

WATERPROOFING OPERATIONS USING BENTONITE, CEMENTITIOUS, BITUMINOUS EMULSION, POLYURETHANE AND READY-TO-USE SYSTEMS



M specifications of **WATERPROOFING WITH BENTONITE, CEMENTITIOUS, READY-MIXED, BITUMINOUS EMULSION AND POLYUREA SYSTEMS**

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M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS**M.1.1 PREPARATION OF THE SUBSTRATE****M.1.1.1 Hydro-cleaning the surfaces**

Pressurised hydro-cleaning of concrete surfaces using hydro-cleaning equipment with more than 150 bar of pressure, to completely remove layers of micro-organisms, old, loose and crumbly portions, dust and traces of previous paint treatments. This operation is also required to saturate the substrate before applying cementitious mortar or concrete to improve its grip.

Included and calculated in the price for work carried out according to specification:

- supply and disposal of all water;
- all costs.

.....(€/m²)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS**M.1.1.2 Hydro-cleaning with caustic soda**

Pressurised hydro-cleaning of tiled surfaces with a solution of water and caustic soda using hydro-cleaning equipment with more than 150 bar of pressure, to completely remove layers of micro-organisms, old, loose and crumbly portions, dust and other foreign matter. Then hydro-clean the surfaces with water only to remove all traces of caustic soda.

Included and calculated in the price for work carried out according to specification:

- supply and disposal of all water;
- all costs.

.....(€/m²)

**M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS
BEFORE APPLYING WATERPROOFING SYSTEMS**

M.1.1.3 Hydro-sandblasting/sandblasting

Cleaning concrete surfaces and exposed steel reinforcement by hydro-sandblasting with silica sand to remove rust, aggressive chemicals, loose surfaces and traces of oil, grease, dirt and all other contaminants in general to create a surface with an Sa 2½ (ISO 8501-1) finish, equivalent to SSPC-SP10 white blast finish.

Included and calculated in the price for work carried out according to specification:
– removal and transport of all debris and waste material to an authorised waste disposal site.

.....(€/m²)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.2 DEMOLITION WORK

M.1.2.1 Demolition of reinforced cement structures by pneumatic hammer

Demolition of concrete structures using a power-hammer and removal of debris and waste material to a temporary storage area.

All other operations included and calculated in the price for work completed according to specification.

.....(€/m²)

**M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS
BEFORE APPLYING WATERPROOFING SYSTEMS**

M.1.2.2 Demolition of ceramic flooring

Demolition of ceramic flooring, stone slabs, steps, doorsteps and similar elements to a depth of 3 cm and removal of debris and waste material to a temporary storage area.

All other operations included and calculated in the price for work completed according to specification.

.....(€/m²)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS**M.1.2.3 Demolition of screeds and flooring**

Demolition of ceramic flooring, stone slabs, steps, doorsteps and similar elements up to 3 cm thick installed with mortar or adhesive and substrates up to 5 cm thick, and removal of debris and waste material to a temporary storage area.

All other operations included and calculated in the price for work completed according to specification.

.....(€/m²)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS**M.1.3 REMOVAL WORK****M.1.3.1 Removal of perimeter baseboards and skirting**

Removal of ceramic or stone baseboards and skirting and removal of debris and waste material to a temporary storage area.

All other operations included and calculated in the price for work completed according to specification.

.....(€/m²)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.3.2 Removal of render

Removal of render up to 3 cm thick applied with adhesive or mortar by pick-axe and scraping down to bare masonry, including removal of small patches, brushing of the surfaces and removal of debris and waste material to a temporary storage area.

All other operations included and calculated in the price for work completed according to specification.

.....(€/m²)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS**M.1.3.3 Removal of waterproof membranes**

Removal of waterproofing layers and removal of debris and waste material to a temporary storage area. Lowering and/or removal of the underlying screed to be calculated and charged separately.

All other operations included and calculated in the price for work completed according to specification:

<i>Single-layered bituminous membrane per square metre</i>	<i>.....(€/m²)</i>
<i>Double-layered bituminous membrane per square metre</i>	<i>.....(€/m²)</i>
<i>Synthetic membrane per square metre</i>	<i>.....(€/m²)</i>

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.4 REGULATING LAYER USING CEMENTITIOUS MORTAR

M.1.4.1 Application of one-component, normal-setting, shrinkage-compensating, class R4 castable mortar for layers from 1 to 4 cm thick

Supply and application of one-component, normal-setting, shrinkage-compensating castable mortar made from high-strength cement, selected aggregates, synthetic polyacrylonitrile fibres and special admixtures (such as **Mapegrout Hi-Flow** produced by MAPEI S.p.A.).

Apply the product by pouring into the prepared area on a clean substrate saturated with water in layers from 1 to 4 cm thick. To improve expansion in the open air during the first few days of curing, add a special curing admixture to reduce both plastic and hydraulic shrinkage when mixing the mortar (such as **Mapecure SRA** produced by MAPEI S.p.A.) at a dose of 0.25% by weight on the weight of the mortar.

The product must comply with the minimum requirements of EN 1504-3 for R4-class structural mortars and have the following performance characteristics:

compressive strength (EN 12190) (MPa):	> 75 (after 28 days)
flexural strength (EN 196/1) (MPa):	12 (after 28 days)
compressive modulus of elasticity (EN 13412) (GPa):	27 (after 28 days)
adhesion to substrate (EN 1542) (MPa):	> 2 (after 28 days)
contrasted expansion (UNI 8147) ($\mu\text{m}/\text{m}$):	> 400 (after 1 day)
crack resistance ("O-ring" test):	no cracks after 180 days
resistance to accelerated carbonatation (EN 13295):	less than reference concrete

Impermeability to water

– penetration depth – (EN 12390/8) (mm):	< 5
capillary absorption (EN 13057) ($\text{kg}/\text{m}^2 \cdot \text{h}^{0.5}$):	< 0.08
slip-resistance of reinforcement rods (EN 15184)	
– adhesion stress - (MPa):	≥ 25
thermal compatibility measured as adhesion according to EN 1542 (MPa):	
– freeze-thaw cycles with de-icing salts (EN 13687/1):	> 2 (after 50 cycles)
– storm cycles (EN 13687/2):	> 2 (after 30 cycles)
– dry thermal cycles (EN 13687/4):	> 2 (after 30 cycles)
reaction to fire (EN 13501-1) (Euroclass):	A1
consumption (per cm of thickness) (kg/m^2):	approximately 21

Included and calculated in the price for application according to specification:

- hydro-cleaning of adhesion surfaces and saturation of substrate with water immediately before applying the mortar;
- casting the mortar around metallic elements;
- careful curing of the mortar by spraying on water for at least 24 hours after application.

– per square metre per cm of thickness(€/m²·cm)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.4.2 Application of one-component, normal-setting, shrinkage-compensating, class R4 thixotropic mortar made with cement with high resistance to sulphates, for layers from 1 to 4 cm thick

Supply and application of one-component, normal-setting, shrinkage-compensating thixotropic mortar made from cement with high resistance to sulphates, selected aggregates, synthetic polyacrylonitrile fibres, organic corrosion inhibitor and special water-retaining admixtures (such as **Mapegrout T60** produced by MAPEI S.p.A.).

Apply the product by trowel or spray with a rendering machine on a clean substrate saturated with water in layers from 1 to 4 cm thick. To improve expansion in the open air during the first few days of curing, add a special curing admixture to reduce both plastic and hydraulic shrinkage when mixing the mortar (such as **Mapecure SRA** produced by MAPEI S.p.A.) at a dose of 0.25% by weight on the weight of the mortar.

The product must comply with the minimum requirements of EN 1504-3 for R4-class structural mortars and have the following performance characteristics:

compressive strength (EN 12190) (MPa):	60 (after 28 days)
flexural strength (EN 196/1) (MPa):	8 (after 28 days)
compressive modulus of elasticity (EN 13412) (GPa):	27 (after 28 days)
adhesion to substrate (EN 1542) (MPa):	> 2 (after 28 days)
contrasted expansion (UNI 8147) ($\mu\text{m}/\text{m}$):	> 400 (after 1 day)
crack resistance ("O-ring" test):	no cracks after 180 days
resistance to accelerated carbonatation (EN 13295):	less than reference concrete
impermeability to water	
– penetration depth – (EN 12390/8) (mm):	< 5
capillary absorption (EN 13057) ($\text{kg}/\text{m}^2 \cdot \text{h}^{0.5}$):	< 0.25
slip-resistance of reinforcement rods (EN 15184)	
– adhesion stress - (MPa):	= 25
thermal compatibility measured as adhesion according to EN 1542 (MPa):	
– freeze-thaw cycles with de-icing salts (EN 13687/1):	> 2 (after 50 cycles)
– storm cycles (EN 13687/2):	> 2 (after 30 cycles)
– dry thermal cycles (EN 13687/4):	> 2 (after 30 cycles)
reaction to fire (EN 13501-1) (Euroclass):	A1
consumption (per cm of thickness) (kg/m^2):	approximately 18.5

Included and calculated in the price for application according to specification:

- hydro-cleaning of adhesion surfaces and saturation of substrate with water immediately before applying the mortar;
- application of the mortar by trowel or spray around steel reinforcement;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar by spraying on water for at least 24 hours after application.

a) Application by trowel

– per square metre per cm of thickness(€/m²-cm)

b) Application by spray with a rendering machine

– per square metre per cm of thickness(€/m²-cm)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.4.3 Application of one-component, normal-setting, shrinkage-compensating, class R3 thixotropic mortar for layers from 0.5 to 3.5 cm thick

Supply and application of one-component, normal-setting, shrinkage-compensating thixotropic mortar made from cementitious binders, selected fine-grained aggregates, special admixtures and synthetic polyacrylonitrile fibres (such as **Mapegrout 430** produced by MAPEI S.p.A.).

Apply the product by trowel or spray with a continuous-feed rendering machine on a clean substrate saturated with water in layers from 0.5 to 3.5 cm thick.

To improve expansion in the open air during the first few days of curing, add a special curing admixture to reduce both plastic and hydraulic shrinkage when mixing the mortar (such as **Mapecure SRA** produced by MAPEI S.p.A.) at a dose of 0.25% by weight on the weight of the mortar.

The product must comply with the minimum requirements of EN 1504-3 for R3-class structural mortars and have the following performance characteristics:

compressive strength (EN 12190) (MPa):	> 30 (after 28 days)
flexural strength (EN 196/1) (MPa):	> 6 (after 28 days)
compressive modulus of elasticity (EN 13412) (GPa):	23 (after 28 days)
adhesion to substrate (EN 1542) (MPa):	> 2 (after 28 days)
capillary absorption (EN 13057) (kg/m ² ·h ^{0.5}):	< 0.40
resistance to accelerated carbonatation (EN 13295):	less than reference concrete
thermal compatibility measured as adhesion according to EN 1542 (MPa):	
– freeze-thaw cycles with de-icing salts (EN 13687/1):	> 1.5 (after 50 cycles)
– storm cycles (EN 13687/2):	> 1.5 (after 30 cycles)
– dry thermal cycles (EN 13687/4):	> 1.5 (after 30 cycles)
reaction to fire (EN 13501-1) (Euroclass):	A1
consumption (per cm of thickness) (kg/m ²):	17

Included and calculated in the price for application according to specification:

- hydro-cleaning of adhesion surfaces and saturation of substrate with water immediately before applying the mortar;
- application of the mortar by trowel or spray around steel reinforcement;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar by spraying on water for at least 24 hours after application.

a) Application by trowel

– per square metre per cm of thickness(€/m²-cm)

b) Application by spray with a rendering machine

– per square metre per cm of thickness(€/m²-cm)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.4.4 Application of one-component, rapid-setting, shrinkage-compensating, class R2 thixotropic mortar for layers from 0.3 to 4 cm thick

Supply and application of one-component, rapid-setting, shrinkage-compensating thixotropic mortar made from special hydraulic binders, selected fine-grained aggregates, synthetic polyacrylonitrile fibres, synthetic resins and special admixtures (such as Planitop Smooth & Repair produced by MAPEI S.p.A.), for reconstructing and skimming deteriorated concrete structures.

Apply the product by trowel on a clean substrate saturated with water in layers from 0.3 to 4 cm thick. The product must comply with the minimum requirements of EN 1504-3 for non-structural R2-class mortars and the requirements of EN 1504-2 coating (C) according to principles MC and IR for protecting concrete, and must have the following performance characteristics:

Setting time:

– start:	approximately 30 min.
– finish:	approximately 40 min.
compressive strength (EN 12190) (MPa):	≥ 18 (after 28 days)
flexural strength (EN 196/1) (MPa):	≥ 4 (after 28 days)
compressive modulus of elasticity (EN 13412) (GPa):	13 (after 28 days)
adhesion to substrate (EN 1542) (MPa):	≥ 1.5 (after 28 days)
capillary absorption (EN 13057) ($\text{kg/m}^2\cdot\text{h}^{0.5}$):	≥ 0.40
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 13687/1) measured adhesion according to EN 1542 (MPa):	≥ 1.5 (after 50 cycles)
impermeability expressed as coefficient of permeability to free water (EN 1062-3) ($\text{kg/m}^2\cdot\text{h}^{0.5}$):	$W < 0.1$ Class III (low permeability to water) according to EN 1062-1
permeability to water vapour	
– equivalent air thickness SD (EN ISO 7783-1) (m):	$S_D < 5$ Class I (permeable to water vapour)
reaction to fire (EN 13501-1) (Euroclass):	A1
consumption (per cm of thickness) (kg/m^2):	approximately 15

Included and calculated in the price for application according to specification:

- hydro-cleaning of adhesion surfaces and saturation of substrate with water immediately before applying the mortar;
- application of the mortar by trowel around steel reinforcement;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar by spraying on water for at least 24 hours after application.

– per square metre per cm of thickness (€/m²-cm)

M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.4.5 Application of a system comprising two-component, pozzolan-reaction cementitious mortar and A.R. glass fibre mesh

Supply and application of a system comprising pre-primed, alkali-resistant, A.R. glass fibre mesh (such as **Mapegrid G 120** or **Mapegrid G 220** produced by MAPEI S.p.A) and two-component, fibre-reinforced, pozzolan-reaction, cementitious mortar with a low modulus of elasticity (such as **Planitop HDM Maxi** produced by MAPEI S.p.A.). Apply the system using the following procedure:

- apply the first layer of two-component mortar (such as **Planitop HDM Maxi** produced by MAPEI S.p.A.) after evening out the surface, if required, with the same mortar;
- place the strengthening mesh in position (such as **Mapegrid G 120** or **Mapegrid G 220** produced by MAPEI S.p.A.);
- apply the second layer of mortar (such as **Planitop HDM Maxi** produced by MAPEI S.p.A.) so that it completely covers the reinforcement mesh with an even coat.

The A.R. glass fibre reinforcement mesh must have the following characteristics:

	G 120;	G220
type of fibre:	A.R. glass fibre	
weight (g/m ²):	125;	225
mesh size (mm):	12.7×12.7;	25×25
tensile strength (kN/m):	30;	45
elongation at failure (%):	< 3	

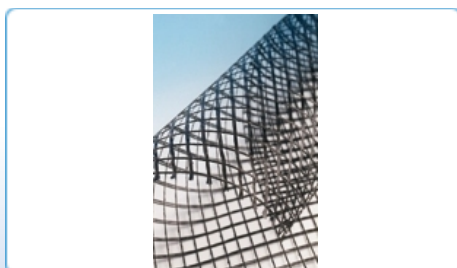
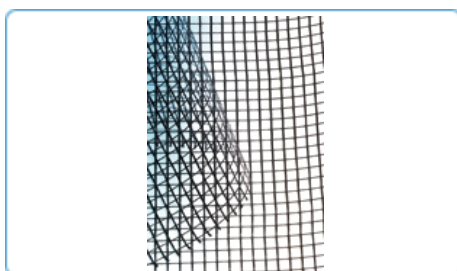
the two-component mortar must have the following characteristics:

density of mix (kg/m ³):	1,850
compressive strength EN 12190 (N/mm ²):	> 25 (after 28 days)
flexural strength EN 196/1 (N/mm ²):	> 8 (after 28 days)
compressive modulus of elasticity (N/mm ²):	1,100
adhesion to masonry substrates (N/mm ²):	> 2.0

Included and calculated in the price for application according to specification:

- vacuuming all surfaces;
- application of system according to procedure described above;
- 15% overlap of reinforcement mesh;
- 10 mm thick layer of mortar

- per square metre of system (G 120 mesh+mortar)	.....(€/m ²)
- per square metre of system (G 220 mesh+mortar)	.....(€/m ²)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.5 PRIMING THE SUBSTRATE

M.1.5.1 Application of two-component epoxy primer with fillers

Supply and application of a coat of two-component epoxy primer with fillers using a smooth metal trowel or spreader, made from solvent-free epoxy resin (such as **Primer SN** produced by MAPEI S.p.A.) and mixed with dry sand, if required, at a ratio of up to 1:0.5 according to the surrounding temperature (such as Quartz 0.5 produced by MAPEI S.p.A), to even out slightly rough surfaces.

The product must have the following performance characteristics:

consistency of mix:	thick fluid
density of mix (kg/m ³):	1,500
viscosity of mix (mPa·s):	1,200
workability time:	30 minutes
application temperature:	from +8°C to +35°C
dust dry at +23°C and 50% R.H.:	2-4 hours
set to light foot traffic at +23°C and 50% R.H.:	12 h
final hardening time:	7 days

– per square metre

.....(€/m²)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.5.2 Application of two-component epoxy primer for metal surfaces

Supply and application of two-component epoxy primer for metal surfaces (such as **Primer EP Rustop** produced by MAPEI S.p.A.), applied with a short-haired mohair roller, by brush or with suitable airless spray equipment. Also, thanks to the product's content of special zinc phosphate fillers, it will be possible to give the treated surface anti-corrosion and anti-rust protection.

The product must have the following performance characteristics:

mixing ratio:	comp A : comp B = 100 : 30
colour of mix:	white
consistency of mix:	liquid
dry solids content (%):	70
density of mix (kg/m ³):	1,100
viscosity of mix (mPa·s):	500 (# 3 - 50 rpm)
workability time:	15-20 minutes at +20°C
surface temperature:	at least +10°C
ready for painting over:	after 6-8 h at +20°C
dusty dry:	2 h at +20°C
pot life:	6 h at +20°C
final hardening time:	24 h

– per square metre

.....(€/m²)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.5.3 Application of three-component, epoxy-cementitious primer for damp substrates

Supply and application of two coats of three-component, epoxy-cementitious primer for damp substrates (such as **Triblock P** produced by MAPEI S.p.A.) after thoroughly cleaning the substrate (not included). After mixing, dilute the product with water. The amount of water required depends on how the primer is applied: by brush, roller or spray.

The product must have the following characteristics (at +23°C and 50% R.H.):

mixing ratio (A:B:C):	12:38:50
consistency of mix:	paste
colour:	white
density (g/cm ³):	1.80
Brookfield viscosity (mPa·s):	120,000 (No. 7 rotor, 10 revs)
application temperature range:	from +5°C to +35°C
workability time:	from 30 to 40 minutes
touch dry:	approx. 4-6 h
waiting time between first and second coat:	4-6 h
set to foot traffic:	24 h
final setting time:	7 days
adhesion to ceramic (N/mm ²):	> 3.5 (failure of ceramic)
adhesion on concrete (N/mm ²):	> 3 (failure of concrete)

– per square metre

..... (€/m²)



M.1 PREPARATION OF THE SUBSTRATE AND PRELIMINARY OPERATIONS BEFORE APPLYING WATERPROOFING SYSTEMS

M.1.5.4 Application of resin-based primer in solvent

Supply and application synthetic resin-based primer in solvent specific for improving the adhesion of polyurea coatings on existing bituminous membranes (such as **Primer BI** produced by MAPEI S.p.A.), applied by brush, roller or spray after thoroughly cleaning the substrate (not included).

The product must have the following characteristics:

colour:	transparent
consistency:	fluid liquid
density (EN ISO 2811-1) (g/cm ³):	0.96
dry solids content (%):	10
viscosity (Ø 4 Ford beaker):	15''
application temperature range:	from +5°C to +35°C
waiting time before overlaying:	2-4 hours
drying time:	5-6 h at +20°C

– per square metre

..... (€/m²)



M.2.1 SEALING SECOND POURS WITH HYDRO-EXPANSIVE PROFILE Procedure

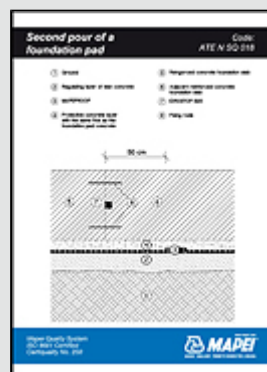
Preparation of the substrate

Thoroughly clean the surface to eliminate all traces of debris and material from previous operations, especially surface slurry caused by bleeding.

Waterproofing

Seal second pours by fixing one of the following products at the mid-point of the element to be cast:

- **Idrostop B25** hydro-expansive bentonite waterstop joint, made from a mixture of natural sodium bentonite and polymers which give it its characteristic compactness, plasticity and stability (see section **M.2.1.1**). The waterstop swells at a controlled, even and gradual rate without altering the mixture, so the joint may also be applied on slightly damp substrates. While swelling, which takes place when the product comes into contact with water, the joint adapts perfectly to the volume defined by the confined area and, thanks to this special characteristic, perfectly seals both second pours and localised honeycombs in the concrete. This type of joint is not suitable for confined areas smaller than 8 cm.
- **Idrostop** hydrophilic, expanding rubber profile bonded to the substrate (see section **M.2.1.2**). This product is a pre-formed, soft, elastic strip made from acrylic polymers specially developed to make waterproof joints up to a pressure of 5 atm. Thanks to its special chemical composition, the profile expands gradually when it comes into contact with water to form an active barrier to water under pressure (negative and positive). Unlike other products, which tend to become less efficient after repeated expansion and shrinkage, the properties of this profile remains constant, even in the presence of aggressive water, such as salt water (sea water) and water in depuration plants and sewers.



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.1.1 Application of self-sealing, hydro-expansive bentonite jointing strip

Supply and application of self-sealing, hydro-expansive jointing strip with a density of 1.6 g/cm³ (such as **Idrostop B25** produced by MAPEI S.p.A.) made from a mixture of natural sodium bentonite and polymers (according to ASTM D 71), which expands up to 425% of its initial volume when in contact with water without comprising its sealing capacity.

Apply the product after adequate preparation of the substrate (not included) to remove all traces of debris and material from previous operations and cement laitance.

The product measures 20 mm x 25 mm, and is suitable for sealing horizontal and vertical second pours in concrete, as long as the laterally confined area is at least 8 cm wide. Fix the joint to the concrete with nails (1 nail every 25 cm), and join the ends by simply running the ends of each piece alongside the next piece for at least 6 cm.

The nails required fasten the jointing material in place are included and calculated in the price for work carried out according to specification:

– per metre

.....(€/m²)



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.1.2 Application of hydrophilic, expanding rubber profile

Supply and application of bentonite-free, hydrophilic expanding rubber profile with a density of 1.3 g/cm³ (such as **Idrostop** produced by MAPEI S.p.A.) made from acrylic polymers, which expand up to 120% of its initial volume when in contact with water without comprising its sealing capacity.

Apply the product after adequate preparation of the substrate (not included) to remove all traces of debris and material from previous operations and cement laitance.

The product measures 20 mm x 10 mm, 20 mm x 15 mm or 20 mm x 25 mm, and is suitable for sealing horizontal and vertical second pours in concrete, as long as the laterally confined area is at least 8 cm wide.

Bond the joint to the concrete with one-component, solvent-free, ready-to-use polymer MS adhesive (such as **Idrostop Mastic** produced by MAPEI S.p.A.) and wait 24 hours before pouring the concrete. Join the ends together by simply running the ends of each piece alongside the next piece for at least 6 cm.

