **MAPELASTIC SMART** may be painted over with **ELASTOCOLOR PAINT** protective and decorative flexible acrylic resin paint in water dispersion. **MONOLASTIC** and **MAPELASTIC AQUADEFENSE**, on the other hand, must always be covered with a flooring material.*

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8. LAYING CERAMIC AND STONE MATERIALS

Waiting times before laying floor finishes depends on the type of waterproofing system used, and in particular:

- 4-5 days for **MAPELASTIC** and **MAPELASTIC SMART**;
- 2 days for **MONOLASTIC**;
- just 4 hours for **MAPELASTIC AQUADEFENSE**.

The times indicated will vary according to climatic conditions.

Floor coatings on a terrace or balcony are exposed to direct sunlight and, therefore, to very large temperature variations between day-time and night-time. These variations provoke the formation of strains due to the different thermal expansion coefficients of the substrate and finishing material. In such conditions, it is very important that tiles are laid with joints sufficiently large enough to absorb movement due to thermal expansion and according to the type of coating laid and its service conditions. Floor coatings must follow the same pattern as the joints in the substrate (structural and control joints) and, if they are not present or if their area is particularly large, expansion joints must be created (in the coating) every 9-12 m². If the floor is long and rectangular, such as with balconies, the joints must be made at a maximum of every 4-5 m. The joints must be sealed with special silicone or polyurethane sealants as indicated below.

The adhesive chosen to bond the coating is essential: under the aforementioned exposure conditions and on flexible substrates such as the waterproofing system applied, a class C2 adhesive system according to EN 12004 will be required, with a deformation rate according to the size of the tiles and shape and size of the terrace. The adhesive must be applied using the double-buttering technique to avoid the formation of voids under the tiling and limiting water collecting beneath the tiles.



Fig. 8.1 - Measuring the height to position the floor drain flush with the surface of the finished floor



Fig. 8.2 - Cutting the telescopic extension for the grate to the length measured in the previous step



Fig. 8.3 - Bonding the telescopic extension for the grate (with anti-odour plug in place) with four spots of MAPESIL AC silicone sealant



Fig. 8.4 - Bonding the tiles on perfectly dry MAPELASTIC or MAPELASTIC SMART with a class C2 adhesive



Fig. 8.5 - Spreading the adhesive on the back of a tile to avoid the formation of gaps under the coating



Fig. 8.6 - Bonding the tiles on perfectly dry MAPELASTIC AQUADEFENSE with a class C2 adhesive

MAPEI has a wide range of suitable adhesives available for laying tiles on balconies and terraces. The choice of adhesive will depend on the type of coating (size and type of material) and the time available before putting the floor into service.

For example, ceramic and stone which are stable in the presence of humidity may be laid using:

- **KERAFLEX**, improved, high-performance, cementitious adhesive with no vertical slip and long open time, class C2TE according to EN 12004.
- **KERAFLEX MAXI S1**, high-performance, flexible, cementitious adhesive with no vertical slip and long open time with Low Dust Technology, class C2TE S1 according to EN 12004.
- **KERABOND + ISOLASTIC**, high-performance, high-flexibility, cementitious adhesive system, class C2E S2 according to EN 12004.

For large tiles and for laying in winter, a quick-setting adhesive must be used such as:

- **GRANIRAPID**, two-component, high-performance, flexible, quicksetting and drying cementitious adhesive, class C2F S1 according to EN 12004.
- **ELASTORAPID**, two-component, high-performance, high-flexibility, quick-setting and drying cementitious adhesive with no vertical slip and long open time, class C2FTE S2 according to EN 12004.

9. GROUTING AND SEALING JOINTS

After installing the tiles, all the joints must be grouted and sealed. With this particular type of work, use the following products:

- **KERACOLOR**, high-performance, polymer-modified, cementitious grout available in two different grain sizes (**FF** and **GG**) according to the size of the joints. **KERACOLOR FF** contains special water-repellent admixtures (**DropEffect**[®] technology) and is suitable for grouting joints up to 6 mm wide. **KERACOLOR GG** is suitable for joints from 4 to 15 mm wide. Mixing **KERACOLOR** with **FUGOLASTIC** special synthetic resin polymer admixture improves the characteristics of the grout so it is resistant to even the most demanding service conditions.
- **KERACOLOR** and **KERACOLOR + FUGOLASTIC** are class CG2WA according to EN 13888 and floors grouted with **KERACOLOR** are set to foot traffic after approximately 24 hours.
- For quicker operations, use **ULTRACOLOR PLUS**, high-performance, polymer-modified, anti-efflorescence grout for joints from 2 to 20 mm wide. This product sets quickly, is water-repellent with **DropEffect**[®] technology, resistant to mould with **BioBlock**[®] technology, is available in 26 different colours and is class CG2WA according to EN 13888. Floors grouted with **ULTRACOLOR PLUS** are set to foot light traffic in 3 hours in normal climatic conditions.