Adhesive is included and calculated in the price to complete work according to specification:

– per linear metre with a 20 mm x 10 mm profile	.....(€/m ²)
– per linear metre with a 20 mm x 15 mm profile	.....(€/m ²)
– per linear metre with a 20 mm x 25 mm profile	.....(€/m ²)



M.2.2 WATERPROOFING LIFT WELLS WITH BENTONITE SHEETS

Procedure

Preparation of the substrate

Excavation of the lift well may be carried out by set-size trenching (a) or by stripping (b). Whichever method is used, to form a suitable laying surface and facilitate application of the **Mapeproof** bentonite sheet, even out the bottom of the excavation by applying a layer of lean concrete about 10 cm thick.

Waterproofing

a) Excavation by set-size trenching

To lay the bentonite sheets on vertical surfaces, apply a levelling layer on the walls of the trench to form a relatively even surface to apply the **Mapeproof** (see section **M.2.2.1**). Extend this layer by at least 20 cm onto the laying surface of the foundation pad and on the lean concrete layer in the trench. Position the underside (the dark side) of the **Mapeproof** geo-textile polypropylene fabric against the substrate with overlaps at least 10 cm wide between adjacent sheets. Fix the sheets in place along the vertical overlaps with nails and **Mapeproof** CD polyethylene washers approximately every 30 cm. The sheets must also extend along the bottom of the trench with overlaps as above, and must be fixed to the substrate every 50 cm. Avoid forming creases when laying the fabric on the lean concrete layer.

Special plastic spacers must be used to keep the steel reinforcement cage for the lift well away from the sheets, and to help the concrete flow around the steel reinforcement and guarantee that it is completely covered.

Pour in the concrete for the lift well foundation pad, which must be designed to withstand the service loads and the hydraulic pressure from the groundwater. When the concrete has cured, seal the second pour between the foundation pad and the vertical walls with **Idrostop B25** (see section **M.2.1.1**) or **Idrostop** (see section **M.2.1.2**). After installing the formwork on the internal faces, pour in the concrete to form the vertical walls for the well.

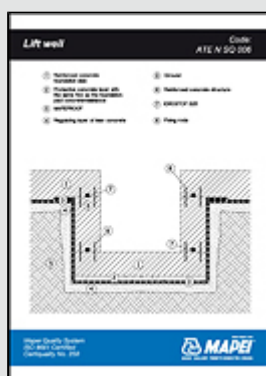
b) Excavation by stripping

Install the perimeter formwork to cast the foundation pad, lay the **Mapeproof** (see section **M.2.2.1**) with the underside (the dark side) of the geo-textile polypropylene fabric against the internal edges of the formwork, and then fold them along the layer of lean concrete for at least 20 cm. The top face (non-woven white fabric) of the geo-textile faces the inside and is visible. Overlap the edges of adjacent sheets by at least 10 cm and fix the sheets to the formwork along the overlaps with nails and polyethylene washers (**Mapeproof** CD) every 30 cm. The sheets must also extend along the bottom of the trench with overlaps as above, and must be fixed to the substrate every 50 cm. Avoid forming creases when laying the fabric on the formwork. If there is pipework, see section **M.2.8**.

Pour in the concrete for the lift well foundation pad, which must be designed to withstand the service loads and the hydraulic pressure from the groundwater. When the concrete has cured, seal the second pour between the foundation pad and the vertical walls with **Idrostop B25** (see section **M.2.1.1**) or **Idrostop** (see section **M.2.1.2**).

Cast the walls of the lift well and, when the concrete is cured, strip the formwork and waterproof the walls with **Mapeproof** (see section **M.2.6.1**). Then seal the fillet between the foundation pad and the vertical walls with **Idrostop B25** or **Idrostop** (see section **M.2.1**).

After completing the waterproofing operations for the lift well, for both the set-size trenching method and stripping method, lay the **Mapeproof** on the foundation pad, remembering that it is extremely important to guarantee continuity between the **Mapeproof** on the vertical walls of the lift well and the horizontal sheets positioned under the foundation pad, with overlaps at least 10 cm wide.



M.2.2.1 Application of bentonite waterproofing sheet before pouring

Supply and application of a bentonite waterproofing system on horizontal and vertical surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

mass per unit area (EN 14196) (g/m ²):	5460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

Before laying the sheet, apply a 10 cm thick layer of lean concrete (not included). Apply the sheets with staggered joints with the light coloured fabric facing the poured concrete, with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and **Mapeproof** CD polyethylene washers every 50 cm on horizontal surfaces and every 30 cm on vertical surfaces.

Included and calculated in the price for work carried out according to specification:

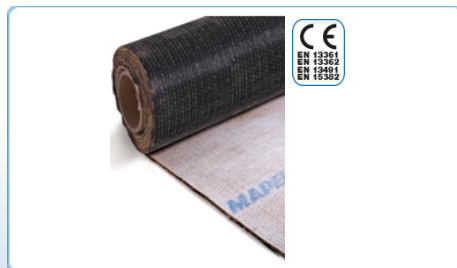
- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

APPLICATION ON EXCAVATION BY SET-SIZE TRENCHING

- per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
- per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
- per square metre, sheet size 5 m x 40 m	.....(€/m ²)

APPLICATION ON EXCAVATION BY STRIPPING

- per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
- per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
- per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.2.3 WATERPROOFING HORIZONTAL FOUNDATION PADS WITH BENTONITE SHEETS **Procedure**

Preparation of the substrate

Laying surfaces must be even and have no humps, large gaps and/or sharp edges, and must be levelled off with a layer of lean concrete with an average thickness of approximately 10 cm.

Waterproofing

For unconfined excavations, install the perimeter formwork to cast the foundation pad, lay **Mapeproof** (see section **M.2.3.1**) with the underside (the dark side) of the geo-textile polypropylene fabric against the internal edges of the formwork, and then fold them along the layer of lean concrete for at least 20 cm. The top face (non-woven white fabric) of the geo-textile faces the inside and is visible. The edges of the sheets must overlap by at least 10 cm. Fix the sheets to the vertical faces of the formwork along the overlaps with nails and **Mapeproof** CD polyethylene washers approximately every 30 cm. The sheets must also extend along layer of lean concrete, and must be fixed to the lean concrete every 50 cm.

For confined excavations, lay the **Mapeproof** in the lower part of the containment bulkheads of the sides of the excavation, and fold a strip at least 20 cm wide onto the lean concrete. The underside of the geo-textile polypropylene fabric (the dark side) must be placed on the substrate and the upper side of the geo-textile fabric (the white side) must face upwards so it is visible. After laying the geo-textile fabric on the formwork or the lower part of the bulkheads, lay the rolls of **Mapeproof** on the lean concrete.

In order to protect the sheets during normal site activities and while positioning the steel reinforcement for the poured concrete for the foundation pad, it may be necessary to cover **Mapeproof** with a 5-10 cm thick layer of the same type of concrete as will be used for the foundations. This operation is not absolutely necessary because the bentonite sheets are able to withstand damage from both the spacers and the reinforcement steel. In this case, special spacers must be used to keep the steel reinforcement away from the **Mapeproof** sheets, which also help the concrete to flow under the steel reinforcement and guarantee that it is well covered. Position the steel reinforcement and pour in the concrete for the foundation pad, which must be designed to withstand the service loads and the hydraulic pressure of the groundwater.

M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.3.1 Application of bentonite waterproofing sheet on horizontal surfaces before pouring

Supply and application of a bentonite waterproofing system on horizontal surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

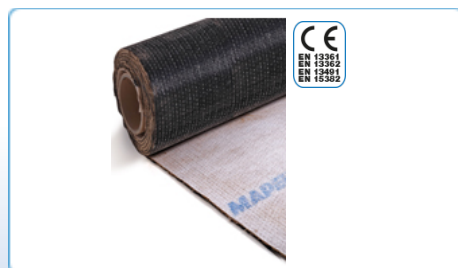
mass per unit area (EN 14196) (g/m ²):	5460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

Before laying the sheet, apply a 10 cm thick layer of lean concrete (not included). Apply the sheets with staggered joints with the light coloured fabric facing the poured concrete, with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and washers (such as **Mapeproof** CD produced by MAPEI S.p.A.) approximately every 50 cm.

Included and calculated in the price for work carried out according to specification:

- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

- per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
- per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
- per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.2.4 WATERPROOFING FOUNDATION PADS WITH PILE HEADS WITH BENTONITE SHEETS

Procedure

When waterproofing a foundation pad resting on piles, it is necessary to differentiate between two different application methods. The difference lies in the way the **Mapeproof** is laid, in that the pile heads may or may not pass through it.

a) Pile head not passing through the bentonite sheet

Preparation of the substrate

Lay on the **Mapeproof** (see section **M.2.4.1**) and make holes in the sheet to allow the steel reinforcement in the pile head to pass through. Lay the lower face (the dark coloured fabric) of the polypropylene geo-textile fabric against the lean concrete, with the upper face (non-woven white fabric) of the polypropylene geo-textile fabric facing upwards so it is visible. Overlap the sheets by at least 10 cm and fasten the sheets to the substrate along the overlaps with nails and polyethylene washers (**Mapeproof** CD) approximately every 50 cm. After grouting all the reinforcement rods with **Mapeproof Mastic** (see section **M.2.4.3**) apply a piece of bentonite sheet over each rod. The fillet between the pieces of sheet and the reinforcement rods must also be grouted with **Mapeproof Mastic**.

Waterproofing

After waterproofing all the pile heads, lay the **Mapeproof** bentonite sheets over the lean concrete as described previously for the area around the pile heads. In order to protect the sheets during normal site activities and while positioning the steel reinforcement for the poured concrete for the foundation pad, it may be necessary to cover the **Mapeproof** with a 5-10 cm thick layer of the same type of concrete as will be used for the foundations. This operation is not absolutely necessary because the bentonite sheets are able to withstand damage from both the spacers and the reinforcement steel. In this case, special plastic spacers must be used to keep the steel reinforcement away from the **Mapeproof** sheets, which also help the concrete to flow under the steel reinforcement and guarantee that it is well covered.

After positioning the steel reinforcement, pour in the concrete for the foundation pad, which must be designed to withstand the service loads and the hydraulic pressure from the groundwater.

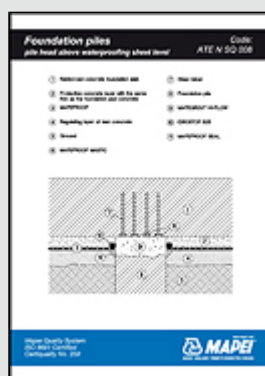
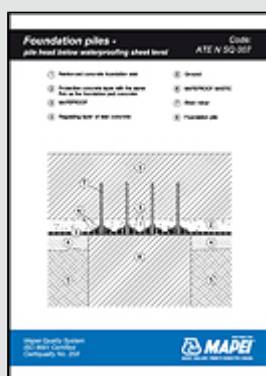
b) Pile head passing through the bentonite sheet

Preparation of the substrate

Crop the pile head until the scarified surface is at least 10 cm below the level of the outer face of the lean concrete. Carry out demolition by mechanical scarifying to leave a sufficiently rough surface. Thoroughly clean the demolished surface by high-pressure hydro-cleaning to completely remove all traces of dust, film or any other type of material which could compromise adhesion of the successive layer of restoration mortar. Fit on a 15 cm high cylindrical mould wide enough for the section of the pile. Then, to guarantee monolithic adhesion between the pile head and the new repair mortar, we recommend applying **Eporip** two-component, solvent-free epoxy adhesive (see section **F.8.2.1**) on the surfaces. Pour **Mapegrout Hi-Flow** (see section **M.1.4.1**) controlled-shrinking, fibre-reinforced mortar for restoring concrete mixed with 30% of gravel with a grain size between 5 and 8-10 mm and 0.25% of **Mapecure SRA** (a curing agent which reduces hygrometric and plastic shrinkage) into the mould while the **Eporip** is still fresh. Mapecure Hi-Flow guarantees both a perfect, watertight joint and high compressive strength of the pile head.

Waterproofing

After removing the mould, seal the perimeter of the pile head by applying **Mapeproof Seal** (see section **M.2.4.2**) natural sodium bentonite powder at a rate of 300 g per metre. Lay on the **Mapeproof** (see section **M.2.4.1**), cutting and trimming the sheet to shape around the pile head, with the lower face (the dark coloured fabric) of the polypropylene geo-textile against the lean concrete. Overlap the sheets by at least 10 cm and fasten the sheets to the substrate with nails and polyethylene washers (**Mapeproof CD**) approximately every 50 cm. Take care when unrolling the fabric to avoid forming creases when laying the fabric on the lean concrete. Nail **Idrostop B25** (see section **M.2.1.1**) around the pile head. Finish off the waterproofing system by grouting all the steel reinforcement in the pile head by towelling **Mapeproof Mastic** (see section **M.2.4.3**) natural sodium bentonite grout with plasticising admixtures around each rod.



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.4.1 Application of bentonite waterproofing sheet on horizontal surfaces before pouring

Supply and application of a bentonite waterproofing system on horizontal surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

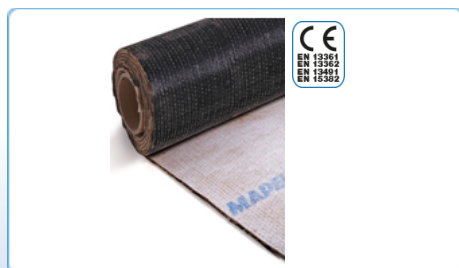
mass per unit area (EN 14196) (g/m ²):	5460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

Before laying the sheet, apply a 10 cm thick layer of lean concrete (not included). Apply the sheets with staggered joints with the light coloured fabric facing the poured concrete, with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and washers (such as **Mapeproof** CD produced by MAPEI S.p.A.) approximately every 50 cm.

Included and calculated in the price for work carried out according to specification:

- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

- per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
- per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
- per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.4.2 Application of natural sodium bentonite powder

Supply and application of natural sodium bentonite powder (such as **Mapeproof Seal** produced by MAPEI S.p.A.) with a high content of montmorillonite, characterised by its high swelling capacity, high water absorption capacity and long-lasting, high chemical stability.

Dust the product on the surface by hand at a rate of 300 g per linear metre.

The product must have the following characteristics:

water absorption (ASTM E 946/43) (%): > 750

Marsh 1500/1000 viscosity (seconds): 38-40

liquid limit (UNI 10040) (%): > 550

– per square metre(€/m²)



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.4.3 Application of bentonite grout

Supply and application of bentonite grout made from natural sodium bentonite and plasticising admixtures (such as **Mapeproof Mastic** produced by MAPEI S.p.A.).

Apply 50 g of product for each rod by trowel.

The product must have the following characteristics:

density (kg/dm³):

1.5

composition:

50% sodium bentonite
50% non-toxic plasticising
agents

– per square metre

.....(€/m²)



M.2.5 WATERPROOFING VERTICAL SURFACES WITH BENTONITE SHEETS BEFORE POURING
Procedure

The laying of **Mapeproof** on the containment bulkheads of the side walls of excavations may be divided into four different cases, according to the type of structural element used to confine the excavation:

a) Sheet piling**Preparation of the substrate**

Mapeproof may be cut and trimmed to shape and is applied directly on sheet piling (after hydro-cleaning).

Waterproofing

Mapeproof is then applied, starting from the top and unrolling the rolls of geo-textile fabric with the underside (the darker side) against the sheet piling, with an overlap of at least 10 cm between each sheet. Fix the sheets in place on the sheet piling with a nail-gun approximately every 30 cm along the overlaps. This solution avoids the overlaps lifting up under the weight of the concrete when it is poured.

b) Piles**Preparation of the substrate**

The first step is to hydro-clean the surfaces, followed by levelling off the laying surface and the heads of the tie-rods (if present) with **Mapegrout T60** (see section **M.1.4.2**) sulphate-resistant, fibre-reinforced thixotropic mortar mixed with 0.25% of **Mapecure SRA** curing agent to reduce hygrometric and plastic shrinkage.

Waterproofing

Once the mortar has hardened, apply pieces of **Mapeproof** (see section **M.2.5.1**) around the heads of the tie-rods to locally reinforce the waterproofing layer. Then lay **Mapeproof** starting from the top with the underside (the dark side) of the geo-textile fabric on the substrate, overlapping the sheets by at least 10 cm. Fix the sheets in place with nails approximately every 30 cm along the overlaps.

c) Micropiles**Preparation of the substrate**

Bulkheads formed by micropiles have an uneven surface, so a flat laying surface suitable for the **Mapeproof**. Hydro-clean and then level off the surface with a layer of **Mapegrout T60** sulphate-resistant, fibre-reinforced thixotropic mortar mixed with 0.25% of **Mapecure SRA** (see section **M.1.4.2**);

Waterproofing

After carrying out the above operations, lay the **Mapeproof** (see section **M.2.5.1**) starting from the top and overlap the sheets by at least 10 cm. Fix the sheets in place with nails and **Mapeproof** CD polyethylene washers approximately every 30 cm along the overlaps.

d) Diaphragms**Preparation of the substrate**

The surface of the diaphragms is smooth enough to lay **Mapeproof** sheets directly on them. The laying procedure is identical to the procedure used for sheet piling, so the first operation to carry out is to hydro-clean the surface with high pressure water jets to eliminate all loose parts. Level off the heads of the tie-rods (if present) with **Mapegrout T60** sulphate-resistant, fibre-reinforced thixotropic mortar mixed with 0.25% of **Mapecure SRA** (see section **M.1.4.2**) curing agent to reduce hygrometric and plastic shrinkage.

Waterproofing

Once the mortar has hardened, apply pieces of bentonite sheet around the heads of the tie-rods to locally reinforce the waterproofing layer. Then lay **Mapeproof** (see section **M.2.5.1**) starting from the top with the underside (the dark side) of the geo-textile fabric on the substrate, overlapping the sheets by at least 10 cm. Fix the sheets in place with nails approximately every 30 cm along the overlaps. If water is seeping through, including water under pressure, before laying **Mapeproof**, seal the leaks by manually applying **Lamposilex** ultra quick-setting and hardening hydraulic binder, a product used to block infiltrations of water (see section **M.3.1.1**).

In all four examples described above, the bentonite sheets applied vertically must overlap the sheet laid before pouring the foundation pad. This will guarantee structural continuity between the horizontal and vertical waterproofing layers.

In certain cases, reinforcement connectors are inserted between the bulkhead and the structure to be poured to form a static union between the two structural elements. In correspondence with the reinforcement connectors, holes must be made in **Mapeproof** for the connectors to pass through. After laying **Mapeproof**, they must be sealed in three steps as follows: grout the connectors with **Mapeproof Mastic** (see section **M.2.4.3**) natural sodium bentonite grout with plasticising agents; apply pieces of bentonite sheet and nail them in place; grout the fillet around the rods with **Mapeproof Mastic**.

After applying the **Mapeproof**, seal the second pour joint between the foundation pad and the reinforced concrete vertical walls with **Idrostop B25** or **Idrostop** (see section **M.2.1**).

M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.5.1 Application of bentonite waterproofing sheet on vertical surfaces before pouring

Supply and application of a bentonite waterproofing system on vertical surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

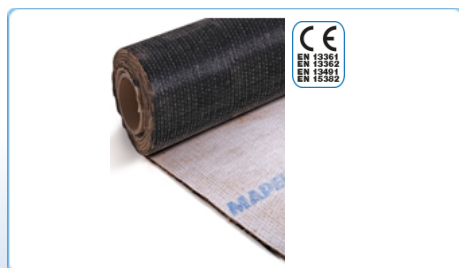
mass per unit area (EN 14196) (g/m ²):	5460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

After levelling off the laying surface (not included), apply the sheets with staggered joints with the light coloured fabric facing the poured concrete, with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and washers (such as **Mapeproof** CD produced by MAPEI S.p.A.) approximately every 30 cm.

Included and calculated in the price for work carried out according to specification:

- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

– per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
– per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
– per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.2.6 WATERPROOFING VERTICAL SURFACES AFTER POURING Procedure

a) Bentonite sheet

Preparation of the substrate

Before applying **Mapeproof** bentonite sheet, remove and/or seal the formwork spacers: for plastic spacers, insert special plugs and skim the surface with **Adesilex PG1** two-component, thixotropic epoxy resin (see section **F.8.1.2**), and dust the surface while still fresh with 0.5 quartz sand, to create a sufficiently rough substrate for the waterproofing product to adhere to. For metallic strips, on the other hand, break them off and seal the gaps left using **Mapegrout 430** fibre-reinforced thixotropic mortar (see section **M.1.4.3**) or, for a quicker intervention, Planitop Smooth & Repair fibre-reinforced, rapid-setting, shrinkage-compensating mortar (see section **M.1.4.4**). Then remove any uneven areas in the substrate (such as gravel clusters) and skim the surface with **Mapegrout 430** or Planitop Smooth & Repair.

Seal any elements passing through the substrate (see section **M.3.1**).

In the vicinity of the 90° joint between the wall and the foundation pad, we recommend forming a shell to support the fillet between the horizontal and vertical surfaces using **Mapegrout 430** applied using the fresh on fresh technique on **Eporip** two-component, solvent-free, epoxy adhesive (see section **F.8.1.2**) applied around the corner where the shell is to be formed.

Waterproofing

A strip at least 50 cm wide at the top of the wall must be waterproofed with **Mapelastic Foundation** (see section **M.2.6.2**) applied in two coats to form a layer at least 2 mm thick. Then lay the **Mapeproof** (see section **M.2.6.1**) starting from the top, making sure that it overlaps the **Mapelastic Foundation** by at least 20 cm.

In the fillet between the two systems, apply **Mapeproof Mastic** (see section **M.2.4.3**) over the **Mapelastic Foundation**. Fix the sheets of **Mapeproof** in place with nails and **Mapeproof** CD washers every 30 cm along the overlaps. When applied after pouring, lay the bentonite sheets with the upper side of the geo-textile fabric (the white side) against the reinforced concrete wall, while the underside of the geo-textile fabric (the darker side) faces the outside, that is, in contact with the ground. Please note that the white non-woven fabric of **Mapeproof** must always be laid in contact with the surface to be waterproofed. When laying around through-pipes, cut and trim the sheets to shape them to the pipework to be sealed (see section **M.2.8**). After laying the **Mapeproof**, lay 250 g/m² non-woven fabric to protect the waterproofing layer when filling in excavations. Fill with homogenous fine or mixed loose earth in well-compacted layers 40 to 50 cm thick, to guarantee that, once the filling operations have been completed, there are no gaps or voids and there is better confinement of the system.

b) Elastic cementitious mortar

Preparation of the substrate

Before applying **Mapelastic Foundation** two-component, elastic cementitious mortar, remove and/or seal the formwork spacers: for plastic spacers, insert special plugs and skim the surface with **Adesilex PG1** two-component, thixotropic epoxy resin (see section **F.8.1.2**), and dust the surface while still fresh with 0.5 quartz sand, to create a sufficiently rough substrate for the waterproofing product to adhere to. For metallic strips, on the other hand, break them off and seal the gaps left using **Mapegrout 430** fibre-reinforced thixotropic mortar (see section **M.1.4.3**) or, for a quicker intervention, Planitop Smooth & Repair fibre-reinforced, rapid-setting, shrinkage-compensating mortar (see section **M.1.4.4**). Then remove any uneven areas in the substrate (such as gravel clusters) and skim the surface with **Mapegrout 430** or Planitop Smooth & Repair.

Seal any elements passing through the substrate (see section **M.3.1**).

The surfaces to be treated must be clean and free of stripping compound, grease and all traces of dirt or any other element which could potentially compromise adherence of the waterproofing product. The surfaces, therefore, must be thoroughly cleaned by controlled-pressure dry sandblasting or with high pressure hydro-cleaning.

Waterproofing

Before applying Mapelastic Foundation, a coat of Primer 3296 consolidating, dust-repellent acrylic The surfaces to be treated must be clean and free of all traces of dirt or any other element which could potentially compromise adherence of the waterproofing product. Concrete surfaces must also be free of all rough edges and gravel clusters. Seal cracks and imperfections in the substrate with water and apply with a brush or roller. Apply **Mapelastic Foundation** (see section **M.2.6.2**) with a roller or by spray to form a coat at least 2 mm thick. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried.

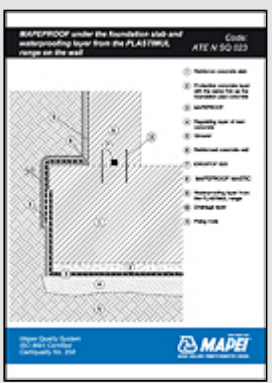
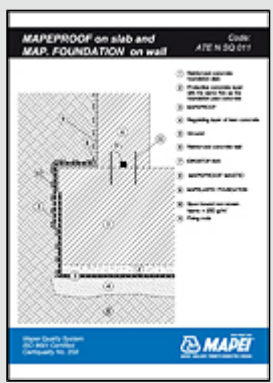
When the cementitious mortar has hardened, spread on a protective drainage layer in combination with non-woven fabric, such as Polyfond Kit Drain produced by Polyglass S.p.A. to protect the waterproofing system when filling in.

Before applying **Plastimul 1K Super Plus** on substrates such as limestone masonry, pumice masonry or brickwork, apply a coat of **Plastimul Primer** with a roller, by brush or by spray (see section **M.2.6.4**)

Preparation of the substrate of **Plastimul 1K Super Plus** (see section **M.2.6.3**) with a flat or Before applying **Plastimul 1K Super Plus** on the entire surface, if there are holes, pits, or imperfections, spread the **Plastimul 1K Super Plus** emulsion to form feather edges and plastic spacers with the new masonry and **Mapelastic Foundation** when work recommences.

Use **Mapelastic PG1** two-component, thixotropic epoxy resin (see section **F.8.1.2**), and spread on a protective drainage layer in combination with a non-woven fabric, such as **Polyfond Kit Drain** produced by Polyglass S.p.A. After applying the product under hand, take care to immediately close any gaps left using **Mapagroot 430** fibre-reinforced thixotropic mortar (see section **M.1.4.3**) or, for a quicker intervention, **Planitop Smooth & Repair** fibre-reinforced, rapid-setting, shrinkage-compensating mortar (see section **M.1.4.4**).

Seal any elements passing through the substrate (see section **M.3.1**).



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.6.2 Application of two-component, elastic, cementitious waterproofing mortar on vertical surfaces

Supply and application of two-component, elastic cementitious mortar on vertical surfaces by roller or spray, made from cementitious binders, selected fine-grained inerts, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Foundation** produced by MAPEI S.p.A.), for waterproofing concrete surfaces subject to positive and negative hydraulic pressure.

Apply the mortar after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid, dry substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

After preparing the substrate as above, apply a coat of acrylic consolidator and adhesion promoter (such as Primer 3296 produced by MAPEI S.p.A.) diluted 1:1 with water with a brush or roller.

Apply the product with a roller or by spray with a rendering machine, fitted with a spraying lance for skimming compound, to form a layer at least 2 mm thick, then finish off the surface with a flat trowel. In the fillet area between the wall and the foundations, also apply the product horizontally to cover the foundations.

The product must have the following characteristics:

adhesion to concrete (EN 1542 after 28 days) (N/mm ²):	> 1
adhesion to concrete (EN 1542 after 7 days) (N/mm ²):	> 0.7
crack resistance (EN 1062-7) (mm):	class A4 (> 1.25 mm)
permeability to water vapour (EN ISO 7783-1):	$S_D = 2.4$ m and $\mu = 1200$
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.07
permeability to CO ₂ (EN 1062-6) (m):	> 300
impermeability to water under positive pressure (EN 12390-8)	
– 5 bar for 3 days:	no penetration
– 1.5 bar for 7 days:	no penetration
impermeability to water under 1.5 bar negative pressure:	no penetration
elasticity after 28 days (DIN 53504) (%):	> 60
reaction to fire:	Euroclass E

AVERAGE THICKNESS 2 mm, APPLIED BY ROLLER

– per square metre(€/m²)

AVERAGE THICKNESS 2 mm, APPLIED BY SPRAY

– per square metre(€/m²)



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.6.3 Application of one-component, bituminous waterproofing emulsion on vertical concrete surfaces

Supply and application of one-component, solvent-free, rapid-drying, low-shrinkage, high-yield, highly-flexible bituminous waterproofing emulsion containing polystyrene spheres and rubber granules (such as **Plastimul 1K Super Plus** produced by MAPEI S.p.A.) on vertical concrete surfaces, including surfaces subject to high dynamic stress.

Apply at least two even layers of the product at least 2 mm thick with a flat or notched trowel or by spray with a peristaltic pump. The second layer must only be applied once the first layer is perfectly dry to avoid damaging the first layer. In the fillet area between the wall and the foundations, also apply the product horizontally to cover the foundations. After applying the product, check that it is completely dry and, before filling in the excavation, protect the waterproofing system by applying a protective drainage layer. In the area where there is water under pressure, lay alkali-resistant glass fibre mesh (compliant with ETAG 004 guidelines) with a mesh size of 4.5 mm × 4 mm and a weight of 150 g/m² (such as **Mapenet 150** produced by MAPEI S.p.A.) on the first layer while it is still fresh. Overlap the edges of adjacent strips of glass fibre mesh by at least 5 cm.

The product must have the following characteristics:

shrinkage (%):	13
resistance to heat (DIN 52123) (°C):	> 70
crack-bridging at +4°C (DIN 28052) (mm):	≥ 2
cold bending (DIN 52123) (°C):	≤ 0
impermeability with 1 mm wide cracks (DIN 52123):	0.75 bar for more than 72 hours

APPLICATION BY TROWEL, MINIMUM THICKNESS 2 mm WITHOUT **MAPENET 150**

– per square metre(€/m²)

APPLICATION BY TROWEL, MINIMUM THICKNESS 3 mm WITH **MAPENET 150**

– per square metre(€/m²)

APPLICATION BY SPRAY, MINIMUM THICKNESS 2 mm WITHOUT **MAPENET 150**

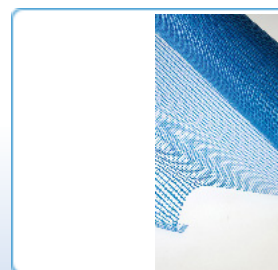
– per square metre(€/m²)

APPLICATION BY SPRAY, MINIMUM THICKNESS 3 mm WITH **MAPENET 150**

– per square metre(€/m²)



DIN 18195-2



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.6.4 Application of one-component, bituminous waterproofing emulsion on vertical brick/stone surfaces

Supply and application of one-component, solvent-free, rapid-drying, low-shrinkage, high-yield, highly-flexible bituminous waterproofing emulsion containing polystyrene spheres and rubber granules (such as **Plastimul 1K Super Plus** produced by MAPEI S.p.A.) on vertical concrete, brick or stone surfaces, including surfaces subject to high dynamic stress.

Before applying the product on brick or stone substrates, apply a coat of low-viscosity bituminous emulsion (such as **Plastimul Primer** produced by MAPEI S.p.A.) with a roller, by brush or by spray.

When the primer is dry, apply at least two even layers of the product at least 2 mm thick with a flat or notched trowel or by spray with a peristaltic pump. The second layer must only be applied once the first layer is perfectly dry to avoid damaging the first layer. In the fillet area between the wall and the foundations, apply the product horizontally to cover the foundations.

In the area where there is water under pressure, lay alkali-resistant glass fibre mesh (compliant with ETAG 004 guidelines) with a mesh size of 4.5 mm × 4 mm and a weight of 150 g/m² (such as **Mapenet 150** produced by MAPEI S.p.A.) on the first layer while it is still fresh. Overlap the edges of adjacent strips of glass fibre mesh by at least 5 cm.

The product must have the following characteristics:

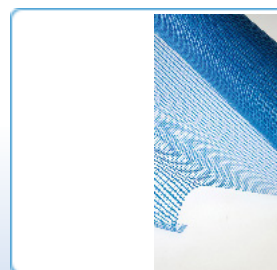
shrinkage (%):	13
resistance to heat (DIN 52123) (°C):	> 70
crack-bridging at +4°C (DIN 28052) (mm):	≥ 2
cold bending (DIN 52123) (°C):	≤ 0
impermeability with 1 mm wide cracks (DIN 52123):	0.75 bar for more than 72 hours

Included and calculated in the price for work carried out according to specification:

<i>APPLICATION BY TROWEL, MINIMUM THICKNESS 2 mm WITHOUT MAPENET 150</i>	
– per square metre	.....(€/m ²)
<i>APPLICATION BY TROWEL, MINIMUM THICKNESS 3 mm WITH MAPENET 150</i>	
– per square metre	.....(€/m ²)
<i>APPLICATION BY SPRAY, MINIMUM THICKNESS 2 mm WITHOUT MAPENET 150</i>	
– per square metre	.....(€/m ²)
<i>APPLICATION BY SPRAY, MINIMUM THICKNESS 3 mm WITH MAPENET 150</i>	
– per square metre	.....(€/m ²)



DIN 18195-2



M.2.7 WATERPROOFING STRUCTURAL JOINTS
Procedure

Joints must be treated with special care: the sealing capacity and watertightness of a joint is guaranteed by the use of special PVC waterstops inserted in the poured concrete, such as **Idrostop** PVC BE (see section **M.2.7.2**) and **Idrostop** PVC BI (see section **M.2.7.1**).

The dimensions and type of **Idrostop** PVC used for each application generally depends on the following parameters:

- type of structure;
- size and type of predicted movements;
- thickness of the poured concrete (only valid for **Idrostop** PVC BI).

To create a continuous watertight system on walls in correspondence with structural joints, use special tape made from Elastomeric Thermoplastic Polyolefin (TPE for short), such as **Mapeband TPE** (see section **M.2.7.3**), to seal the joint on the surface to be waterproofed, and to guarantee that the fillet is also elastic and deformable.

a) PVC waterstop with internal bulb

Idrostop PVC BI is a pre-formed, flexible internal waterstop made by extruding high quality PVC, and is designed for sealing joints in reinforced cement structures (see section **M.2.7.1**). The waterstop is positioned at the mid-point of the foundation slab or wall and is stretched and held in position with wire. One end of the wire is attached to the steel reinforcement of the structure while the other end is attached to the waterstop. Insert suitable compressible material between the first and second pour of concrete to form the joint, and to prevent rigid material clogging the joint. To make joints in **Idrostop** PVC BI, heat-weld the two pieces by melting the PVC with a Leister electronic hot air blower, which allows the two pieces to adhere perfectly. Cut the ends to be joined at a right-angle and make sure they are perfectly aligned.

b) PVC waterstop with external bulb

Idrostop PVC BE (see section **M.2.7.2**) is a pre-formed, flexible external waterstop made from high quality, extruded PVC designed for sealing construction and expansion joints in reinforced cement structures. Nail the waterstop to the layer of lean concrete or the formwork, according to whether it is used to form a joint in the foundation pad or in the wall and then buried in the poured concrete, with the anchoring lug turned towards the pour so that it adheres perfectly to the concrete. Insert suitable compressible material between the first and second pour of concrete to form the joint, and to prevent rigid material clogging the joint. To make joints in **Idrostop** PVC BE, heat-weld the pieces as per the procedure for PVC waterstop with an internal bulb.

c) With TPE tape**Preparation of the substrate**

Clean the surfaces where the **Mapeband TPE** is to be applied so there are no traces of oil, grease, paint, dust and loose or detached parts.

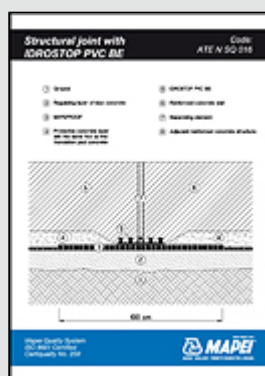
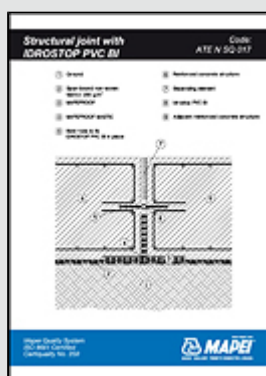
Waterproofing

Apply **Mapeband TPE** (see section **M.2.7.3**) high-elasticity, waterproof TPE tape, suitable for elastic sealing and waterproofing expansion joints subject to movement of up to 10 mm. The tape is 1 mm thick with edges reinforced with polyester fabric, and is bonded in place with **Adesilex PG4** two-component, thixotropic epoxy adhesive as follows:

Apply an even 1-2 mm thick layer of **Adesilex PG4** with a smooth trowel on the clean, dry substrate, trying to prevent the adhesive running into the joint. Insert the **Mapeband TPE** by pressing it 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 layer. Smooth over with a flat trowel and, while the product is still fresh, dust with 0.5 spheroid quartz sand to form a rough surface to help the specified MAPEI waterproofing system adhere. Once the reticulation process of **Adesilex PG4** has been completed, remove any loose quartz and apply the waterproofing system.

Mapecband TPE may be joined by “heat-welding” with a Leister electronic hot air blower, or by “cold-welding” by double-buttering with **Adesilex LP** polychloroprene contact adhesive in solvent. This operation makes it easy to make straight joints and to join special pieces, and guarantees the watertightness of the system.



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.7.1 Application of PVC waterstop with an internal bulb for sealing structural joints

Supply and application of PVC waterstop with an internal bulb to seal structural joints in civil, industrial and hydraulic constructions (such as **Idrostop** PVC BI produced by MAPEI S.p.A.).

The joint is positioned at the mid-point of the reinforced concrete foundations or wall and stretched and held in position with wire. One end of the wire is attached to the steel reinforcement of the structure while the other end is attached to the waterstop.

The product must have the following characteristics:

Shore A hardness (ISO 868/ASTM D 2240):	70 ± 3
density (ISO 1183/ASTM D 792) (g/cm ³):	1.31 ± 0.03
ultimate tensile strength (ISO 527/ASTM D 638) (N/mm ²):	14
elongation at failure (ISO 527/ASTM D 638) (%):	450

Included and calculated in the price for work carried out according to specification:

- heat-welding various pieces together to suit the geometry of the structure using Leister welding equipment;
- supply and application of suitable compressible material between the first and second pour of concrete to form the joint, and rigid material to avoid the flexible material becoming clogged.

APPLICATION OF 20 cm WIDE PROFILE

- per metre(€/m)

APPLICATION OF 25 cm WIDE PROFILE

- per metre(€/m)

APPLICATION OF 30 cm WIDE PROFILE

- per metre(€/m)



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.7.2 Application of PVC waterstop with an external bulb for sealing structural joints

Supply and application of PVC waterstop with an external bulb to seal structural joints in civil, industrial and hydraulic constructions (such as **Idrostop** PVC BE produced by MAPEI S.p.A.). Nail the waterstop to the layer of lean concrete for joints in the foundation pad or to the formwork for joints in walls.

The product must have the following characteristics:

Shore A hardness (ISO 868/ASTM D 2240):	70 ± 3
density (ISO 1183/ASTM D 792) (g/cm ³):	1.31 ± 0.03
ultimate tensile strength (ISO 527/ASTM D 638) (N/mm ²):	14
elongation at failure (ISO 527/ASTM D 638) (%):	450

Included and calculated in the price for work carried out according to specification:

- heat-welding various pieces together to suit the geometry of the structure using Leister welding equipment;
- supply and application of nails to fix the waterstop in place;
- supply and application of suitable compressible material between the first and second pour of concrete to form the joint, and rigid material to avoid the flexible material becoming clogged.

APPLICATION OF 20 cm WIDE PROFILE

- per metre(€/m)

APPLICATION OF 24 cm WIDE PROFILE

- per metre(€/m)



M.2 NEW STRUCTURES BELOW GROUND LEVEL

M.2.7.3 TPE tape for elastic sealing and waterproofing of joints and cracks (movements up to 5 or 10 mm)

Supply and application of TPE tape for elastic sealing and waterproofing of joints and cracks with movements up to 5 or 10 mm (such as **Mapeband TPE** produced by MAPEI S.p.A.).

The surfaces on which the product is applied must be solid and dry. If not, they must be cleaned and then consolidated beforehand (not included). The tape has edges reinforced with non-woven polyester fabric, and is bonded in place with two-component, thixotropic, low-viscosity epoxy adhesive (such as **Adesilex PG4** produced by MAPEI S.p.A.). After applying the adhesive, dust with 0.5 quartz sand to create a sufficiently-rough surface.

The product must have the following characteristics:

ultimate tensile strength (EN ISO 527-1) (N/mm ²):	> 4.5
elongation at failure (EN ISO 527-1) (%):	> 650
foldability at low temperatures (SIA V 280/3) (°C):	< -30
resistance to atmospheric agents and UV rays (SIA V 280/10) (h):	> 5000
resistance to root penetration (SIA V 280/11):	no root penetration
flammability class (DIN 4102-1):	B2
impermeability (EN 1928-B) (N/mm ²):	≤ 0.6
water vapour diffusion resistance index (SIA V 280/6):	approx. 30,000
mechanical perforation resistance (SIA V280/15) (mm):	> 500

Included and calculated in the price for work carried out according to specification:

- hot-welding pieces of tape together with Leister welding equipment or contact adhesive (such as **Adesilex LP** produced by MAPEI S.p.A.);
- supply and application of two-component epoxy adhesive to bond the tape;
- supply and application of 0.5 quartz sand to dust the surface of the adhesive used to bond the tape.

APPLICATION OF 17 cm WIDE TAPE

– per metre(€/m)

APPLICATION OF 32.5 cm WIDE TAPE

– per metre(€/m)



M.2.8 SEALING THROUGH-PIPES IN VERTICAL WALLS AND FOUNDATION PADS WITH HYDRO-EXPANSIVE BENTONITE PROFILE BEFORE POURING
Procedure

In correspondence with elements passing through vertical walls and foundation pads, the bentonite sheet must be cut and trimmed to shape so it fits perfectly around the elements. Pipework passing through vertical walls must be sealed to prevent the formation of preferential routes for water by adopting two precautionary measures.

The first is to apply **Idrostop B25** hydro-expansive bentonite jointing material (see section **M.2.8.1**) around the pipework (at the mid-point of the wall) before pouring the concrete. The second is to apply a piece of **Mapeproof** bentonite sheet (see section **M.2.6.1**) around the through element, and over the layer already applied, and to seal the edges of the piece of sheet by grouting with **Mapeproof Mastic** (see section **M.2.4.3**) bentonite grout made from natural sodium bentonite and plasticising admixtures.

For pipework passing through the foundation pad, on the other hand, the **Mapeproof** sheet must be cut and trimmed to shape around the pipework and the outer part of the pipework must be sealed as follows. Apply **Mapeproof Seal** natural sodium bentonite powder under the sheet, then apply **Idrostop B25** hydro-expansive bentonite jointing material around the pipework and over the **Mapeproof** (see section **M.2.4.2**). Then seal the bentonite bead with **Mapeproof Mastic**.

M.2 NEW STRUCTURES BELOW GROUND LEVEL**M.2.8.1 Application of self-sealing, hydro-expansive bentonite jointing material around through elements**

Supply and application of self-sealing, hydro-expansive jointing strip with a density of 1.6 g/cm³ (such as **Idrostop B25** produced by MAPEI S.p.A.), made from a mixture of natural sodium bentonite and polymers (according to ASTM D 71), which expands up to 425% of its initial volume when in contact with water without comprising its sealing capacity.

The size of the product is 20 mm × 25 mm, and is fixed in place with metal wire around the element to be sealed.

– per metre

.....(€/m)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.1 SEALING SECOND POURS, CRACKS AND THROUGH ELEMENTS Procedure

a) With continuous seeping water

Preparation of the substrate

Make a small trench at least 8 cm deep around the through-element or in correspondence with the crack or second pour, and clean the trench to remove all traces of demolished material and rubble.

Waterproofing

Block the seeping water using **Lamposilex** ultra rapid-setting hydraulic binder (see section **M.3.1.1**) by moulding it by hand to form a plug. Wait a few seconds until it starts to harden and then press the plug firmly into the crack or hole.

Extrude a bead of **Mapeproof Swell** one-component, hydro-expansive paste (see section **M.3.1.2**) to form a bead of sealant around the **Lamposilex**.

Then confine the **Mapeproof Swell** by filling the trench with restoration mortar, such as **Mapegrout 430** fine-grained, fibre-reinforced thixotropic mortar (see section **M.1.4.3**).

b) Without continuous seeping water

Preparation of the substrate

Make a small trench at least 8 cm deep around the through-element or in correspondence with the crack or second pour, and clean the trench to remove all traces of demolished material and rubble.

Waterproofing

Extrude **Mapeproof Swell** one-component, hydro-expansive paste (see section **M.3.1.2**) on the bottom of the trench, crack or around the through element.

Then confine the **Mapeproof Swell** by filling the trench with restoration mortar, such as **Mapegrout 430** fine-grained, fibre-reinforced thixotropic mortar.

M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.1.1 Application of ultra rapid-setting and hardening hydraulic binder for blocking continuous seeping water, including when under pressure

Supply and application of ultra rapid-setting and hardening hydraulic binder for blocking continuous seeping water under pressure (such as **Lamposilex** produced by MAPEI S.p.A.).

The substrate must be clean and solid and free of any loose portions which could compromise adhesion.

The product, supplied in powder form and made from high-strength cement and admixtures, must be applied on substrates wetted with water by moulding it by hand and pressing it firmly in place for 2-3 minutes to allow it to set. After applying the product, remove any excess material with a grinder or an abrasive disk.

The product must have the following characteristics:

flexural strength (N/mm²)

– after 30 mins.:	3
– after 1 hour:	4
– after 3 hours:	4
– after 24 hours:	5
– after 7 days:	8
– after 28 days:	9

compressive strength (N/mm²):

– after 30 mins.:	17
– after 1 hour:	20
– after 3 hours:	24
– after 24 hours:	32
– after 7 days:	44
– after 28 days:	46

Included and calculated in the price for work carried out according to specification:

– per cubic decimetre(€/dm³)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.1.2 Application of one-component, hydro-expansive paste for waterproof sealing of cracked concrete

Supply and application of one-component, hydro-expansive paste in cartridges for waterproof sealing of cracks and through-elements in concrete (such as **Mapeproof Swell** produced by MAPEI S.p.A.). The substrate must be free of any material which could comprise adhesion of the product. The substrate may be damp but there must be no free water on the surface. Extrude a 6 to 13 mm bead of the product, according to requirements, to form a continuous, consistent layer. The product must then be confined with a layer of mortar at least 8 cm thick (not included).

The product must have the following characteristics:

Shore A hardness (DIN 53505):	32
elongation (DIN 53504) (%):	> 700
ultimate tensile strength (DIN 53504) (N/mm ²):	2.5
modulus of elasticity at 100% elongation (DIN 53504) (N/mm ²):	0.55
tear strength (ISO 34-1) (N/mm):	10
water-tightness (atm):	1
– per metre	.....(€/dm ³)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.2 SEALING SECOND POURS OF LININGS STRUCTURALLY CONNECTED TO EXISTING LININGS

Procedure

When you need to seal a second pour between an existing structure and a new, reinforced concrete lining that are structurally connected to each other, their interface must be sealed using a hydro-expansive jointing profile such as **Idrostop Soft**, as described below.

As an alternative, use **Idrostop B25** and **Idrostop** (see section **M.2.1**).

Substrate preparation

Thoroughly clean the surfaces to eliminate all traces of debris and material from previous operations.

Waterproofing

Seal second pours between existing structures and new, reinforced concrete linings that are structurally connected using **Idrostop Soft** (see section **M.3.2.1**) hydro-expansive, high flexibility bentonite jointing profile bonded to the substrate using suitable sililated polymer-based adhesive.

The special mixture of natural sodium bentonite and butyl rubber gives the profile excellent flexibility and stability and makes it highly adaptable to the surface with which it comes into contact. Also, thanks to its flexibility, it adapts to any type of substrate to form an efficient seal.

M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.2.1 Application of hydro-expansive, high flexibility bentonite jointing profile

Supply and application of hydro-expansive, high flexibility jointing profile (such as **Idrostop Soft** produced by MAPEI S.p.A.) made from a mixture of natural sodium bentonite and butyl rubber, density 1.48 kg/dm³ (according to ASTM D 71-84), with the capacity to expand by more than 250% of its initial volume without compromising its sealing properties.