The following ranges of sealing products should be used for the installations discussed in this notebook:

- **MAPESIL AC**, solvent-free, acetic-cure, resistant to mould (**BioBlock**[®] technology), silicone sealant with a low modulus of



Fig. 9.1 - Grouting the joints



Fig. 9.2 - Sealing with MAPESIL AC



Fig. 9.3 - Sealing with MAPESIL AC



Fig. 9.4 - Inserting MAPEFOAM cord in the structural joint to regulate the thickness of MAPEFLEX PU40



Fig. 9.5 - Sealing the structural joint with MAPEFLEX PU40



Fig. 9.6 - Smoothing over the MAPEFLEX PU40

elasticity, available in the same colours as the grouting mortars.

To guarantee a better bond with the edges of tiles, we recommend treating them beforehand with **PRIMER FD**.

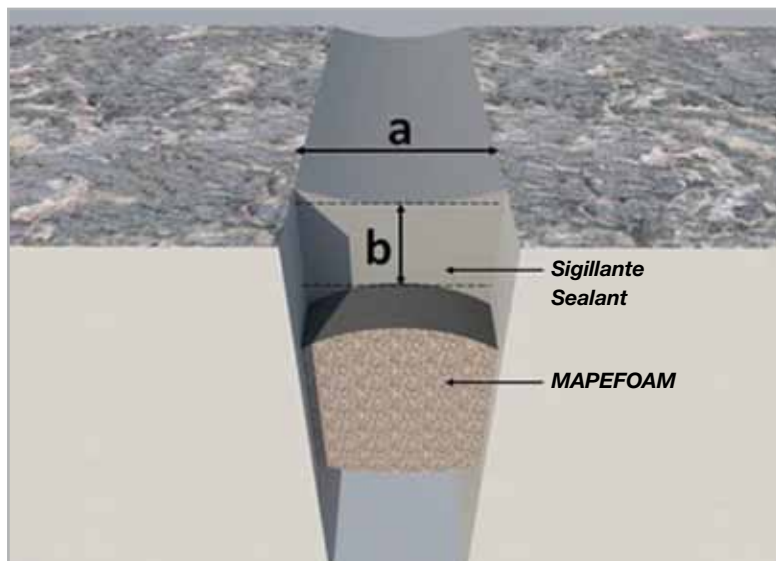
MAPESIL AC is used for sealing expansion joints and control joints (see section 3.1) and joints around the perimeter of rooms (fillets between skirting tiles and floors and between skirting tiles and walls).

- **MAPEFLEX PU40** or **MAPEFLEX PU50 SL**, one-component polyurethane sealant with a low modulus of elasticity and a thixotropic or fluid consistency respectively. These products are used for sealing structural joints (see section 3.1). Where attachment points for railings pass through the floor, we recommend sealing the areas between the floor and metallic fittings with **MAPEFLEX PU40**.

WATERPROOFING TERRACES AND BALCONIES

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 indications 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 sticking 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.



**RESTAURANT
MEDITERRANEO
Sopron – Hungary**

Waterproofing and tiling
an external terrace with
MAPELASTIC, GRANIRAPID,
KERAFLEX and MAPESIL AC



**PRIVATE VILLA
Milan – Italy**

Waterproofing and tiling
an external terrace with
MAPELASTIC, GRANIRAPID,
ULTRACOLOR PLUS and
MAPESIL AC

WATERPROOFING TERRACES AND BALCONIES



HOTEL PALACE Milano Marittima - Italy

Waterproofing and tiling balconies and terraces with MAPELASTIC, KERABOND, ISOLASTIC, KERAFLEX MAXI and ULTRACOLOR PLUS



PRIVATE HOME Cereseto (Alessandria) - Italy

Waterproofing and tiling an external terrace with TOPCEM, TOPCEM PRONTO, MAPELASTIC, MAPEBAND, KERABOND, ISOLASTIC and MAPESIL AC



**HOTEL HILTON IMPERIAL
Dubrovnik – Croatia**

Waterproofing and tiling
balconies with MAPELASTIC,
MAPEBAND, MAPEGUM WPS,
KERAFLEX MAXI, KERAPOXY,
GRANIRAPID, ULTRACOLOR
PLUS and MAPESIL AC



**PRIVATE VILLA
Stritez – Czech Republic**

Waterproofing and tiling
an external terrace with
MAPELASTIC, KERAFLEX and
KERAPOXY

WATERPROOFING TERRACES AND BALCONIES



HOTEL RADISON Bukkfurdo – Hungary

Waterproofing and tiling an external terrace with MAPELASTIC, MAPEBAND, KERAFLEX and KERABOND



HOTEL CONCHIGLIA Cervia – Italy

Waterproofing and tiling balconies with MAPELASTIC, GRANIRAPID, KERAFLEX, KERAFLEX MAXI S1 and KERACOLOR FF

Technical Notebook

WATERPROOFING

TERRACES AND BALCONIES

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