Apply the profile after adequate preparation of the substrate (not included) to remove all traces of debris and material from previous operations.

The profile measures 20 mm × 25 mm and is suitable for sealing second pours of concrete as long as the laterally confined area is at least 8 cm wide. Bond the jointing profile to the concrete using silitated polymer-based adhesive (such as **Ultrabond MS Rapid** produced by MAPEI S.p.A.) and join the ends of adjacent lengths of profile by laying them alongside each other with an overlap at least 6 cm long.

Included and calculated in the price to complete work according to specification (adhesive included).

– per metre

..... (€/m)



Fast Track Ready



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.3 LINING INTERNAL SURFACES IN AREAS BELOW GROUND LEVEL Procedure

a) Elastic cementitious mortar on vertical surfaces

Preparation of the substrate

Preparation work for this type of intervention depends on the type of substrate:

- concrete walls: remove the render down to the concrete wall, remove any gravel clusters and level off the vertical surfaces with **Mapegrout 430** fine-grained, fibre-reinforced, controlled-shrinking thixotropic mortar for restoring concrete (see section **M.1.4.3**) or, for more rapid interventions, Planitop Smooth & Repair fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar (see section **M.1.4.4**). Second pours, cracks and any pipework or through-elements in concrete walls must be sealed (see section **M.3.1**).
- masonry walls: remove deteriorated render down to the brick masonry. Cracks in the substrate and pipework or through-elements in concrete walls must be sealed (see section **M.3.1**). Level off the surface with **Planitop HDM Maxi** two-component, fibre-reinforced, high-ductility mortar made from pozzolan-reaction binders (see section **M.1.4.5**), in combination with **Mapegrid G 120** or **Mapegrid G 220** special alkali-resistant, primed glass fibre mesh.

Waterproofing

Before applying Mapelastic Foundation, a coat of Primer 3296 consolidating, dust-repellent acrylic primer in water dispersion must be applied on the surface to improve adhesion. Dilute the primer 1:1 with water and apply with a brush or roller.

Apply two coats of **Mapelastic Foundation** two-component, elastic cementitious mortar (see section **M.3.2.1**) on the walls and for at least 50 cm on the horizontal surfaces with a roller or by spray to form a layer at least 2 mm thick. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried. Once the **Mapelastic Foundation** is fully cured, apply a de-humidifying cycle to form an anti-condensation buffer on the new waterproofing system.

b) Bentonite sheet on horizontal and vertical surfaces

This type of intervention is carried out when groundwater under pressure infiltrates into areas below ground level from the floor or vertical retaining walls, and when the volume of areas below ground level may be reduced by relining them.

Preparation of the substrate

The first step is to demolish the first 3 or 4 steps on flights of stairs, and to remove dividing walls, flooring and substrates. Level off the vertical walls with **Mapegrout 430** fine-grained, fibre-reinforced, controlled-shrinking thixotropic mortar (see section **M.1.4.3**) for restoring concrete or, for more rapid interventions, Planitop Smooth & Repair fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar (see section **M.1.4.4**).

Second pours, cracks and any pipework or through-elements must be sealed (see section **M.3.1**).

Waterproofing

Line the internal vertical and horizontal surfaces of the area with **Mapeproof** bentonite sheet (see section **M.3.2.2**), positioned with the lower layer (the dark fabric) of the geo-textile against the floor and walls, and the upper layer (white non-woven fabric) facing upwards so it is visible. Overlap the edges of adjacent sheets by at least 10 cm and fix the sheets to the substrate along the overlaps with nails and polyethylene washers **Mapeproof** CD (see section **M.2.8**) every 50 cm on horizontal surfaces and every 30 cm on vertical surfaces. When laying the product around through elements (pillars, pipework, etc.), cut and trim the sheets to shape so they fit perfectly around the elements and seal the joints.

If there is a horizontal structure to which the new foundations may be anchored, perforate the **Mapeproof** sheet so that metallic connectors may be cast in place. This operation means that the thickness of the new foundations may be lower, in that the old structure will act as ballast for the new one. **Mapeproof** must only be perforated according to the results of structural calculations. Apart from the thickness of the new floor slab and walls, the structural analysis must also indicate the number per square metre and diameter of the metallic connectors which must be used on the

horizontal surfaces (foundation pad) and vertical surfaces (walls). Anchor the connectors to the horizontal surfaces using **Mapefix VE SF** (see section **E.6.1.2**). Grout the areas where the connectors

pass through the sheets with **Mapeproof Mastic** bentonite grout (see section **M.2.4.3**). If there is a horizontal structure to which the new foundations may be anchored, perforate the structure after carrying out the operations described above, position the steel reinforcement for the new **Mapeproof** sheet so that metallic connectors may be cast in place. This operation means that the reinforced concrete floor slab on the horizontal surfaces at a suitable distance from the **Mapeproof** sheets using plastic spacers. These spacers allow the concrete to flow freely under and around the one **Mapeproof** must only be perforated according to the results of structural calculations. Apart from the thickness of the new floor slab and walls, the structural analysis must also indicate the thickness of which must be sufficient to resist the hydraulic pressure from the groundwater. After pouring and curing the concrete for the new foundation slab, seal second pours between the foundation slab and the reinforced concrete vertical walls with suitable hydro-expansive jointing profile such as **Idrostop B25** (see section **M.2.1.1**), **Idrostop** (see section **M.2.1.2**) or **Idrostop Soft** (see section **M.3.2.1**).

Then seal all the formwork and pour the reinforced concrete counter-walls. The thickness of the walls must be calculated to resist the hydraulic pressure from the groundwater. The concrete counter-walls may also be made to form a single body with the existing structure following the procedure described previously.

After pouring and curing the concrete for the new foundation slab, seal second pours between the foundation slab and the reinforced concrete vertical walls with suitable hydro-expansive jointing profile such as **Idrostop B25** (see section **M.2.1.1**), **Idrostop** (see section **M.2.1.2**) or **Idrostop Soft** (see section **M.3.2.1**).

c) Combined bentonite-cementitious system on horizontal and vertical surfaces
The choice of which system to use for this type of intervention does not depend on the hydrostatic pressure acting on the structure, but rather on two main factors: the area available in the room below ground level and the time required to carry out the work. As mentioned in the previous section, lining internal surfaces with **Mapeproof** bentonite sheet reduces the area available in the room below ground level, in that a counter-wall thick enough to resist the hydraulic pressure of the groundwater must be constructed. The use of a cementitious system on the other hand, such as **Mapelastic Foundation** does not reduce the area available but may lead to long delays when carrying out the work if it has to be applied on a layer of reinforced levelling render. Therefore, when choosing which system to use in areas below ground level, the analysis must take into consideration both the technical aspects and the overall cost of the intervention.

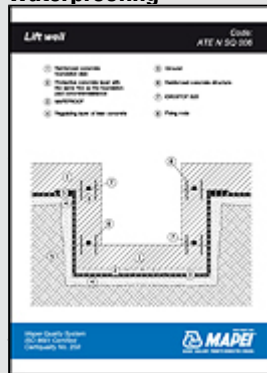
Preparation of the substrate

As mentioned in *point a*, preparation of the walls depends on the type of material they are made from.

- concrete walls: remove the render down to the concrete wall, remove any gravel clusters and level off the vertical surfaces with **Mapegrout 430** fine-grained, fibre-reinforced, controlled-shrinking thixotropic mortar for restoring concrete (see section **M.1.4.3**) or, for more rapid interventions, Planitop Smooth & Repair fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar (see section **M.1.4.4**). Second pours, cracks and any pipework or through-elements must be sealed (see section **M.3.1**).
- masonry walls: remove deteriorated render down to the brick masonry. Seal second pours, cracks in the substrate and pipework or through-elements in concrete walls (see section **M.3.1**). Level off the surface with **Planitop HDM Maxi** two-component, fibre-reinforced, high-ductility mortar (see section **M.1.4.5**) made from pozzolan-reaction binders, in combination with **Mapegrid G 120** or **Mapegrid G 220** special alkali-resistant, primed glass fibre mesh.

Also, demolish the first 3 or 4 steps on flights of stairs, and remove dividing walls, flooring and substrates.

Waterproofing



Mapelastic Foundation two-component, elastic cementitious mortar on the substrate. Apply the first coat 50 cm on the horizontal surfaces with a roller or by spray to form a layer of **Mapelastic Foundation** (see section **M.3.2.1**). Apply the second coat 4-5 hours after applying the first coat in all cases only when the first coat has completely dried.

When **Mapelastic Foundation** is cured, apply the **Mapeproof** bentonite sheets on the horizontal surfaces. Fix the sheets to the substrate along the overlaps with nails and washers approximately every 50 cm. When laying the sheets around pipework, etc.), cut and trim the sheets to shape so they fit perfectly around the elements and seal the joints (see section **M.2.3**). Make sure there are no creases when laying the sheets.

M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.3.1 Application of two-component, elastic cementitious mortar on vertical surfaces

Supply and application of two-component, elastic cementitious mortar on vertical surfaces by roller or spray, made from cementitious binders, selected fine-grained inerts, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Foundation** produced by MAPEI S.p.A.), for waterproofing concrete surfaces subject to positive and negative hydraulic pressure.

Apply the mortar after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid, dry substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

After preparing the substrate as above, apply a coat of acrylic consolidator and adhesion promoter (such as Primer 3296 produced by MAPEI S.p.A.) diluted 1:1 with water with a brush or roller.

Apply the product with a roller or by spray with a rendering machine, fitted with a spraying lance for skimming compound, to form a layer at least 2 mm thick, then finish off the surface with a flat trowel. Apart from the vertical walls, apply a 50 cm wide strip of the product on the horizontal surfaces.

The product must have the following characteristics:

adhesion to concrete (EN 1542 after 28 days) (N/mm ²):	> 1
adhesion to concrete (EN 1542 after 7 days) (N/mm ²):	> 0.7
crack resistance (EN 1062-7) (mm):	class A4 (> 1.25 mm)
permeability to water vapour (EN ISO 7783-1):	$S_D = 2.4$ m and $\mu = 1200$
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.07
permeability to CO ₂ (EN 1062-6) (m):	> 300
impermeability to water under positive pressure (EN 12390-8)	
– 5 bar for 3 days:	no penetration
– 1.5 bar for 7 days:	no penetration
impermeability to water under 1.5 bar negative pressure:	no penetration
elasticity after 28 days (DIN 53504) (%):	> 60
reaction to fire:	Euroclass E

AVERAGE THICKNESS 2 mm, APPLIED BY ROLLER

– per square metre(€/m²)

AVERAGE THICKNESS 2 mm, APPLIED BY SPRAY

– per square metre(€/m²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.3.2 Application of bentonite waterproofing sheet on horizontal surfaces before pouring

Supply and application of a bentonite waterproofing system on horizontal surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

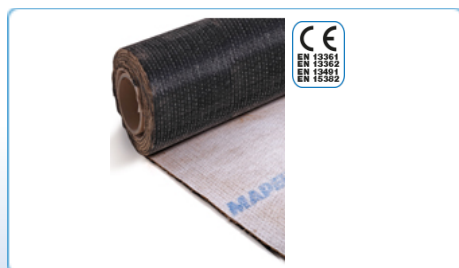
mass per unit area (EN 14196) (g/m ²):	5460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

Apply the sheets with staggered joints with the light coloured fabric facing the poured concrete and the dark coloured fabric against the existing substrate with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and washers (such as **Mapeproof** CD produced by MAPEI S.p.A.) approximately every 50 cm.

Included and calculated in the price for work carried out according to specification:

- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

– per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
– per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
– per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.3.3 Application of bentonite waterproofing sheet on horizontal surfaces before pouring

Supply and application of a bentonite waterproofing system on horizontal surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

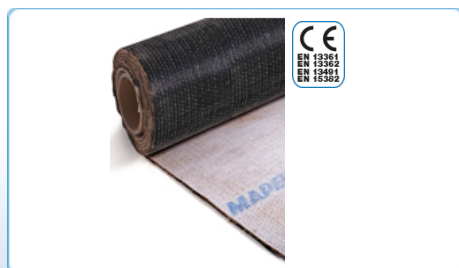
mass per unit area (EN 14196) (g/m ²):	5460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

Apply the sheets with staggered joints with the light coloured fabric facing the poured concrete and the dark coloured fabric against the existing substrate with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and washers (such as **Mapeproof** CD produced by MAPEI S.p.A.) approximately every 50 cm.

Included and calculated in the price for work carried out according to specification:

- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

– per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
– per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
– per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.4 WATERPROOFING LIFT WELLS AGAINST COUNTER-PRESSURE Procedure

Waterproofing lift wells against counter-pressure can be achieved in three different ways:

- by applying a layer of **Idrosilex** water-repellent mortar on the horizontal surface combined with **Idrosilex Pronto** on the vertical walls;
- application of a waterproof coating made from **Idrosilex** water-repellent mortar on the horizontal surface and **Mapelastich Foundation** on the vertical and horizontal surfaces;
- application of **Mapeproof** on the horizontal surface combined with **Mapelastich Foundation** on the vertical surfaces.

Preparation of the substrate

With all three solutions, second pours, cracks in the substrate and through-elements in the concrete walls must first be sealed (see section **M.3.1**).

The surfaces to be waterproofed must be perfectly clean and solid. Any gravel clusters must be removed and the vertical surfaces must be levelled off with **Mapegrout 430** fine-grained, fibre-reinforced, controlled-shrinking thixotropic mortar for restoring concrete (see section **M.1.4.3**) or, for more rapid interventions, Planitop Smooth & Repair fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar (see section **M.1.4.4**). Then remove all dust and residues of previous operations with a mechanical brush, by sand-blasting or with high pressure water jets.

a) Osmotic mortar

Waterproofing

After preparing the substrate as described above, wet the substrate until it is saturated with a dry surface and apply a layer of **Idrosilex Pronto** (see section **M.3.3.1**) waterproof osmotic cementitious mortar with a brush, trowel or by spray. Pay particular attention when applying the product on the fillet joint between the walls and horizontal surface and between adjacent walls, and make sure it penetrates into the substrate. Spread the **Idrosilex Pronto** on the vertical surfaces and form an overlap on the horizontal surface at least 30 cm wide. The product must form a layer at least 2-3 mm thick and the characteristics of the hardened layer make it suitable only for forming rigid waterproofing layers. Complete the waterproofing system by applying several layers of water-repellent mortar made with **Idrosilex Liquid** (see section **M.3.3.2**) or **Idrosilex Powder** (see section **M.3.3.3**) as described in the Technical Data Sheet.

b) Combined osmotic mortar - elastic cementitious mortar system

Waterproofing

After preparing the substrate as described above, apply several layers of **Idrosilex Liquid** (see section **M.3.3.2**) or **Idrosilex Powder** (see section **M.3.3.3**) water-repellent mortar as described in the Technical Data Sheet.

The screed must be well compacted and smoothed over and must be cured for at least two days.

Then apply a layer of **Eporip** (see section **F.8.2.1**) two-component, solvent-free epoxy adhesive on the fillet joints between the horizontal and vertical surfaces and between the adjacent walls. While the **Eporip** is still fresh, make fillets using **Mapegrout 430** fine-grained, normal-setting thixotropic mortar (see section **M.1.4.3**). After completing the cycle, apply two layers of **Mapelastich Foundation** two-component cementitious mortar (see section **M.3.3.4**) on the vertical and horizontal surfaces with a roller or by spray to form a layer at least 2 mm thick. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried.

c) Bentonite - elastic cementitious mortar system

Waterproofing

After preparing the substrate as described above. Before applying Mapelastic Foundation, a coat of Primer 3296 consolidating, dust-repellent acrylic primer in water dispersion must be applied on the surface to improve adhesion. Dilute the primer 1:1 with water and apply with a brush or roller.

Apply two coats of **Mapelastic Foundation** (see section **M.3.3.4**) on the vertical surfaces and a strip at least 30 cm wide on the horizontal surfaces with a brush or roller to form a layer at least 2 mm thick. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried.

When the **Mapelastic Foundation** is fully cured, line the internal horizontal surfaces of the area with **Mapeproof** (see section **M.3.3.5**) bentonite sheet, positioned with the lower layer (the dark fabric) of the geo-textile against the existing substrate, and the upper layer (white non-woven fabric) facing upwards so it is visible. Overlap the edges of adjacent sheets by at least 10 cm and fix the sheets to the substrate along the overlaps with nails and **Mapeproof** CD polyethylene washers approximately every 50 cm on horizontal surfaces and every 30 cm on vertical surfaces. When laying the sheets around through elements, cut and trim the sheets to shape so they fit perfectly around the elements and seal the joints (see section **M.2.8**). Make sure there are no creases when laying the sheets.

Seal the joints between **Mapeproof** and **Mapelastic Foundation** with a suitable hydro-expansive profile such as **Idrostop B25** (see section **M.2.1.1**), **Idrostop** (see section **M.2.1.2**) or **Idrostop Soft** (see section **M.3.2.1**).

To join the steel reinforcement in the new reinforced concrete floor slab with the reinforcement in the old one, the **Mapeproof** sheets must be perforated according to the results of structural calculations. Apart from the thickness of the new floor slab, the structural analysis must also indicate the number per square metre and diameter of the metallic connectors which must be used on the horizontal surfaces. Anchor the connectors to the horizontal surfaces using **Mapefix VE SF** (see section **E.6.1.2**). Grout the points where the metal connectors pass through the sheets with **Mapeproof Mastic** (see section **M.2.4.3**) bentonite grout, and where they pass through the cementitious waterproofing mortar with **Mapeproof Swell** (see section **M.3.1.2**). After carrying out the operations described above, position the steel reinforcement for the new floor slab on the horizontal surfaces, at a suitable distance from the **Mapeproof** sheets using spacers. These spacers allow the concrete to flow freely under and around the steel reinforcement and guarantee that the reinforcement is well covered. Then pour the concrete, the thickness of which must be sufficient to resist the hydraulic pressure from the ground water.

M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.4.1 Application of osmotic cementitious mortar for waterproofing against counter-pressure

Supply and application of osmotic cementitious mortar (such as **Idrosilex Pronto** produced by MAPEI S.p.A.) for waterproofing masonry and concrete structures against counter-pressure.

The product is made from cement, selected aggregates and special synthetic resins, and must be applied on clean, solid substrates saturated with water using a trowel, brush or by spray to form a layer at least 2-3 mm thick.

The product must have the following characteristics:

compressive strength (EN 12190) (MPa)	
– after 1 day:	> 6
– after 7 days:	> 15
– after 28 days:	> 25
flexural strength (EN 196-1) (MPa)	
– after 1 day:	> 2
– after 7 days:	> 4
– after 28 days:	> 6
adhesion to concrete after 28 days (EN 1766) (MPa):	> 2
impermeability (EN 1062-3) ($\text{kg}/\text{m}^2 \cdot \text{h}^{0.5}$):	< 0.05
permeability to water vapour - S_D (m):	< 1
reaction to fire:	Euroclass E

AVERAGE THICKNESS 2-3 mm, APPLIED BY TROWEL

– per square metre(€/m²)

AVERAGE THICKNESS 2-3 mm, APPLIED BY BRUSH

– per square metre(€/m²)

AVERAGE THICKNESS 2-3 mm, APPLIED BY SPRAY

– per square metre(€/m²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.4.2 Application of osmotic cementitious mortar mixed with liquid water-repellent admixture

Supply and application of a layer of cement mixed with liquid water-repellent admixture for cementitious mortar (such as **Idrosilex** Liquid produced by MAPEI S.p.A.).

Surfaces to be treated must be clean and solid, roughened by bush-hammering and saturated with a dry surface (ssd state).

Apply a first layer 2-3 mm thick of fluid mortar (45 litres of sand + 50 kg of CEM II/A-L 32.5 Portland cement + 1.5-2.5 kg of liquid water-repellent admixture) with a large brush. Then immediately apply a second layer 7-8 mm thick of plastic mortar (45 litres of sand + 50 kg of CEM II/A-L 32.5 Portland cement + 1.5-2.5 kg of liquid water-repellent admixture) and roughly tamp the surface. While the second layer is still fresh, apply a third layer approximately 30 mm thick of semi-dry mortar (150 litres of sand + 50 kg of CEM II/A-L 32.5 Portland cement + 1.5-2.5 kg of liquid water-repellent admixture). Tamp the surface vigorously to force the water to the surface and then finish off by fine tamping.

The sand and cement required to make the layer of cement are included and calculated in the price for work carried out according to specification:

– per square metre

.....(€/m²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.4.3 Application of osmotic cementitious mortar mixed with powdered water-repellent admixture

Supply and application of a layer of cement mixed with powdered water-repellent admixture for cementitious mortar (such as **Idrosilex** Powder produced by MAPEI S.p.A.).

Surfaces to be treated must be clean and solid, roughened by bush-hammering and saturated with a dry surface (ssd state).

Apply a first layer 2-3 mm thick of fluid mortar (45 litres of sand + 50 kg of CEM II/A-L 32.5 Portland cement + 1-2 kg of powdered water-repellent admixture) with a large brush. Then immediately apply a second layer 7-8 mm thick of plastic mortar (45 litres of sand + 50 kg of CEM II/A-L 32.5 Portland cement + 1-2 kg of powdered water-repellent admixture) and roughly tamp the surface. While the second layer is still fresh, apply a third layer approximately 30 mm thick of semi-dry mortar (150 litres of sand + 50 kg of CEM II/A-L 32.5 Portland cement + 1-2 kg of powdered water-repellent admixture). Tamp the surface vigorously to force the water to the surface and then finish off by fine tamping.

The sand and cement required to make the layer of cement are included and calculated in the price for work carried out according to specification:

– per square metre

.....(€/m²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.4.4 Application of two-component, elastic cementitious mortar on vertical and horizontal surfaces

Supply and application of two-component, elastic cementitious mortar on vertical surfaces by roller or spray, made from cementitious binders, selected fine-grained inerts, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Foundation** produced by MAPEI S.p.A.), for waterproofing concrete surfaces subject to positive and negative hydraulic pressure.

Apply the mortar after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid, dry substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

After preparing the substrate as above, apply a coat of acrylic consolidator and adhesion promoter (such as Primer 3296 produced by MAPEI S.p.A.) diluted 1:1 with water with a brush or roller.

Apply the product using a roller to form a layer at least 2 mm thick.

The product must have the following characteristics:

adhesion to concrete (EN 1542 after 28 days) (N/mm ²):	> 1
adhesion to concrete (EN 1542 after 7 days) (N/mm ²):	> 0.7
crack resistance (EN 1062-7) (mm):	class A4 (> 1.25 mm)
permeability to water vapour (EN ISO 7783-1):	$S_D = 2.4$ m and $\mu = 1200$
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.07
permeability to CO ₂ (EN 1062-6) (m):	> 300
impermeability to water under positive pressure (EN 12390-8)	
– 5 bar for 3 days:	no penetration
– 1.5 bar for 7 days:	no penetration
impermeability to water under 1.5 bar negative pressure:	no penetration
elasticity after 28 days (DIN 53504) (%):	> 60
reaction to fire:	Euroclass

AVERAGE THICKNESS 2 mm, APPLIED BY ROLLER

– per square metre

.....(€/m²)



M.3 STRUCTURES BELOW GROUND LEVEL REQUIRING RESTORATION WORK

M.3.4.5 Application of bentonite waterproofing sheet on horizontal surfaces before pouring

Supply and application of a bentonite waterproofing system on horizontal surfaces (such as **Mapeproof** produced by MAPEI S.p.A.) made from two layers of polypropylene geo-textile fabric, with a top layer of 220 g/m² non-woven fabric and a bottom layer of 140 g/m² fabric, needle-punched together to form a sandwich around an even layer of 5100 g/m² natural sodium bentonite. The layers which form the bentonite barrier are joined together by a dense network of needle-punched synthetic fibres which go from the upper layer and are stitched to the lower layer. The needle-punching is distributed evenly across the whole surface, to ensure there is no slip between the layers and that the hydrated bentonite is held firmly in position, even when applied on vertical surfaces.

The sheet measures 1.1 m × 5 m, 2.5 m × 22.5 m or 5 m × 40 m, and must have the following characteristics:

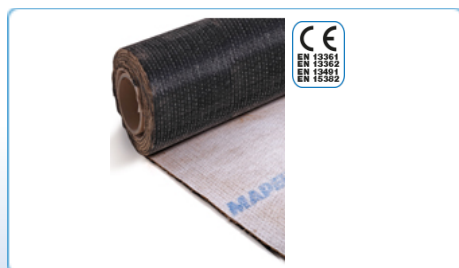
mass per unit area (EN 14196) (g/m ²):	5,460
coefficient of permeability (ASTM D 5887) (m/s):	< 1E-11
flow (ASTM D 5887) (m ³ /m ² /s):	< 5E-9
static punch test (EN ISO 12236) (N):	2,400 (- 50 N)
longitudinal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
transversal tensile strength (EN ISO 10319) (kN/m):	> 14 (- 0.5 kN/m)
peeling (ASTM D 6496) (N/m):	> 420
adhesion to concrete (ASTM D 903) (N/mm):	> 3.5
thickness of product (EN 964-1) (mm):	6

Apply the sheets with staggered joints with the light coloured fabric facing the poured concrete and the dark coloured fabric against the existing substrate with overlaps 10 cm wide between adjacent sheets. Fix the sheets in place along the overlaps with nails and washers (such as **Mapeproof** CD produced by MAPEI S.p.A.) approximately every 50 cm.

Included and calculated in the price for work carried out according to specification:

- all trimming and cutting required on site to suit the shape of the structure to be waterproofed;
- nails and washers to fix the sheets in place.

– per square metre, sheet size 1.1 m x 5 m	.....(€/m ²)
– per square metre, sheet size 2.5 m x 22.5 m	.....(€/m ²)
– per square metre, sheet size 5 m x 40 m	.....(€/m ²)



M.4.1 WATERPROOFING DRAINAGE OUTLETS
Procedure

Waterproofing around drainage outlets must be carried out using special components from the Drain range.

a) Drainage outlets in floors**Preparation of the substrate**

Level off the surface, if required, using **Planitop Fast 330** (see section **R.1.3.3.2**) fibre-reinforced, rapid-setting cementitious levelling mortar applied in layers from 3 to 30 mm thick, for evening out irregularities on uneven substrates.

Waterproofing

Around the drain, apply the first layer of the specified waterproofing product so that it covers a larger area than that of the non-woven fabric collar heat-welded to the polypropylene Drain fitting. Then place the Drain Vertical (see section **M.4.1.1**) or Drain Lateral (see section **M.4.1.2**) fitting in place and press the fabric onto the waterproofing layer while it is still fresh. Cover the fabric with the waterproofing product and blend it in with the previous layer.

After waterproofing all the surface of the terrace/balcony, fix the telescopic Drain fitting in place (cut to length according to the coating to be applied later) by spot-bonding with **Mapesil AC** acetic-reticulation silicone sealant.

Then complete installation of the drainage outlet after the coating has been installed, making sure that the interface between the grate on the Drain fitting kit and the floor is sealed with **Mapesil AC**.

b) Drainage outlets in parapets**Preparation of the substrate**

Make a small trench in the wall and floor in order to position the **Drain Front**, TPE angular pipe union for balconies so that, when the flooring has been installed, it remains level with the flooring.

Waterproofing

Apply an even coat of **Adesilex PG4** two-component, thixotropic epoxy adhesive with a smooth trowel on a clean, dry substrate and insert the **Drain Front** (see section **M.4.1.3**), pressing down slightly so it is embedded in the **Adesilex PG4**. Apply a second coat of **Adesilex PG4** fresh on fresh, so it completely covers the **Drain Front**. Smooth over with a flat trowel and, while the product is still fresh, dust the surface with 0.5 spheroid quartz sand to form a rough layer to help the waterproofing product adhere. Once the reticulation process of the **Adesilex PG4** has been completed, remove any loose quartz.

M.4 NEW TERRACES AND BALCONIES

M.4.1.1 Application of a floor-mounted drainage outlet kit with a vertical connection

Supply and application of a floor-mounted drainage outlet with a vertical connection (such as Drain Vertical produced by MAPEI S.p.A.), with a telescopic extension, anti-odour plug and removable stainless steel grate.

Install the drainage outlet on a compact, clean dry substrate by applying a waterproofing product applied in two layers in which the 400 mm x 400 mm non-woven fabric collar welded to the drainage outlet is embedded.

After completing the waterproofing system for the pedestrian surface, fix the telescopic extension in place by spot-bonding with acetic-reticulation silicone sealant (such as **Mapesil AC** produced by MAPEI S.p.A.). Then, after completing installation of the flooring, seal the interface between the metallic grate from the drainage outlet kit and the flooring with the same silicone sealant.

Included and calculated in the price for work carried out according to specification:

- supply and application of the waterproofing product required to fix the drainage outlet to the substrate;
- supply and application of the silicone sealant required to fix the extension for the outlet in place and seal the stainless steel grate;
- application of all the components in the drainage outlet kit, with installation time scheduled according to the type of intervention and the characteristics of the product.

APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 50 mm	.....(€/kit)
APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 75 mm	.....(€/kit)
APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 82 mm	.....(€/kit)
APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 90 mm	.....(€/kit)
APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 100 mm	.....(€/kit)



M.4 NEW TERRACES AND BALCONIES

M.4.1.2 Application of a floor-mounted drainage outlet kit with a side connection

Supply and application of a floor-mounted drainage outlet with a side connection (such as Drain Lateral produced by MAPEI S.p.A.), with a telescopic extension, anti-odour plug and removable stainless steel grate.

Install the drainage outlet on a compact, clean dry substrate by applying a waterproofing product applied in two layers in which the 400 mm x 400 mm non-woven fabric collar welded to the drainage outlet is embedded.

After completing the waterproofing system for the pedestrian surface, fix the telescopic extension in place by spot-bonding with acetic-reticulation silicone sealant (such as **Mapesil AC** produced by MAPEI S.p.A.). Then, after completing installation of the flooring, seal the interface between the metallic grate from the drainage outlet kit and the flooring with the same silicone sealant.

Included and calculated in the price for work carried out according to specification:

- supply and application of the waterproofing product required to fix the drainage outlet to the substrate;
- supply and application of the silicone sealant required to fix the extension for the outlet in place and seal the stainless steel grate;
- application of all the components in the drainage outlet kit, with installation time scheduled according to the type of intervention and the characteristics of the product.

APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 50 mm	.....(€/kit)
APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 75 mm	.....(€/kit)
APPLICATION OF DRAINAGE OUTLET KIT, DIAMETER 90 mm	.....(€/kit)



M.4 NEW TERRACES AND BALCONIES

M.4.1.3 Application of a TPE angular pipe union

Supply and application of a TPE drainage pipe union for parapets (such as **Drain Front** produced by MAPEI S.p.A.).

Install the drainage outlet by making a small trench in the wall and floor (not included) in order to position the drainage outlet level with the flooring to be installed.

Apply an even coat of two-component, thixotropic epoxy adhesive (such as **Adesilex PG4** produced by MAPEI S.p.A.) with a smooth trowel on a clean, dry substrate and insert the pipe union, pressing down slightly so it is embedded in the adhesive. Apply a second coat of adhesive fresh on fresh, so it completely covers the pipe union, smooth over the surface with a flat trowel and, while the product is still fresh, dust the surface with 0.5 spheroid quartz sand. Once the reticulation process of the adhesive has been completed, remove any loose quartz.

Included and calculated in the price for work carried out according to specification:

- supply and application of two-component, thixotropic epoxy adhesive;
- supply and application of 0.5 quartz sand;
- removal of excess sand upon completion of the installation.

.....(€/piece)



M.4.2 WATERPROOFING JOINTS**Procedure****a) Waterproofing fillet joints between horizontal and vertical surfaces and check joints with rubber tape**

Elastic waterproofing of fillet joints between horizontal and vertical surfaces is carried out with **Mapeband** alkali-resistant rubber tape with felt backing. The same may also be used for waterproofing expansion joints typically found in flooring on balconies and terraces.

Preparation of the substrate

Substrates must be compact and dry. If the render has been previously demolished, level off the surface of the masonry with **Planitop Fast 330** (see section **R.1.3.3.2**) fibre-reinforced, rapid-setting cementitious levelling mortar applied in layers from 3 to 30 mm thick, for evening out irregularities on uneven substrates.

Waterproofing

Apply a first, even coat of the specified waterproofing product with a smooth trowel. Apply the **Mapeband** (see section **M.4.2.1**) by pressing along the sides, making sure there are no creases or air bubbles. Apply a second layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

In the corners, use the special pieces from the **Mapeband** range (90° corners and 270° corners), while the joints between the strips and special pieces must be made using **Adesilex LP** double-buttering polychloroprene contact adhesive in solvent.

Apply **Mapeband** in the check 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 inverted “Ω” shape. These joints are then also made in the flooring and sealants (see sections **E.2** and **E.3**).

b) Structural joints with TPE tape

Waterproof structural joints by bonding **Mapeband TPE** 1.2 mm thick tape with reinforced polyester fabric edges. The tape is 1 mm thick with edges reinforced with polyester fabric, and is bonded in place with **Adesilex PG4** two-component, thixotropic epoxy adhesive.

Preparation of the substrate

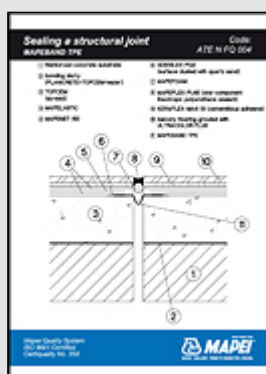
Clean the surfaces where the **Mapeband TPE** is to be applied so there are no traces of oil, grease, paint, dust and loose or detached parts.

Waterproofing

Apply an even 1-2 mm thick layer of **Adesilex PG4** with a smooth trowel on the clean, dry substrate, trying to prevent the adhesive running into the joint. Insert the **Mapeband TPE** (see section **M.4.2.2**) by pressing it 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 layer. Smooth over with a flat trowel and, while the product is still fresh, dust with 0.5 spheroid quartz sand to form a rough surface to help the specified MAPEI waterproofing system adhere. Once the reticulation process of **Adesilex PG4** has been completed, remove any loose quartz and apply the waterproofing system.

Mapeband TPE may be joined by “hot-welding” with a Leister electronic hot air blower, or by “cold-welding” by double-buttering with **Adesilex LP** contact adhesive. This operation makes it easy to make straight joints and to join special pieces, and guarantees the watertightness of the system. The joints are then also made in the flooring and sealed (see section **E.3**).



M.4 NEW TERRACES AND BALCONIES

M.4.2.1 Application of rubber tape for waterproofing fillet joints between horizontal and vertical surfaces and expansion joints in floors

Supply and application of alkali-resistant, elastic, rubber tape with felt backing and good deformability properties, including at low temperatures (such as **Mapeband** produced by MAPEI S.p.A.), for waterproofing fillet joints between horizontal and vertical surfaces and expansion joints.

Apply a first, even coat of the specified waterproofing product on a clean, compact substrate with a smooth trowel, then apply the tape by pressing along the sides, making sure there are no creases or air bubbles. Apply a second layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

Apply the tape in the check joints in the substrate to form an inverted “Ω” shape.

The product must have the following characteristics:

tensile strength (ISO 527-1) (N/mm ²):	> 2
elongation at failure (ISO 527-1) (%):	> 400
tear strength (DIN 53363) (N/mm):	> 100
resistance to alkalis (EN 1847) (days/°C/%):	90/23/10
vapour diffusion resistance factor:	30,000

Included and calculated in the price for work carried out according to specification:

- welding pieces of tape together with contact adhesive (such as **Adesilex LP** produced by MAPEI S.p.A.);
- supply and application of the specified waterproofing product to fix the tape to the substrate.

– per metre

.....(€/m)



M.4 NEW TERRACES AND BALCONIES

M.4.2.2 Application of TPE tape for elastic sealing and waterproofing of joints and cracks (up to 5 or 10 mm)

Supply and application of TPE tape for elastic sealing and waterproofing of joints and cracks with movements up to 5 or 10 mm (such as **Mapeband TPE** produced by MAPEI S.p.A.).

The surfaces on which the product is applied must be solid and dry. If not, they must be cleaned and then consolidated beforehand (not included). The tape has edges reinforced with non-woven polyester fabric, and is bonded in place with two-component, thixotropic, low-viscosity epoxy adhesive (such as **Adesilex PG4** produced by MAPEI S.p.A.). After applying the adhesive, dust with 0.5 quartz sand to create a sufficiently-rough surface.

The product must have the following characteristics:

ultimate tensile strength (EN ISO 527-1) (N/mm ²):	> 4.5
elongation at failure (EN ISO 527-1) (%):	> 650
foldability at low temperatures (SIA V 280/3) (°C):	< - 30
resistance to atmospheric agents and UV rays (SIA V 280/10) (h):	> 5000
resistance to root penetration (SIA V 280/11):	no root penetration
flammability class (DIN 4102-1):	B2
impermeability (EN 1928-B) (N/mm ²):	≤ 0.6
water vapour diffusion resistance index (SIA V 280/6):	approx. 30,000
mechanical perforation resistance (SIA V280/15) (mm):	> 500

Included and calculated in the price for work carried out according to specification:

- hot-welding pieces of tape together with Leister welding equipment or contact adhesive (such as **Adesilex LP** produced by MAPEI S.p.A.);
- supply and application of two-component epoxy adhesive to bond the tape;
- supply and application of 0.5 quartz sand to dust the surface of the adhesive used to bond the tape.

APPLICATION OF 17 cm WIDE TAPE

- per square metre(€/m²)

APPLICATION OF 32.5 cm WIDE PROFILE

- per square metre(€/m²)



M.4.3 WATERPROOFING APPLIED UNDER FLOORING Procedure

Preparation of the substrate

Remember that provisions must be made so that the waterproofing system is hemmed onto the masonry, and not onto the render. Therefore, if the walls have to be rendered and the render has been applied before the waterproofing system, a 10 cm high strip of render must be removed.

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 perfectly align the floor and kerb, which often have different thicknesses.

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** (see section **F.8.2.1**) two-component, solvent-free epoxy adhesive. While the resin is still fresh, dust the surface with quartz sand to create a sufficiently-rough surface to help adhesion of the flexible cementitious waterproofing product applied later.

Seal any drainage outlets (see section **M.4.1**) and waterproof the joints (see section **M.4.2**). The substrate must be solid, compact and clean. If the state of the substrate is not as required, remove and repair all detached areas and eliminate uneven areas with **Planitop Fast 330** (see section **R.1.3.3.2**) fibre-reinforced, controlled-shrinking thixotropic mortar or, for more rapid interventions, **Planitop Smooth & Repair** (see section **M.1.4.4**) fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar.

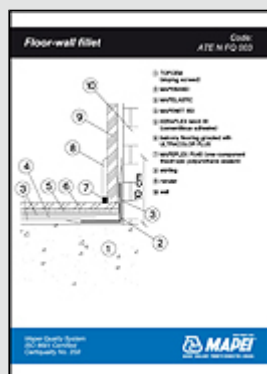
Waterproofing

Then waterproof the terrace using the most suitable MAPEI product:

- two-component, elastic cementitious mortar by trowel (**Mapelastic**): spread two coats of **Mapelastic** (see section **M.4.3.1**) 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 of **Mapelastic** to increase its flexibility and guarantee its capacity to cover cracks up to 1.5 mm wide. After applying the first coat of product, insert the **Mapenet 150** by overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to guarantee perfect buttering. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when the **Mapenet 150** (width 1 metre) is applied, there are at least 10 cm on each side of **Mapelastic** to guarantee that it forms a continuous layer when the adjacent pitch of product is applied. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.
- two-component, high-elasticity cementitious mortar applied by roller (**Mapelastic Smart**): Apply **Mapelastic Smart** (see section **M.4.3.2**) as per **Mapelastic**, but with a roller, and reinforce the mortar in this case with **Mapetex Sel** macro-perforated, non-woven polypropylene fabric.
- ready-to-use, rapid-drying, elastic liquid membrane (**Mapelastic AquaDefense**): **Mapelastic AquaDefense** (see section **M.4.3.3**) is supplied ready to use and does not need to be mixed. Apply with a roller, brush or trowel in two even layers around 0.4 mm thick per coat to form a layer at least 0.8 mm thick, in order to create a robust, continuous elastic film. Make sure there are no interruptions in the film caused by imperfections in the substrate. After applying **Mapelastic AquaDefense** wait until it cures before laying the ceramic.

Covering

When the waterproofing membrane is completely dry, install the ceramic or natural stone covering.



M.4.3.1 Application of two-component, elastic cementitious mortar for waterproofing under flooring

Supply and application of two-component, elastic cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic** produced by MAPEI S.p.A.) for waterproofing under flooring. Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a smooth, metal trowel to form a layer at least 3 mm thick, then finish off the surface with the same trowel. Apply two layers of the product, with alkaline-resistant fibreglass reinforcement mesh (compliant with ETAG 004 guidelines), with a mesh size of 4 x 4.5 mm and a weight of 150 g/m² (such as **Mapenet 150** produced by Mapei S.p.A.), placed between the first and second layers. Overlap the edges of each strip of fibreglass mesh by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

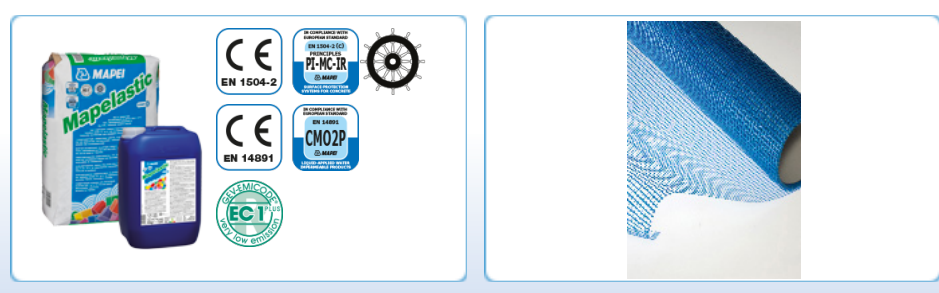
The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.0
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.8
elasticity (DIN 53504) (%):	30
static crack-bridging at -20° C (EN 1062-7) (mm):	class A3 (>0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 2.4m
	μ = 1200
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.05
permeability to CO ₂ (EN 1062-6) (m):	s _{DCO2} >50
reaction to fire (EN 13501-1) (Euroclass):	C, s1-d0

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	0.9
crack-bridging capacity at -20°C (mm):	0.8
initial adhesion (N/mm ²):	0.8
adhesion after immersion in water (N/mm ²):	0.55
adhesion after application of heat source (N/mm ²):	1.2
adhesion after freeze-thaw cycles (N/mm ²):	0.6
adhesion after immersion in basic water (N/mm ²):	0.6

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPENET 150**
– per square metre (€/m²)



M.4.3.2 Application of two-component, high-elasticity cementitious mortar for waterproofing under flooring

Supply and application of two-component, high elasticity cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Smart** produced by MAPEI S.p.A.) for waterproofing under flooring.

Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a roller to form a layer at least 3 mm thick, then finish off the surface with a smooth metal trowel. Apply two layers of the product, with macro-perforated, non-woven polypropylene, reinforcement fabric with a thickness of 0.6 mm and a weight of 80 g/m² (such as **Mapetex Sel** produced by MAPEI S.p.A.), placed between the first and second layers. Overlap the edges of each strip of non-woven fabric by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.3
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.9
elasticity (DIN 53504) (%):	120
static crack-bridging at +20°C (EN 1062-7) (mm):	class A5 (>2.5 mm)
dynamic crack-bridging at +20°C:	class B4.2 (no failure of test sample after 2000 cracking cycles with movements of the crack from 0.2 to 0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 3.6 m
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	μ = 1800
permeability to CO ₂ (EN 1062-6) (m):	< 0.05
reaction to fire (EN 13501-1) (Euroclass):	s _{DCO2} >50
	E

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	2.8
initial adhesion (N/mm ²):	1.2
adhesion after immersion in water (N/mm ²):	0.7
adhesion after application of heat source (N/mm ²):	1.5
adhesion after freeze-thaw cycles (N/mm ²):	0.8
adhesion after immersion in basic water (N/mm ²):	0.8

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPETEX SEL**

– per square metre (€/m²)



M.4 NEW TERRACES AND BALCONIES

M.4.3.3 Application of ready-to-use, elastic liquid waterproofing membrane

Supply and application of ready-to-use, ultra rapid-drying, elastic liquid membrane made from synthetic resins in water dispersion (such as **Mapelastic AquaDefense** produced by MAPEI S.p.A.) for waterproofing concrete and plasterboard surfaces.

Apply the product after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

Apply two layers of the product approximately 0.4 mm thick on substrates with a residual humidity lower than 3% with a roller, brush or by spray to form a final layer at least 0.8 mm thick.

The product must have the following characteristics:

initial adhesion (EN 14891) (N/mm ²):	1.7
adhesion after immersion in water (EN 14891) (N/mm ²):	> 1
adhesion after application of heat source (EN 14891) (N/mm ²):	> 1.8
adhesion after freeze-thaw cycles (EN 14891) (N/mm ²):	> 0.9
adhesion after immersion in basic water (EN 14891) (N/mm ²):	> 1.3
adhesion after immersion in sodium hypochlorite solution (EN 14891) (N/mm ²):	> 1.2
crack-bridging at +23°C (EN 14891) (mm):	3.2
crack-bridging at -5°C (EN 14891) (mm):	1.6
impermeability to water at 1500 kPa pressure (EN 14891):	no penetration

– per square metre

.....(€/m²)



M.5.1 SEALING CRACKS IN SUBSTRATES
Procedure

If the substrate has cracks, seal them monolithically with **Eporip** (see section **M.5.1.1**) two-component, solvent-free, medium-viscosity epoxy resin.

Open the cracks with a hand-grinder and, after removing all traces of dust, seal the cracks with **Eporip** and dust the surface with quartz sand (fresh on fresh) to create a sufficiently-rough surface with a good grip.

M.5 TERRACES AND BALCONIES REQUIRING RESTORATION WORK

M.5.1.1 Application of two-component epoxy resin to monolithically seal cracks

Supply and application of two-component, solvent-free, medium-viscosity epoxy resin to monolithically seal cracks (such as **Eporip** produced by MAPEI S.p.A.).

Apply the product by pouring onto a solid substrate with no traces of dust.

The product must have the following characteristics:

linear shrinkage at +23°C (EN 12617-1) (%):	0.02
compressive modulus of elasticity (EN 13412) (N/mm ²):	3000
coefficient of thermal expansion (EN 1770) (K ⁻¹):	97·10 ⁻⁶
vitreous transition temperature (EN 12614) (°C):	> 40
durability (freeze/thaw and hot damp cycles) (EN 13733):	meets specifications
reaction to fire:	Euroclass C, s1-d0

Included and calculated in the price for work carried out according to specification:

– per cubic decimetre(€/dm³)



**M.5.2 WATERPROOFING BY OVERLAYING EXISTING FLOORING TO BE COVERED WITH CERAMIC OR NATURAL STONE
Procedure**

If the existing flooring is in good condition and well-bonded to the substrate, the system may be laid on top without having to carry out any demolition work. There are waterproofing systems available which are suitable for waterproofing balconies and terraces which are already tiled and without removing the old flooring, comprising a waterproofing layer-adhesive-tile system which is generally no more than 15 mm thick.

Preparation of the substrate

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

After completing the above cycle, the floor should be clean and rough enough to favour adhesion of the waterproofing product to be applied.

If the slope has to be corrected, eliminate all dips and hollows, fill the gaps created by the damaged tiles being removed and skim the surface with **Planitop Fast 330** (see section **R.1.3.3.2**) fibre-reinforced, rapid-setting cementitious levelling mortar, or with **Adesilex P4** (see section **R.1.3.2.2**) high-performance, rapid-setting, self-buttering cementitious skimming mortar. If the gaps to be filled are thicker than 3 cm, install a bonded screed with a slope (see section **R.1.1**).

If the flooring has cracks, before carrying out any other operations, remove the damaged tiles and seal the cracks (see section **M.5.1**). When analysing the layout of the cracks, check whether there are cracks due to a check-joint in the underlying screed without a corresponding check-joint in the flooring, or if there are joints caused naturally in the substrate by a lack of check-joints when the screed was made, or if they are due to structural joints which have not then been made also in the overlying structure. In such cases, after removing the area of floor involved, the crack must be opened up with a hand grinder and sealed (see section **M.4.2**). Seal the fillets between the horizontal and vertical surfaces with the same method.

Then treat the more detailed elements to be waterproofed, such as attachment points for railings, drainage outlets, fillets.

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** (see section **F.8.2.1**) two-component, solvent-free epoxy adhesive. While the resin is still fresh, dust the surface with quartz sand to create a sufficiently-rough surface to help adhesion of the flexible cementitious waterproofing product applied later.

Waterproof any through-elements (see section **M.3.1**).

Waterproofing

Then waterproof the terrace using the most suitable MAPEI product:

- **Mapelastic** (see section **M.5.2.1**) two-component, elastic cementitious mortar applied by trowel: 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 of **Mapelastic** to increase its flexibility and guarantee its capacity to cover cracks up to 1.5 mm wide. After applying the first coat of product, insert **Mapenet 150** by overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to guarantee perfect buttering. 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 are at least 10 cm on each side of **Mapelastic** to guarantee that it forms a continuous layer when the adjacent pitch of product is applied. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.
- **Mapelastic Smart** (see section **M.5.2.2**) two-component, high-elasticity cementitious mortar applied by roller: apply **Mapelastic Smart** as per **Mapelastic**, but with a roller, and reinforce the mortar in this case with **Mapetex Sel** macro-perforated, non-woven polypropylene fabric.
- **Mapelastic AquaDefense** (see section **M.5.2.3**) ready-to-use, rapid-drying, elastic liquid membrane: **Mapelastic AquaDefense** is supplied ready to use and does not need to be mixed. Apply with a roller, brush or trowel in two even coats of around 0.4 mm thick per coat to form a layer at least 0.8 mm thick, in order to create a robust, continuous elastic film. Make sure there are no interruptions in the film caused by imperfections in the substrate. After applying **Mapelastic AquaDefense**, wait until it cures before laying the ceramic. Before laying the coating, carefully check the surface of **Mapelastic AquaDefense** to make sure it is continuous and that there are no pin-holes or small craters. If there are such defects, apply a further coat where they are located.

Covering

When the waterproofing membrane is completely dry, install the ceramic or natural stone covering (see section A).

M.5.2.1 Application of two-component, elastic cementitious mortar for waterproofing under flooring

Supply and application of two-component, elastic cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic** produced by MAPEI S.p.A.) for waterproofing under flooring. Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a smooth, metal trowel to form a layer at least 3 mm thick, then finish off the surface with the same trowel. Apply two layers of the product, with alkaline-resistant fibreglass reinforcement mesh (compliant with ETAG 004 guidelines), with a mesh size of 4 x 4.5 mm and a weight of 150 g/m² (such as **Mapenet 150** produced by Mapei S.p.A.), placed between the first and second layers. Overlap the edges of each strip of fibreglass mesh by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.0
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.8
elasticity (DIN 53504) (%):	30
static crack-bridging at -20° C (EN 1062-7) (mm):	class A3 (>0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 2.4 m
	μ = 1200
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.05
permeability to CO ₂ (EN 1062-6) (m):	s _{DCO2} >50
reaction to fire (EN 13501-1) (Euroclass):	C, s1-d0

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	0.9
crack-bridging capacity at -20°C (mm):	0.8
initial adhesion (N/mm ²):	0.8
adhesion after immersion in water (N/mm ²):	0.55
adhesion after application of heat source (N/mm ²):	1.2
adhesion after freeze-thaw cycles (N/mm ²):	0.6
adhesion after immersion in basic water (N/mm ²):	0.6

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPENET 150**

– per square metre (€/m²)



M.5.2.2 Application of two-component, high-elasticity cementitious mortar for waterproofing under flooring

Supply and application of two-component, high elasticity cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Smart** produced by MAPEI S.p.A.) for waterproofing under flooring.

Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a roller to form a layer at least 3 mm thick, then finish off the surface with a smooth metal trowel. Apply two layers of the product, with macro-perforated, non-woven polypropylene, reinforcement fabric with a thickness of 0.6 mm and a weight of 80 g/m² (such as **Mapetex Sel** produced by MAPEI S.p.A.), placed between the first and second layers. Overlap the edges of each strip of non-woven fabric by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.3
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.9
elasticity (DIN 53504) (%):	120
static crack-bridging at 20° C (EN 1062-7) (mm):	class A5 (>2.5 mm)
dynamic crack-bridging at +20°C:	class B4.2 (no failure of test sample after 2000 cracking cycles with movements of the crack from 0.2 to 0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 3.6 m
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	μ = 1800
permeability to CO ₂ (EN 1062-6) (m):	< 0.05
reaction to fire (EN 13501-1) (Euroclass):	s _{DCO2} >50
	E

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	2.8
initial adhesion (N/mm ²):	1.2
adhesion after immersion in water (N/mm ²):	0.7
adhesion after application of heat source (N/mm ²):	1.5
adhesion after freeze-thaw cycles (N/mm ²):	0.8
adhesion after immersion in basic water (N/mm ²):	0.8

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPETEX SEL**

– per square metre (€/m²)



M.5 TERRACES AND BALCONIES REQUIRING RESTORATION WORK

M.5.2.3 Application of ready-to-use, elastic liquid waterproofing membrane

Supply and application of ready-to-use, ultra rapid-drying, elastic liquid membrane made from synthetic resins in water dispersion (such as **Mapelastic AquaDefense** produced by MAPEI S.p.A.) for waterproofing concrete and plasterboard surfaces.

Apply the mortar after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly and, where required, correct the slope (not included).

Apply two layers of the product approximately 0.4 mm thick on substrates with a residual humidity lower than 3% with a roller, brush or by spray to form a final layer at least 0.8 mm thick.

The product must have the following characteristics:

initial adhesion (EN 14891) (N/mm ²):	1.7
adhesion after immersion in water (EN 14891) (N/mm ²):	> 1
adhesion after application of heat source (EN 14891) (N/mm ²):	> 1.8
adhesion after freeze-thaw cycles (EN 14891) (N/mm ²):	> 0.9
adhesion after immersion in basic water (EN 14891) (N/mm ²):	> 1.3
adhesion after immersion in sodium hypochlorite solution (EN 14891) (N/mm ²):	> 1.2
crack-bridging at +23°C (EN 14891) (mm):	3.2
crack-bridging at -5°C (EN 14891) (mm):	1.6
impermeability to water at 1500 kPa pressure (EN 14891):	no penetration

APPLICATION BY ROLLER

– per square metre(€/m²)

APPLICATION BY BRUSH

– per square metre(€/m²)

APPLICATION BY TROWEL

– per square metre(€/m²)



M.5 TERRACES AND BALCONIES REQUIRING RESTORATION WORK

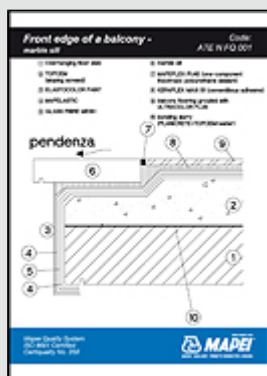
M.5.3 UNDERFLOOR WATERPROOFING, OVERLAID WITH CERAMIC OR NATURAL STONE, AFTER REMOVING THE EXISTING FLOORING Procedure

Preparation of the substrate

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

The skirting boards also need to be removed along with the first 10 cm of render above the floor. Then check the compactness and mechanical characteristics of the existing screed. If it is compact with just a light layer of dust on the surface, before proceeding with the next steps of the intervention, 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.

Once the flooring has been demolished and the underlying substrate has been checked to make sure it is in good condition, the details and particular areas may be prepared and the waterproofing treatment may be applied on the surface according to the procedure in section **M.4.3**.



M.5.4 WATERPROOFING APPLIED AFTER DEMOLISHING AND COMPLETELY RESTORING FLOORING AND SCREEDS
Procedure

Preparation of the substrate

If the mechanical properties and other characteristics of the screed are considered unsuitable for the installation of a waterproofing system and flooring, the flooring and underlying screed must be demolished and removed. The skirting boards also need to be removed along with the first 10 cm of render above the floor.

After demolishing the flooring and screed, make a new sloping screed (see section [A.1.1](#)).

The screed must be installed with the correct slope to allow rainwater to run 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 perfectly align the floor and kerb, which often have different thicknesses.

When the screed is fully cured, treat the more detailed elements to be waterproofed, such as attachment points for railings, drainage outlets, fillets between horizontal and vertical surfaces and joints.

Successive waterproofing and covering operations according to the procedure in section [M.4.3](#).

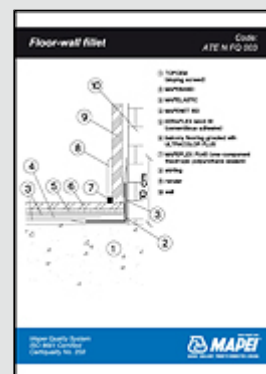
M.6.1 WATERPROOFING WITH TWO-COMPONENT, HIGH-ELASTICITY CEMENTITIOUS MORTAR APPLIED UNDER FLOORING Procedure

Preparation of the substrate

Remember that provisions must be made so that the waterproofing system is hemmed onto the masonry, and not onto the render. Therefore, if the walls have to be rendered and the render has been applied before the waterproofing system, a 10 cm high strip of render must be removed. 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** (see section **F.8.2.1**) two-component, solvent-free epoxy adhesive. While the resin is still fresh, dust the surface with quartz sand to create a sufficiently-rough surface to help adhesion of the flexible cementitious waterproofing product applied later. Seal any drainage outlets (see section **M.4.1**) and waterproof the joints (see section **M.4.2**). The substrate must be solid, compact and clean. If the state of the substrate is not as required, remove and repair all detached areas and eliminate uneven areas with **Mapegrout 430** (see section **M.1.4.3**) fibre-reinforced, controlled-shrinking thixotropic mortar or, for more rapid interventions, Planitop Smooth & Repair (see section **M.1.4.4**) fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar.

Waterproofing

Waterproof the surface with **Mapelastisc Smart** (see section **M.6.1.1**) two-component, high-elasticity cementitious mortar. Spread two coats of **Mapelastisc Smart** on the clean, dry substrate with a roller to form a total thickness of at least 2 mm. Insert **Mapetex Sel** macro-perforated, non-woven polypropylene fabric between the first and second coat of **Mapelastisc Smart**. After applying the first coat of product, insert the **Mapetex Sel** by overlapping the adjacent strips by at least 10 cm, and press down with a flat trowel on the substrate to guarantee perfect buttering. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when the **Mapetex Sel** (width 1 metre) is applied, there are at least 10 cm on each side of **Mapelastisc Smart** to guarantee that it forms a continuous layer when the adjacent pitch of product is applied. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.



M.6.1.1 Application of two-component, high-elasticity cementitious mortar for waterproofing under flooring

Supply and application of two-component, high elasticity cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Smart** produced by MAPEI S.p.A.), for waterproofing under flooring.

Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a roller to form a layer at least 3 mm thick, then finish off the surface with a smooth metal trowel. Apply two layers of the product, with macro-perforated, non-woven polypropylene, reinforcement fabric with a thickness of 0.6 mm and a weight of 80 g/m² (such as **Mapetex Sel** produced by MAPEI S.p.A.), placed between the first and second layers. Overlap the edges of each strip of non-woven fabric by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.3
thermal compatibility to freeze/thaw cycles	
with de-icing salts (EN 1542) (N/mm ²):	0.9
elasticity (DIN 53504) (%):	120
static crack-bridging at +20°C (EN 1062-7) (mm):	class A5 (>2.5 mm)
dynamic crack-bridging at +20°C:	class B4.2 (no failure of test sample after 2000 cracking cycles with movements of the crack from 0.2 to 0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 3.6 m
	μ = 1800
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.05
permeability to CO ₂ (EN 1062-6) (m):	s _{DCO2} >50
reaction to fire (EN 13501-1) (Euroclass):	E

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	2.8
initial adhesion (N/mm ²):	1.2
adhesion after immersion in water (N/mm ²):	0.7
adhesion after application of heat source (N/mm ²):	1.5
adhesion after freeze-thaw cycles (N/mm ²):	0.8
adhesion after immersion in basic water (N/mm ²):	0.8

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPETEX SEL**

– per square metre (€/m²)



M.6.2 WATERPROOFING WITH SPRAY-APPLIED HYBRID POLYUREA MEMBRANE AND EXPOSED FINISHES SUITABLE FOR FOOT TRAFFIC Procedure

This waterproofing system is suitable for large areas (> 500 m²) and/or when there are complicated shapes to be waterproofed, in that its characteristics make it quick and easy to apply.

Preparation of the substrate

The first operation to carry out is to check the substrate to make sure it is suitable for the waterproofing system. Verify the following:

- longitudinal and lateral slope of the surfaces > 1.5%;
- roughness of the substrate < 2.0 mm;
- compressive strength and tear strength (Pull Out Test) of the surface ≥ 25 MPa and ≥ 1.5 MPa, respectively;
- maximum moisture content of the substrate 4%.

Then waterproof the drainage outlets (see section [M.4.1](#)) and use **Mapelastic** two-component, elastic cementitious mortar to fix the drainage outlet kit to the substrate.

Waterproof any structural joints (see section [M.4.2.2](#)).

– Cementitious substrates

Prepare the surface with a sanding machine or by shot-blasting to remove all traces of oil, grease, dirt and any other material which could compromise adhesion of the waterproofing system. Then remove all dust and any loose or detached parts from the substrate to leave a dry, porous, slightly rough surface with no contaminants.

Round off all the corners with a fillet of suitable polyurethane sealant from the Mapeflex range or suitable mortar from the Mapegrout range. Hollows, cavities or detached portions in the substrate must be restored to form a perfectly flat surface. For this operation, we recommend using rapid-hardening, compensated-shrinking, castable cementitious mortar such as **Mapegrout SV** (see section [F.11.2.1](#)).

Prime horizontal surfaces and vertical hems (with a drop of at least 20-25 cm from the finished flooring) with **Primer SN** (see section [M.1.5.1](#)) two-component, solvent-free, epoxy resin bonding promoter with fillers. If slightly rough surfaces need to be levelled off, apply a coat of **Primer SN** mixed with 20% in weight of 0.25 quartz sand. Apply the **Primer SN** with a metal trowel or smooth spreader to clog the surface porosity. Dust the treated surface with 0.5 quartz sand. The waterproofing membrane must then be applied within 12 to 24 hours of applying the primer.

If the moisture content of the substrate is higher than 4%, and it is not possible to wait until this level drops, apply a coat of **Triblock P** (see section [M.1.5.3](#)) three-component epoxy-cementitious primer in two or more coats, depending on the condition of the substrate, until the system is completely sealed.

The waterproofing membrane must then be applied within 2 to 7 days of applying the primer.

– Metallic substrates

Verify the integrity of the substrate and dry-sandblast the surface to grade SA 2½. The sandblasting operation is required to eliminate old paint, rust, traces of oil and any other contaminant which could compromise adherence of the waterproofing system to be applied. If it is not possible to dry-sandblast the surface, the substrate must be cleaned mechanically with either abrasive or percussion tools. Always remove debris created while treating the surface using an industrial vacuum cleaner.

Treat the surfaces with a coat of **Primer EP Rustop** (see section [M.1.5.2](#)) two-component epoxy primer with a brush, roller or airless spray. Then apply the waterproofing membrane within 6 to 24 hours.

Waterproofing

Before applying **Purtop 400 M** (see section **M.6.2.1**) remove all traces of dust from the surface with an industrial vacuum cleaner. The temperature of the substrate must be at least +3°C higher than the dew-point temperature and the moisture content must be no higher than 4%.

To apply the **Purtop 400 M** membrane, use a high-pressure, bi-mixer industrial spray gun with flow and temperature control, preferably fitted with a self-cleaning spray gun. Apply **Purtop 400 M** in a continuous coat over all the horizontal surfaces and vertical overlaps, and on the inside of drainage outlets positioned in the covering. If application of **Purtop 400 M** is interrupted and then taken up again after the maximum covering time (2 hours), an overlap at least 30 cm wide must be made. First sand the strip of membrane and then apply a coat of **Primer M** before continuing with the application of **Purtop 400 M**.

To increase its resistance to UV rays, aggressive chemicals and wear, apply a coat of **Mapefloor Finish 55** two-component, high-elasticity, aliphatic polyurethane finish by airless spray.

M.6 WATERPROOFING NEW FLAT ROOFS

M.6.2.1 Application of two-component hybrid polyurethane membrane with an exposed finish

Supply and application of two-component, solvent-free, hybrid polyurethane membrane (such as **Purtop 400 M** produced by MAPEI S.p.A.), with immediate permeability and rapid set to foot traffic, for waterproofing flat roofs.

Apply a 2 mm thick layer of the product with a high-pressure, bi-mixer industrial spray gun with flow and temperature control, fitted with a self-cleaning spray gun, on solid, clean substrates treated beforehand with primer (not included).

The product must have the following characteristics (after 7 days at +23°C):

tensile strength (DIN 53504) (N/mm ²):	14
elongation at failure (DIN 53504) (%):	400
tear strength (ISO 34-1) (N/mm):	55
Shore A hardness (DIN 53505):	70
glass transition temperature (°C):	-50

Finish off the surface of the product with a two-component, high-elasticity, aliphatic polyurethane product (such as **Mapefloor Finish 55** produced by MAPEI S.p.A.) applied by airless spray.

Supply and application of two-component, aliphatic polyurethane finish included and calculated in the price for work carried out according to specification.

MINIMUM THICKNESS 2 mm, APPLIED BY SPRAY

– per square metre

.....(€/m²)



**M.7.1 UNDERFLOOR WATERPROOFING WITH TWO-COMPONENT, HIGH-ELASTICITY CEMENTITIOUS MORTAR
Procedure****Preparation of the substrate**

Remember that provisions must be made so that the waterproofing system is hemmed onto the masonry, and not on the render. Therefore, if the parapets have already been rendered, a 10 cm high strip of render must be removed.

Then check the solidity of the substrate. If it is sound and well anchored, the system may be applied without carrying out any demolition work. Detached and/or cracked tiles must be removed. Then clean the existing flooring with a mixture of water and caustic soda (30%), and rinse the floor thoroughly with water to remove all traces of caustic soda.

After completing the above cycle, the floor must be clean and rough enough to help the adhesion of the waterproofing product applied later.

If the flooring has cracks, before carrying out any other operations, remove the damaged tiles and seal the cracks (see section [M.5.1](#)). When analysing the layout of the cracks, check whether there are cracks due to a check-joint in the underlying screed without a corresponding check-joint in the flooring, if there are joints caused naturally in the substrate by a lack of check-joints when the screed was made, or if they are due to structural joints which have not then been made also in the overlying structure. In such cases, after removing the area of flooring involved, the crack must be opened up with a hand grinder and sealed (see section [M.4.2](#)). Seal the fillets between the horizontal and vertical surfaces with the same method.

If the slope has to be corrected, eliminate all dips and hollows, fill the gaps created by removing damaged tiles and skim the surface with **Planitop Fast 330** (see section [R.1.3.3.2](#)) fibre-reinforced, rapid-setting cementitious levelling mortar, or with **Adesilex P4** (see section [R.1.3.2.2](#)) high-performance, rapid-setting, cementitious skimming mortar. If there are gaps to be filled thicker than 3 cm, install a bonded screed with a slope (see section [R.1.1](#)).

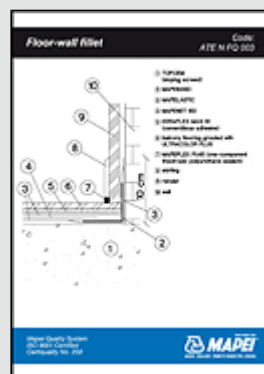
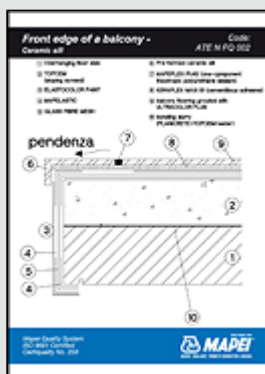
Then treat the more detailed elements to be waterproofed, such as attachment points for railings, drainage outlets, fillets.

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** (see section [F.8.2.1](#)) two-component, solvent-free epoxy adhesive. While the resin is still fresh, dust the surface with quartz sand to create a sufficiently-rough surface to help adhesion of the flexible cementitious waterproofing product to be applied later.

Waterproof any through-elements (see section [M.3.1.2](#)).

Waterproofing

Waterproof the surface with **Mapelastic Smart** (see section **M.7.1.1**) two-component, high-elasticity cementitious mortar. Spread two coats of **Mapelastic Smart** on the clean, dry substrate with a roller to form a total thickness of at least 2 mm. Insert **Mapetex Sel** macro-perforated, non-woven polypropylene fabric between the first and second coat of **Mapelastic Smart**. After applying the first coat of product, insert the **Mapetex Sel** by overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to guarantee perfect buttering. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when the **Mapetex Sel** (width 1 metre) is applied, there are at least 10 cm on each side of **Mapelastic Smart** to guarantee that it forms a continuous layer when the adjacent pitch of product is applied. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.



M.7.1.1 Application of two-component, high-elasticity cementitious mortar for waterproofing under flooring

Supply and application of two-component, high elasticity cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Smart** produced by MAPEI S.p.A.), for waterproofing under flooring.

Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a roller to form a layer at least 3 mm thick, then finish off the surface with a smooth metal trowel. Apply two layers of the product, with macro-perforated, non-woven polypropylene, reinforcement fabric with a thickness of 0.6 mm and a weight of 80 g/m² (such as **Mapetex Sel** produced by MAPEI S.p.A.), placed between the first and second layers. Overlap the edges of each strip of non-woven fabric by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.3
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.9
elasticity (DIN 53504) (%):	120
static crack-bridging at +20°C (EN 1062-7) (mm):	class A5 (>2.5 mm)
dynamic crack-bridging at +20°C:	class B4.2 (no failure of test sample after 2000 cracking cycles with movements of the crack from 0.2 to 0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 3.6 m
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	μ = 1800
permeability to CO ₂ (EN 1062-6) (m):	< 0.05
reaction to fire (EN 13501-1) (Euroclass):	s _{DCO2} >50
	E

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	2.8
initial adhesion (N/mm ²):	1.2
adhesion after immersion in water (N/mm ²):	0.7
adhesion after application of heat source (N/mm ²):	1.5
adhesion after freeze-thaw cycles (N/mm ²):	0.8
adhesion after immersion in basic water (N/mm ²):	0.8

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPETEX SEL**

– per square metre (€/m²)



**M.7.2 WATERPROOFING WITH LIQUID MEMBRANE OVERLAID ON EXISTING BITUMINOUS MEMBRANE (NOT SUITABLE FOR FOOT TRAFFIC)
Procedure**

Preparation of the substrate

Clean the bituminous membrane to remove all traces of oil, grease, dirt in general and any other material which could compromise adhesion of the primer, and remove all traces of dust with a vacuum cleaner or compressed air. The membrane must be perfectly dry before inspecting the surface, and any damage in the membrane, such as blistering, tears or detached areas, must be repaired before applying the primer.

Apply a coat of **Primer for Aquaflex** (see section **M.7.2.1**) synthetic resin impregnator in solvent with high wetting capacity on all horizontal surfaces and vertical hems. Apply the primer with a brush, roller or by airless spray.

Waterproofing

Apply **Aquaflex Roof HR** (see section **M.7.2.1**) ready-to-use, white, with high solar reflectance and thermal remittance with a solar reflectance index (SRI) of 105 liquid waterproofing membrane in thin even coats. Wait until the first coat is dry before applying the next coat diagonally to the first one (generally from 8 to 12 hours, according to the surrounding conditions). Apply **Aquaflex Roof HR** with a roller, by brush or airless spray.

The final thickness of the product must be at least 1 mm so that it creates a robust, flexible, continuous film. Make sure there are no interruptions in the film caused by imperfections in the substrate.

M.7 WATERPROOFING FLAT ROOFS REQUIRING RESTORATION WORK

M.7.2.1 Application of liquid waterproofing sheath with high solar reflectance and thermal remittance

Supply and application of liquid sheath with high solar reflectance and thermal remittance (such as **Aquaflex Roof HR** produced by MAPEI S.p.A.), overlaid on surfaces coated with old bituminous membranes.

The substrate where the membrane is applied must be clean and solid, and must be treated beforehand with a synthetic resin impregnator in solvent with high wetting capacity (such as **Primer for Aquaflex** produced by MAPEI S.p.A.), applied with a brush, roller or by airless spray.

Apply the membrane in two criss-cross coats with a roller or by airless spray to form a layer at least 1 mm thick.

The product must have the following characteristics:

elongation at failure (DIN 53504) (%):	300
tensile strength (DIN 53504) (N/mm ²):	1.1
SRI (Solar Reflectance Index) (ASTM E1980):	105
solar reflectance (ASTM E903) (%):	83
thermal emittance (ASTM C1371) (%):	91

Supply and application of primer over the existing bituminous membrane included and calculated in the price for work carried out according to specification:

APPLICATION BY BRUSH (MINIMUM THICKNESS 1 mm)

– per square metre(€/m²)

MINIMUM THICKNESS 1 mm, APPLIED BY ROLLER

– per square metre(€/m²)

MINIMUM THICKNESS 1 MM, APPLIED BY SPRAY

– per square metre(€/m²)



M.7.3 WATERPROOFING BY OVERLAYING EXISTING COVERINGS AND FINISHES SUITABLE FOR FOOT TRAFFIC WITH SPRAY-APPLIED HYBRID POLYUREA MEMBRANE

Procedure

This waterproofing system is suitable for large areas (> 500 m²) and/or when there are complicated shapes to be waterproofed, in that its characteristics make it quick and easy to apply.

Preparation of the substrate

The first operation to carry out is to check the substrate to make sure it is suitable for the waterproofing system. Verify the following:

- longitudinal and lateral slope of the surfaces > 1.5%;
- roughness of the substrate < 2.0 mm;
- compressive strength and tear strength of the surface (Pull Out Test) ≥ 25 MPa and ≥ 1.5 MPa, respectively;
- maximum moisture content of the substrate 4%.

Then waterproof the drainage outlets (see section [M.4.1](#)) and use **Mapelastic** two-component, elastic cementitious mortar to fix the drainage outlet kit to the substrate.

Waterproof any structural joints (see section [M.4.2.2](#)).

– Cementitious substrates

Prepare the surface with a sanding machine or by shot-blasting to remove all traces of oil, grease, dirt and any other material which could compromise adhesion of the waterproofing system. Then remove all dust and any loose or detached parts from the substrate to leave a dry, porous, slightly rough surface with no contaminants.

Round off all the corners with a fillet of suitable polyurethane sealant from the Mapeflex range or suitable mortar from the Mapegrout range. Hollows, cavities or detached portions in the substrate must be restored to form a perfectly flat surface. For this operation, we recommend using rapid-hardening, compensated-shrinking, castable cementitious mortar such as **Mapegrout SV** (see section [F.11.2.1](#)).

Prime horizontal surfaces and vertical hems (with a drop of at least 20-25 cm from the finished flooring) with **Primer SN** (see section [M.1.5.1](#)) two-component, solvent-free, epoxy resin bonding promoter with fillers. If slightly rough surfaces need to be levelled off, apply a coat of **Primer SN** mixed with 20% in weight of 0.25 quartz sand. Apply the **Primer SN** with a metal trowel or smooth spreader to clog the surface porosity. Dust the treated surface with 0.5 quartz sand. The waterproofing membrane must then be applied within 12 to 24 hours of applying the primer.

If the moisture content of the substrate is higher than 4%, and it is not possible to wait until this level drops, apply a coat of **Triblock P** three-component epoxy-cementitious primer (see section [M.1.5.3](#)) in two or more coats, depending on the condition of the substrate, until the system is completely sealed. The waterproofing membrane must then be applied within 2 to 7 days of applying the primer.

– Metallic substrates

Verify the integrity of the substrate and dry-sandblast the surface to grade SA 2½. The sandblasting operation is required to eliminate old paint, rust, traces of oil and any other contaminant which could compromise adhesion of the waterproofing system to be applied. If it is not possible to dry-sandblast the surface, the substrate must be cleaned mechanically with either abrasive or percussion tools. Always remove debris created while treating the surface using an industrial vacuum cleaner.

Treat the surfaces with a coat of **Primer EP Rustop** (see section [M.1.5.2](#)) two-component epoxy primer with a brush, roller or airless spray. Then apply the waterproofing membrane within 6 to 24 hours.

Bituminous membranes

Clean the bituminous membrane to remove all traces of oil, grease, dirt in general and any other material which could compromise the bond of the primer, and remove all traces of dust with a vacuum cleaner or compressed air. The membrane must be perfectly dry before inspecting the surface, and any damage in the membrane, such as blistering, tears or detached areas, must be repaired before applying the primer. Apply **Primer BI** ready-to-use, synthetic resin-based impregnating primer in solvent on the existing horizontal surfaces and vertical hems (see section **M.1.5.4**). Apply the primer with a brush, roller or by airless spray. Apply the waterproofing membrane within 2 to 4 hours of applying the primer.

Waterproofing

Before applying **Purtop 400 M** (see section **M.7.3.1**) remove all traces of dust from the surface with an industrial vacuum cleaner. The temperature of the substrate must be at least 3°C higher than the dew-point temperature and the moisture content must be no higher than 4%.

To apply the **Purtop 400 M** membrane, use a high-pressure, bi-mixer industrial spray gun with flow and temperature control, preferably fitted with a self-cleaning spray gun. Apply **Purtop 400 M** in a continuous coat over all the horizontal surfaces and vertical overlaps, and on the inside of drainage outlets positioned in the covering. If application of **Purtop 400 M** is interrupted and then taken up again after the maximum covering time (2 hours), an overlap at least 30 cm wide must be made. First sand the strip of membrane and then apply a coat of **Primer M** before continuing with the application of **Purtop 400 M**.

To increase its resistance to UV rays, aggressive chemicals and wear, apply a coat of **Mapefloor Finish 55** two-component, high-elasticity, aliphatic polyurethane finish by airless spray.

M.7 WATERPROOFING FLAT ROOFS REQUIRING RESTORATION WORK

M.7.3.1 Application of two-component hybrid polyurethane membrane with an exposed finish

Supply and application of two-component, solvent-free, hybrid polyurethane membrane (such as **Purtop 400 M** produced by MAPEI S.p.A.), with immediate permeability and rapid set to foot traffic, for waterproofing flat roofs.

Apply a 2 mm thick layer of the product with a high-pressure, bi-mixer industrial spray gun with flow and temperature control, fitted with a self-cleaning spray gun, on solid, clean substrates treated beforehand with primer (not included).

The product must have the following characteristics (after 7 days at +23°C):

tensile strength (DIN 53504) (N/mm ²):	14
elongation at failure (DIN 53504) (%):	400
tear strength (ISO 34-1) (N/mm):	55
Shore A hardness (DIN 53505):	70
glass transition temperature (°C):	-50

Finish off the surface of the product with a two-component, high-elasticity, aliphatic polyurethane product (such as **Mapefloor Finish 55** produced by MAPEI S.p.A.) applied by airless spray.

Supply and application of two-component, aliphatic polyurethane finish included and calculated in the price for work carried out according to specification.

MINIMUM THICKNESS 2 MM, APPLIED BY SPRAY

– per square metre

.....(€/m²)



M.8.1 WATERPROOFING FILLET JOINTS BETWEEN HORIZONTAL AND VERTICAL SURFACES WITH PVC TAPE FOR WATERPROOFING SYSTEMS MADE FROM ELASTIC LIQUID MEMBRANE
Procedure

Elastic waterproofing of fillets between horizontal and vertical surfaces, on waterproofing systems made with **Mapegum WPS**, is carried out using **Mapeband PE 120** water and vapour-proof PVC tape with polyester mesh.

Preparation of the substrate

Substrates must be compact and dry. If the render has been previously demolished, level off the surface of the masonry with **Planitop Fast 330** fibre-reinforced, rapid-setting cementitious levelling mortar applied in layers from 3 to 30 mm thick, for evening out irregularities on uneven substrates (see section **R.1.3.3.2**).

Waterproofing

Apply a first, even coat approximately 1 mm thick of **Mapegum WPS** (see section **M.8.1.1**) with a smooth trowel. Lay on **Mapeband PE 120** by pressing along the sides where there is the mesh, making sure there are no creases or air bubbles. Apply a second layer of **Mapegum WPS** fresh on fresh to completely cover the sides of the tape.

Use special shaped pieces of **Mapeband PE 120** around corners.

M.8.1.1 Application of PVC tape for waterproofing fillet joints between horizontal and vertical surfaces and expansion joints in floors

Supply and application of water and vapour-proof PVC tape with polyester mesh (such as **Mapeband PE 120** produced by MAPEI S.p.A.) for waterproofing fillets between horizontal and vertical surfaces. Apply a first, even coat approximately 1 mm thick of elastic, liquid waterproofing membrane (such as **Mapegum WPS** produced by MAPEI S.p.A.) on a clean, compact substrate with a smooth trowel, then apply the tape by pressing along the sides, making sure there are no creases or air bubbles. Apply a second layer of the waterproofing product fresh on fresh to completely cover the sides of the tape.

The product must have the following characteristics:

resistance to water under pressure (bar):	1.5
elongation at failure (ISO 527-1) (%):	> 135

Included and calculated in the price for work carried out according to specification and application of the liquid waterproofing membrane required to fix the tape to the substrate

– per square metre(€/m²)



M.8.2 WATERPROOFING WITH ELASTIC LIQUID MEMBRANE APPLIED UNDER FLOORING

Procedure

Preparation of the substrate

The substrate must be solid, clean, dry and free of oil, grease, old paint and any other material which could compromise adhesion. Thoroughly clean the surface to be waterproofed to remove mould, loose parts, etc. by washing and brushing or with jets of water and steam.

Seal all drainage outlets (see section [M.4.1](#).) and waterproof the fillet joints between horizontal and vertical surfaces (as described in section [M.4.2](#).) if waterproofing with [Mapelastic AquaDefense](#), or as described in section [M.8.1](#) if waterproofing with [Mapegum WPS](#).

Cementitious substrates must be stable and dry with no rising damp. Skim surfaces, if required, with [Planitop Fast 330](#) (see section [R.1.3.3.2](#)) fibre-reinforced, rapid-setting levelling mortar or with [Adesilex P4](#) (see section [R.1.3.2.2](#)) high-performance, rapid-setting, cementitious skimming mortar.

Waterproofing

Then waterproof the terrace using the most suitable MAPEI product:

- [Mapegum WPS](#) (see section [M.8.2.1](#)) rapid-drying elastic liquid membrane: prime particularly absorbent substrates and gypsum with [Primer G](#) synthetic resin primer in water dispersion. Anhydrite and gypsum substrates must be perfectly dry (maximum residual humidity content 0.5%), sanded and treated with a coat of [Primer G](#).

Apply [Mapegum WPS](#) with a trowel, roller or airless spray. Apply thin, even coats of the product (approximately 1 mm per coat). Wait until the first coat is dry before applying the successive criss-cross coats (1-2 hours according to surrounding conditions). The final thickness must be at least 1 mm.

- [Mapelastic AquaDefense](#) (see section [M.8.2.2](#)) ready-to-use, rapid-drying, elastic liquid membrane: [Mapelastic AquaDefense](#) is supplied ready to use and does not need to be mixed. Apply with a roller, brush or trowel in two even coats of around 0.4 mm thick per coat to form a layer at least 0.8 mm thick, in order to create a robust, continuous elastic film. Make sure there are no interruptions in the film caused by imperfections in the substrate. After applying [Mapelastic AquaDefense](#) wait until it cures before laying the ceramic. Before laying the coating, carefully check the surface of [Mapelastic AquaDefense](#) to make sure it is continuous and that there are no pin-holes or small craters: If there are such defects, apply a further coat where they are located.

M.8 INTERNAL ENVIRONMENTS

M.8.2.1 Application of rapid-drying elastic liquid membrane

Supply and application of rapid-drying elastic liquid membrane (such as **Mapegum WPS** produced by MAPEI S.p.A.) for waterproofing internal surfaces.

Apply the product after treating the substrate with a suitable primer (not included) with a trowel, roller or by spray. Apply thin, even coats of the product (approximately 1 mm per coat). Wait until the first coat is dry before applying the successive criss-cross coats. The final thickness must be at least 1 mm.

The product must have the following characteristics:

elongation at failure (DIN 53504) (%):	180
Mass water absorption after 7 days at +23°C and 21 days in H ₂ O (UNI 8202-22) (%):	10
permeability to water vapour (UNI 8202-23):	$\mu = 650$

MINIMUM THICKNESS 1 mm, APPLIED BY TROWEL

– per square metre(€/m²)

MINIMUM THICKNESS 1 mm, APPLIED BY ROLLER

– per square metre(€/m²)

MINIMUM THICKNESS 1 mm, APPLIED BY SPRAY

– per square metre(€/m²)



M.8.2.2 Application of ready-to-use, elastic liquid waterproofing membrane

Supply and application of ready-to-use, ultra rapid-drying, elastic liquid membrane made from synthetic resins in water dispersion (such as **Mapelastic AquaDefense** produced by MAPEI S.p.A.) for waterproofing concrete and plasterboard surfaces.

Apply the product after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

Apply two layers of the product approximately 0.4 mm thick on substrates with a residual humidity lower than 3% with a roller, brush or by spray to form a final layer at least 0.8 mm thick.

The product must have the following characteristics:

initial adhesion (EN 14891) (N/mm ²):	1.7
adhesion after immersion in water (EN 14891) (N/mm ²):	> 1
adhesion after application of heat source (EN 14891) (N/mm ²):	> 1.8
adhesion after freeze-thaw cycles (EN 14891) (N/mm ²):	> 0.9
adhesion after immersion in basic water (EN 14891) (N/mm ²):	> 1.3
adhesion after immersion in sodium hypochlorite solution (EN 14891) (N/mm ²):	1.2
crack-bridging at +23°C (EN 14891) (mm):	3.2
crack-bridging at -5°C (EN 14891) (mm):	1.6
impermeability to water at 1500 kPa pressure (EN 14891):	no penetration

<i>THICKNESS 0.8 mm, APPLIED BY ROLLER</i>	
<i>– per square metre</i>	.....(€/m ²)
<i>THICKNESS 0.8 mm, APPLIED BY BRUSH</i>	
<i>– per square metre</i>	.....(€/m ²)
<i>THICKNESS 0.8 mm, APPLIED BY TROWEL</i>	
<i>– per square metre</i>	.....(€/m ²)



M.8.3 WATERPROOFING BY OVERLAYING EXISTING FLOORING TO BE COVERED WITH CERAMIC OR NATURAL STONE WITH ELASTIC LIQUID MEMBRANE

Procedure

Preparation of the substrate

The substrate must be solid, clean, dry and free of oil, grease, old paint and any other material which could compromise adhesion. Thoroughly clean the surface to be waterproofed to remove mould, loose parts, etc. by washing and brushing or with jets of water and steam.

Seal all drainage outlets (see section [M.4.1](#).) and waterproof the fillet joints between horizontal and vertical surfaces (see section [M.4.2](#).) if waterproofing with **Mapelastic AquaDefense**, or section [M.8.1](#) (if waterproofing with **Mapegum WPS**).

Cementitious substrates must be stable and dry with no rising damp. Skim surfaces, if required, with **Planitop Fast 330** (see section [R.1.3.3.2](#)) fibre-reinforced, rapid-setting levelling mortar or with **Adesilex P4** (see section [R.1.3.2.2](#)) high-performance, rapid-setting, cementitious skimming mortar.

Waterproofing

Then waterproof the terrace using the most suitable MAPEI product:

- **Mapegum WPS** (see section [M.8.3.1](#)) rapid-drying elastic liquid membrane: on existing ceramic or natural stone substrates, prime the surface with **Mapeprim SP** two-component, solvent-free primer before applying **Mapegum WPS**. Apply Mapegum WPS with a trowel, roller or airless spray. Apply thin, even coats of the product (approximately 1 mm per coat). Wait until the first coat is dry before applying the successive criss-cross coats (1-2 hours according to surrounding conditions). The final thickness must be at least 1 mm.
- **Mapelastic AquaDefense** (see section [M.8.3.2](#)) ready-to-use, rapid-drying, elastic liquid membrane: **Mapelastic AquaDefense** is supplied ready to use and does not need to be mixed. Apply with a roller, brush or trowel in two even coats of around 0.4 mm thick per coat to form a layer at least 0.8 mm thick, in order to create a robust, continuous elastic film. Make sure there are no interruptions in the film caused by imperfections in the substrate. After applying **Mapelastic AquaDefense** wait until it cures before laying the ceramic. Before laying the coating, carefully check the surface of **Mapelastic AquaDefense** to make sure it is continuous and that there are no pin-holes or small craters: if there are such defects, apply a further coat where they are located.

Covering

When the waterproofing membrane is completely dry, install the ceramic or natural stone covering (see section A).

M.8.3.1 Application of rapid-drying elastic liquid membrane

Supply and application of rapid-drying elastic liquid membrane (such as **Mapegum WPS** produced by MAPEI S.p.A.) for waterproofing internal surfaces.

Apply the product after treating the substrate with a suitable primer (not included) with a trowel, roller or by spray. Apply thin, even coats of the product (approximately 1 mm per coat). Wait until the first coat is dry before applying the successive criss-cross coats. The final thickness must be at least 1 mm.

The product must have the following characteristics:

elongation at failure (DIN 53504) (%):	180
mass water absorption after 7 days at +23°C and 21 days in H ₂ O (UNI 8202-22) (%):	10
permeability to water vapour (UNI 8202-23):	μ = 650

<i>MINIMUM THICKNESS 1 mm, APPLIED BY TROWEL</i>	
<i>– per square metre</i>	<i>.....(€/m²)</i>
<i>MINIMUM THICKNESS 1 mm, APPLIED BY ROLLER</i>	
<i>– per square metre</i>	<i>.....(€/m²)</i>
<i>MINIMUM THICKNESS 1 mm, APPLIED BY SPRAY</i>	
<i>– per square metre</i>	<i>.....(€/m²)</i>



M.8.3.2 Application of ready-to-use, elastic liquid waterproofing membrane

Supply and application of ready-to-use, ultra rapid-drying, elastic liquid membrane made from synthetic resins in water dispersion (such as **Mapelastic AquaDefense** produced by MAPEI S.p.A.) for waterproofing concrete and plasterboard surfaces.

Apply the product after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

Apply two layers of the product approximately 0.4 mm thick on substrates with a residual humidity lower than 3% with a roller, brush or by spray to form a final layer at least 0.8 mm thick.

The product must have the following characteristics:

initial adhesion (EN 14891) (N/mm ²):	1.7
adhesion after immersion in water (EN 14891) (N/mm ²):	> 1
adhesion after application of heat source (EN 14891) (N/mm ²):	> 1.8
adhesion after freeze-thaw cycles (EN 14891) (N/mm ²):	> 0.9
adhesion after immersion in basic water (EN 14891) (N/mm ²):	> 1.3
adhesion after immersion in sodium hypochlorite solution (EN 14891) (N/mm ²):	> 1.2
crack-bridging at +23°C (EN 14891) (mm):	3.2
crack-bridging at -5°C (EN 14891) (mm):	1.6
impermeability to water at 1500 kPa pressure (EN 14891):	no penetration

<i>THICKNESS 0.8 mm, APPLIED BY ROLLER</i>	
<i>– per square metre</i>	.....(€/m ²)
<i>THICKNESS 0.8 mm, APPLIED BY BRUSH</i>	
<i>– per square metre</i>	.....(€/m ²)
<i>THICKNESS 0.8 mm, APPLIED BY TROWEL</i>	
<i>– per square metre</i>	.....(€/m ²)



M.9.1 WATERPROOFING STORAGE TANKS FOR FIRE-FIGHTING SYSTEMS AND COOLING WATER WITH TWO-COMPONENT, ELASTIC CEMENTITIOUS MORTAR

Procedure

Preparation of the substrate

Seal any drainage outlets (see section [M.4.1](#)) and waterproof the joints (see section [M.4.2](#)). Substrates must be solid, compact and clean. If the state of the substrate is not as required, remove and repair all detached areas and eliminate uneven areas with [Mapegrout 430](#) (see section [M.1.4.3](#)) fibre-reinforced, controlled-shrinking thixotropic mortar or, for more rapid interventions, Planitop Smooth & Repair (see section [M.1.4.4](#)) fibre-reinforced, rapid-setting, compensated-shrinking thixotropic mortar.

Waterproofing

Then waterproof the storage tank using the most suitable MAPEI product.

For storage tanks partially below ground level, choose between:

- [Mapelastic](#) (see section [M.9.1.1](#)) two-component, elastic cementitious mortar applied by trowel: 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 of [Mapelastic](#) to increase its flexibility and guarantee its capacity to cover cracks up to 1.5 mm wide. After applying the first coat of product, insert the [Mapenet 150](#) by overlapping the adjacent strips at least 10 cm, and press down with a flat trowel on the substrate to guarantee perfect buttering. Please note that the first layer of product must be applied in pitch areas wider than 1.2 metres, so that when the [Mapenet 150](#) (width 1 metre) is applied, there are at least 10 cm on each side of [Mapelastic](#) to guarantee that it forms a continuous layer when the adjacent pitch of product is applied. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried. Make sure the second layer completely covers the mesh, and finish off the surface with a flat trowel.
- [Mapelastic Smart](#) (see section [M.9.1.2](#)) two-component, high-elasticity cementitious mortar applied by roller: apply [Mapelastic Smart](#) as per [Mapelastic](#), but with a roller, and reinforce the mortar in this case with [Mapetex Sel](#) macro-perforated, non-woven polypropylene fabric.

For storage tanks below ground level, waterproof them using:

- [Mapelastic Foundation](#) (see section [M.9.1.3](#)) two-component, elastic cementitious mortar for waterproofing concrete surfaces subject to positive and negative hydraulic pressure: on the solid and dry substrate, before applying [Mapelastic Foundation](#), a coat of Primer 3296 consolidating, dust-repellent acrylic primer in water dispersion must be applied on the surface to improve adhesion. Dilute the primer 1:1 with water and apply with a brush or roller. Apply [Mapelastic Foundation](#) with a roller or by spray to form a coat at least 2 mm thick. Apply the second coat 4-5 hours after applying the first coat in good weather, and in all cases only when the first coat has completely dried.

M.9 STORAGE TANKS

M.9.1.1 Application of two-component, elastic cementitious mortar for waterproofing concrete surfaces

Supply and application of two-component, elastic cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic** produced by MAPEI S.p.A.) for waterproofing under flooring. Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a smooth, metal trowel to form a layer at least 3 mm thick, then finish off the surface with the same trowel. Apply two layers of the product, with alkaline-resistant fibreglass reinforcement mesh (compliant with ETAG 004 guidelines), with a mesh size of 4 x 4.5 mm and a weight of 150 g/m² (such as **Mapenet 150** produced by MAPEI S.p.A.), placed between the first and second layers. Overlap the edges of each strip of fibreglass mesh by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.0
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.8
elasticity (DIN 53504) (%):	30
static crack-bridging at -20°C (EN 1062-7) (mm):	class A3 (>0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 2.4m
	μ = 1200
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.05
permeability to CO ₂ (EN 1062-6) (m):	s _{DCO₂} >50
reaction to fire (EN 13501-1) (Euroclass):	C, s1-d0

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	0.9
crack-bridging capacity at -20°C (mm):	0.8
initial adhesion (N/mm ²):	0.8
adhesion after immersion in water (N/mm ²):	0.55
adhesion after application of heat source (N/mm ²):	1.2
adhesion after freeze-thaw cycles (N/mm ²):	0.6
adhesion after immersion in basic water (N/mm ²):	0.6

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPENET 150**

– per square metre (€/m²)



M.9.1.2 Application of two-component, high-elasticity cementitious mortar for waterproofing concrete surfaces

Supply and application of two-component, high elasticity cementitious mortar made from cementitious binders, selected fine-grained aggregates, synthetic fibres, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Smart** produced by MAPEI S.p.A.) for waterproofing under flooring.

Apply the mortar after adequate preparation of the substrate (not included), which must be clean, solid and degreased.

For concrete substrates, remove all crumbly or detached areas to obtain a solid substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly. For existing tiled substrates, check the adherence of the tiles, that there is sufficient slope and that there are no cracks. If necessary, skim the surface with a suitable cementitious product (not included).

Apply the product on the surface of clean, dry substrates with a roller to form a layer at least 3 mm thick, then finish off the surface with a smooth metal trowel. Apply two layers of the product, with macro-perforated, non-woven polypropylene, reinforcement fabric with a thickness of 0.6 mm and a weight of 80 g/m² (such as **Mapetex Sel** produced by MAPEI S.p.A.), placed between the first and second layers. Overlap the edges of each strip of non-woven fabric by at least 5 cm.

Cover the product with ceramic tiles bonded to the membrane using class C2 cementitious adhesive (supply and installation of the ceramic is not included).

The product, in the form of a 2 mm thick free film, must have the following characteristics:

adhesion to concrete after 28 days (EN 1542) (N/mm ²):	1.3
thermal compatibility to freeze/thaw cycles with de-icing salts (EN 1542) (N/mm ²):	0.9
elasticity (DIN 53504) (%):	120
static crack-bridging at 20° C (EN 1062-7) (mm):	class A5 (>2.5 mm)
dynamic crack-bridging at +20°C:	class B4.2 (no failure of test sample after 2000 cracking cycles with movements of the crack form 0.2 to 0.5 mm)
permeability to water vapour (EN ISO 7783-1) (m):	s _D = 3.6 m
	μ = 1800
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.05
permeability to CO ₂ (EN 1062-6) (m):	s _{DCO2} >50
reaction to fire (EN 13501-1) (Euroclass):	E

The product (in compliance with EN 14891) must have the following characteristics (adhesion is determined by using class C2 adhesive in compliance with EN 12004):

impermeability to water under pressure (1.5 bar for 7 days of positive lift):	no penetration
crack-bridging capacity at +20°C (mm):	2.8
initial adhesion (N/mm ²):	1.2
adhesion after immersion in water (N/mm ²):	0.7
adhesion after application of heat source (N/mm ²):	1.5
adhesion after freeze-thaw cycles (N/mm ²):	0.8
adhesion after immersion in basic water (N/mm ²):	0.8

APPLICATION BY TROWEL, AVERAGE THICKNESS 3 mm WITH **MAPETEX SEL**

– per square metre (€/m²)



M.9 STORAGE TANKS

M.9.1.3 Application of two-component, elastic cementitious mortar on vertical surfaces

Supply and application of two-component, elastic cementitious mortar on vertical surfaces by roller or spray, made from cementitious binders, selected fine-grained inerts, special admixtures and synthetic polymers in water dispersion (such as **Mapelastic Foundation** produced by MAPEI S.p.A.), for waterproofing concrete surfaces subject to positive and negative hydraulic pressure.

Apply the mortar after adequate preparation of the substrate (not included) by removing all crumbly or detached areas to obtain a solid, dry substrate. Remove all traces of dust or other elements which could prevent the product adhering correctly.

After preparing the substrate as above, apply a coat of acrylic consolidator and adhesion promoter (such as Primer 3296 produced by MAPEI S.p.A.) diluted 1:1 with water with a brush or roller.

Apply the product with a roller or by spray with a rendering machine, fitted with a spraying lance for skimming compound, to form a layer at least 2 mm thick, then finish off the surface with a flat trowel. In the fillet area between the wall and the foundations, apply the product horizontally to cover the foundations.

The product must have the following characteristics:

adhesion to concrete (EN 1542 after 28 days) (N/mm ²):	> 1
adhesion to concrete (EN 1542 after 7 days) (N/mm ²):	> 0.7
crack resistance (EN 1062-7) (mm):	class A4 (> 1.25 mm)
permeability to water vapour (EN ISO 7783-1):	$S_D = 2.4$ m and $\mu = 1200$
impermeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	< 0.07
permeability to CO ₂ (EN 1062-6) (m):	> 300
impermeability to water under positive pressure (EN 12390-8)	
– 5 bar for 3 days:	no penetration
– 1.5 bar for 7 days:	no penetration
impermeability to water under 1.5 bar negative pressure:	no penetration
elasticity after 28 days (DIN 53504) (%):	> 60
reaction to fire:	Euroclass E

AVERAGE THICKNESS 2 mm, APPLIED BY ROLLER

– per square metre(€/m²)

AVERAGE THICKNESS 2 mm, APPLIED BY SPRAY

– per square metre(€/m²)



M.9.2 ACID-RESISTANT PROTECTIVE EPOXY PAINT FOR CONCRETE SURFACES

Procedure

Preparation of the substrate

The inner faces of the storage tank (floor and walls) must be clean, free of stripping compound, grease, dirt and any other material which could compromise adhesion of the products to be applied later. Therefore, a thorough cleaning cycle for the surfaces must be scheduled using controlled-pressure dry-sandblasting or by hydro-cleaning.

Form 5 x 5 cm triangular fillets between the floor of the storage tank and the vertical walls and between adjacent walls by applying **Eporip** (see section **F.8.2.1**) two-component, solvent-free epoxy adhesive with a trowel or brush, and then, while it is still fresh, **Mapegrout 430** fine-grained, fibre-reinforced, controlled-shrinking thixotropic mortar.

Repair deteriorated areas of substrates also with **Mapegrout 430**.

Seal the porosity and eliminate and level off uneven areas in the substrates using **Mapefinish** (see section **F.9.1.3**) two-component cementitious mortar for finishing off concrete, applied by trowel in layers from 2-3 mm thick.

If the storage tank is below ground level (with no groundwater) when the **Mapefinish** has cured, prime the floor and walls of the storage tank with **Triblock P** (see section **M.1.5.3**) three-component epoxy-cementitious primer with the capacity of reticulating on damp surfaces, including particularly smooth surfaces, and forming an efficient barrier against rising damp, including under positive pressure, to guarantee excellent adhesion of the waterproofing layer to be applied later. Apply two coats of diluted **Triblock P** or once **Mapefinish** has cured sufficiently by brush, with a roller or by airless spray on the surfaces to be treated. The two coats should be applied evenly and diagonally to each other. The second coat may be applied 4-6 hours after the first one.

Waterproofing

Then waterproof the storage tank using the most suitable MAPEI product:

- **Duresil EB** (see section **M.9.2.1**) epoxy paint modified with hydrocarbon resins for protecting storage tanks containing aggressive chemical agents. Approximately 24 hours after applying the second coat of **Triblock P**, apply **Duresil EB** two-component, anti-acid, protective epoxy paint modified with hydrocarbon resins and special admixtures, resistant to freezing weather and direct sunlight, on all the surfaces of the storage tank (walls and bottom). Apply at least two coats of the product using conventional methods, such as by brush with a roller or by spray. Wait from 6 to 24 hours between each coat, according to the surrounding conditions. Once it has completely hardened, **Duresil EB** may come into contact with sewage waste and, therefore, may be used for coating deuration tanks and tanks for run-off water from drains. It is resistant to acids, diluted alkalis, base materials, salts, mineral oil and hydrocarbons, as well as the main aggressive chemical products carried in sewage waste, such as chlorides, sulphates and sulphides, and protects the structure against the aggressive action of carbonatation and freeze/thaw cycles.
- **Mapecoat I 24** (see section **M.9.2.2**) two-component epoxy paint suitable for protecting storage tanks containing highly-aggressive chemical agents: around 24 hours after applying the second coat of **Triblock P** or once **Mapefinish** has cured sufficiently, apply two coats of **Mapecoat I 24** with a brush, roller or by airless spray. Wait from 6 to 24 hours between each coat, according to the surrounding conditions.

M.9 STORAGE TANKS

M.9.2.1 Application of two-component epoxy paint modified with hydrocarbon resins

Supply and application of two-component, epoxy paint modified with hydrocarbon resins (such as **Duresil EB** produced by MAPEI S.p.A.) for anti-acid protection of concrete substrates.

Apply the epoxy paint after adequate preparation of the concrete substrate (not included) by removing all crumbly or detached areas and all traces of cement laitance, stripping oils and paint by sandblasting or brushing.

Thoroughly clean the surfaces with compressed air to remove all dust deposits which could impede correct adhesion of the product.

Apply two coats at least 250 µm thick per coat of product with a brush, roller or by airless spray on solid, clean, dry substrates.

The product must comply with the minimum requirements of EN 1504-2 coating (C) according to principles PI, MC, RC and IR for protecting concrete, and must have the following performance characteristics:

dry solids content (%):	100
final hardening time:	7 days (at +23°C)
permeability to carbon dioxide (CO ₂) (EN 1062-6) (m):	500
permeability to water vapour (EN ISO 7783-1) (m):	S _D < 50 Class II
capillary absorption and permeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	0.01
resistance to thermal shock (EN 13687-5) (MPa):	3.5
resistance to severe chemical attack (EN 13529):	Class II: 28 days with no pressure: no alteration. Opacification with 10% acetic acid and 20% sulphuric acid
direct traction adherence test (EN 1542) (MPa):	3.5 (after 7 days)
reaction to fire (EN 13501-1) (Euroclass):	E
– per square metre	.....(€/m ²)



M.9 STORAGE TANKS

M.9.2.2 Two-component epoxy paint for anti-acid coatings on concrete surfaces

Supply and application of two-component epoxy paint made from epoxy resins and special pigments with high covering capacity (such as **Mapecoat I 24** produced by MAPEI S.p.A.) for anti-acid coatings on concrete surfaces.

Apply two coats of the product on a solid, clean substrate treated with primer (not included) with a brush, roller or by airless spray. Wait between 6 and 24 hours between each coat, according to surrounding conditions.

The product must comply with the principles defined in EN 1504-2/-9 and have the following characteristics:

abrasion resistance (EN ISO 5470-1) (mg):	919
permeability to CO ₂ (EN 1062-6) (m):	S _D = 1255
permeability to water vapour (EN ISO 7783-1-2):	class III
capillary absorption and permeability to water (EN 1062-3) (kg/m ² ·h ^{0.5}):	0.02
resistance to thermal shock (EN 13687-5) (MPa):	3.5
resistance to severe chemical attack (EN 13529):	no alteration
impact strength (EN ISO 6272-1):	class I
direct traction adherence test (EN 1542) (MPa):	3.89
reaction to fire:	Euroclass E _{fl}

APPLICATION BY BRUSH

– per square metre(€/m²)

APPLICATION BY ROLLER

– per square metre(€/m²)

APPLICATION BY SPRAY

– per square metre(€/m²)



M.9.3 ACID-RESISTANT, NON-TOXIC COATING SUITABLE FOR CONTACT WITH DRINKING WATER FOR CONCRETE SURFACES

Procedure

Preparation of the substrate

The inner faces of the storage tank (floor and walls) must be clean, free of stripping compound, grease, dirt and any other material which could compromise adhesion of the products to be applied later. Therefore, a thorough cleaning cycle for the surfaces must be scheduled using controlled-pressure dry-sandblasting or by hydro-cleaning.

Form 5 x 5 cm triangular fillets between the floor of the storage tank and the vertical walls and between adjacent walls by applying **Eporip** (see section **F.8.2.1**) two-component, solvent-free epoxy adhesive with a trowel or brush, and then, while it is still fresh, **Mapegrout 430** (see section **M.1.4.3**) fine-grained, fibre-reinforced, controlled-shrinking thixotropic mortar.

Repair deteriorated areas of substrates also with **Mapegrout 430**.

Seal the porosity and level off uneven areas in the substrates using **Mapefinish** (see section **F.9.1.3**) two-component cementitious mortar for finishing off concrete, applied by trowel in layers from 2-3 mm thick.

Waterproofing

It is possible to choose between two different types of coating suitable for contact with drinking water, which differ for their chemical content and application cycle:

- **Mapecoat DW 25** two-component epoxy paint for coating concrete surfaces: once **Mapefinish** has cured sufficiently, prime the surfaces of the storage tank (sides and bottom) with **Triblock P** (see section **M.1.5.3**) three-component epoxy-cementitious primer with the capacity of reticulating on damp surfaces, including particularly smooth surfaces, and guaranteeing excellent adhesion of the waterproofing layer to be applied later, including when there is water at negative pressure. Apply two coats of **Triblock P** diluted according to requirements by brush, with a roller or by spray on the surface to be treated. The two coats should be applied evenly and diagonally to each other. The second coat may be applied 4-6 hours after the first one. Around 24 hours after applying the second coat of **Triblock P** or once **Mapefinish** has cured sufficiently, apply two coats of **Mapecoat DW 25** (see section **M.9.3.1**) with a brush, roller or by airless spray. Wait from 6 to 24 hours between each coat, according to the surrounding conditions.
- **Idrosilex Pronto** osmotic cementitious mortar for waterproofing concrete structures: once **Mapefinish** has cured sufficiently, apply 2/3 criss-cross coats of **Idrosilex Pronto** by brush or roller (see section **M.9.3.2**). Wait until each coat is sufficiently dry before applying the next one. We recommend making sure the product penetrates deep down into the substrate. If the product is applied by trowel, we recommend applying a coat of **Idrosilex Pronto** on the substrate by brush beforehand.

M.9 STORAGE TANKS

M.9.3.1 Application of two-component epoxy paint for anti-acid and non-toxic coatings on concrete surfaces

Supply and application of two-component epoxy paint made from epoxy resins and special pigments with high covering capacity (such as **Mapecoat DW 25** produced by MAPEI S.p.A.) for anti-acid and non-toxic coatings on concrete surfaces.

Apply two coats of the product on a solid, clean substrate treated with primer (not included) with a brush, roller or by airless spray. Wait between 6 and 24 hours between each coat, according to surrounding conditions.

The product must comply with the principles defined in EN 1504-2/-9 and have the following characteristics:

Taber abrasion resistance (g):	0.1
viscosity - rotor 5, 20 revs (mPa·s):	1500

APPLICATION BY BRUSH

– per square metre(€/m²)

APPLICATION BY ROLLER

– per square metre(€/m²)

APPLICATION BY SPRAY

– per square metre(€/m²)



M.9 STORAGE TANKS

M.9.3.2 Application of osmotic cementitious mortar suitable for contact with drinking water for waterproofing concrete structures

Supply and application of ready-to-use, osmotic cementitious mortar suitable for contact with drinking water for waterproofing concrete surfaces (such as **Idrosilex Pronto** produced by MAPEI S.p.A.) by brush or trowel.

Apply several criss-cross coats of the product on a clean substrate saturated with water.

The product must have the following mechanical characteristics when mixed with 23% water and applied in layers 2.5 mm thick:

Compressive strength (EN 12190) (MPa):	> 25 (after 28 days)
Flexural strength (EN 196/1) (MPa):	> 6.0 (after 28 days)
Adhesion to substrate (EN 1542) (MPa):	≥ 2 (after 28 days)
Impermeability expressed as coefficient of permeability to free water (EN 1062-3) (kg/m ² ·h ^{0.5}):	W < 0.05 Class III (low permeability to water) according to EN 1062-1

Permeability to water vapour

equivalent air thickness S_D (EN ISO 7783-1) (m):

$S_D < 1$

Class I (permeable to water vapour)

Reaction to fire (Euroclass):

E

AVERAGE THICKNESS 2.5 mm, APPLIED BY TROWEL

– per square metre

..... (€/m²)



M.9.4 WATERPROOFING STORAGE TANKS WITH PURE POLYUREA-BASED MEMBRANE WITH HIGH ELASTICITY AND EXCELLENT RESISTANCE TO CHEMICALS

Procedure

This type of waterproofing membrane is recommended for medium to large hydraulic structures (internal surface > 500 m²) such as: safety tanks, fire-fighting tanks, industrial waste tanks, water towers, canals, dams...

Purtop 1000 membrane has excellent resistance to a number of chemicals. However, before applying the product, contact Mapei technical Services to verify the resistance of the membrane to the type of chemicals with which it will come into contact once in service.

Substrate preparation

The first operation to carry out is to check the substrate to make sure it is suitable for the waterproofing system. Verify the following:

- longitudinal and lateral slope of the surfaces > 1.5%;
- roughness of the substrate < 2.0 mm;
- compressive strength of the surface ≥ 25 MPa and tear strength of the surface (pull-out test) ≥ 1.5 MPa;
- maximum moisture content of the substrate 4%.

The inner faces of the tank (bottom and sides) must be clean, dry and free of form release agents, grease, dirt and any other material that could compromise adhesion of the products to be applied later. Therefore, a thorough cleaning cycle for the surfaces must be scheduled using dry-sandblasting or by high-pressure hydro-cleaning.

Form 5 x 5 cm triangular fillets between the bottom and sides of the storage tank and between adjacent sides by applying **Eporip** two-component, solvent-free epoxy adhesive with a trowel or brush (see section **F.8.2.1**), and then, while it is still fresh, **Mapegrout 430** fine-texture, fibre-reinforced, controlled-shrinkage thixotropic mortar (see section **M.1.4.3**).

Also repair deteriorated areas of substrates with **Mapegrout 430**.

Seal the porosity and level off any uneven areas in the substrates using **Mapefinish** two-component cementitious mortar for finishing off concrete, applied by trowel in layers from 2-3 mm thick (see section **F.9.1.3**).

Waterproof any structural joints (see section **M.4.2.2**).

– Cementitious substrates

Apply one or two coats of **Triblock P** three-component epoxy primer on all the internal surfaces of the tank, depending on the condition of the substrate, until they are completely sealed (see section **M.1.5.3**). The waterproofing membrane must be applied within 2-7 days of applying the primer.

– Metal substrates

Make sure the substrate is in good condition and dry-sandblast the surface to grade SA 2½. The sandblasting operation is required to eliminate traces of old paint, rust, oil and any other contaminant that could compromise adherence of the waterproofing system to be applied. If it is not possible to dry-sandblast the surface, the substrate must be cleaned mechanically with either abrasive or percussion tools. Always remove debris created while treating the surface using an industrial vacuum cleaner.

Treat metal surfaces with a coat of **Primer EP Rustop** two-component epoxy primer with a brush, roller or airless spray (see section **M.1.5.2**). Then apply the waterproofing membrane within 6 to 24 hours.

Waterproofing

Before applying **Purtop 1000**, remove all traces of dust from the surface with an industrial vacuum cleaner (see section **M.9.4.1**). The temperature of the substrate must be at least +3°C higher than the dew-point temperature and the moisture content must be no higher than 4%.

To apply **Purtop 1000** membrane, use a high-pressure, bi-mixer industrial spray gun with flow and temperature control fitted with a self-cleaning spray gun. Apply **Purtop 1000** in a continuous coat on all the surfaces. If application is interrupted and then recommences within the maximum re-coating time (2 hours), form an overlap at least 30 cm wide. First sand the strip of membrane and then apply a coat of **Primer M** before continuing with the application of **Purtop 1000**.

If **Purtop 1000** is exposed to UV rays, its mechanical properties are not affected but it gradually yellows.

To prevent it yellowing, we recommend applying **Mapefloor Finish 55** two-component, aliphatic, polyurethane coating with excellent elasticity and resistance to wear and UV rays with a roller.

M.9 STORAGE TANKS

M.9.4.1 Application of two-component, pure polyurea-based membrane for waterproofing hydraulic structures

Supply and application of two-component, solvent-free, pure polyurea-based membrane (such as **Purtop 1000** produced by MAPEI S.p.A.) with immediate waterproofing and set to foot traffic properties for waterproofing hydraulic structures in general.

Apply a 2 mm thick layer of the product with high-pressure, bi-mixer industrial spray equipment with a self-cleaning spray gun and flow and temperature control on solid, clean substrates treated beforehand with primer (not included).

The product must have the following characteristics (after 7 days at +23°C):

Tensile strength (DIN 53504) (N/mm ²):	25
Elongation at failure (DIN 53504) (%):	350
Tear strength (ISO 34-1) (N/mm):	96
Shore A hardness (DIN 53505):	90
Glass transition temperature (°C):	-46

MINIMUM THICKNESS 2 mm APPLIED BY SPRAY

– per square metre

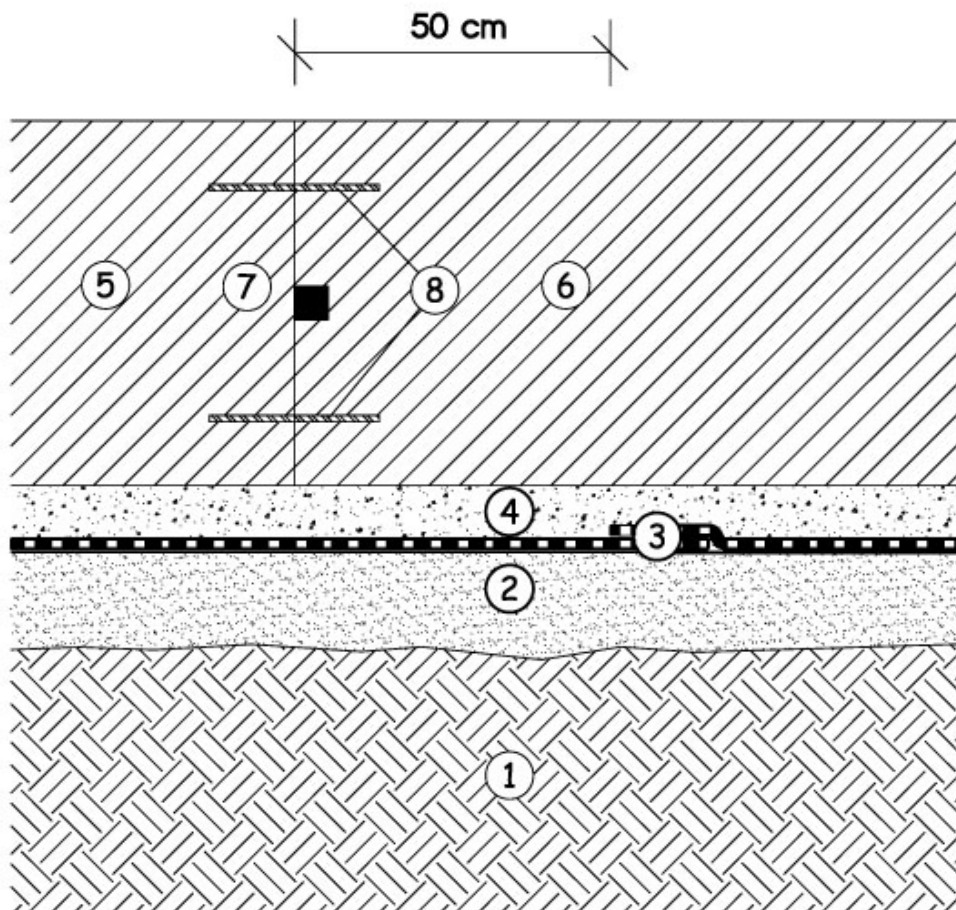
.....(€/m²)



Second pour of a foundation pad

Code:
ATE N SQ 018

- | | |
|--|--|
| ① Ground | ⑤ Reinforced concrete foundation slab |
| ② Regulating layer of lean concrete | ⑥ Adjacent reinforced concrete foundation slab |
| ③ MAPEPROOF | ⑦ IDROSTOP B25 |
| ④ Protective concrete layer with the same Rck as the foundation pad concrete | ⑧ Fixing rods |



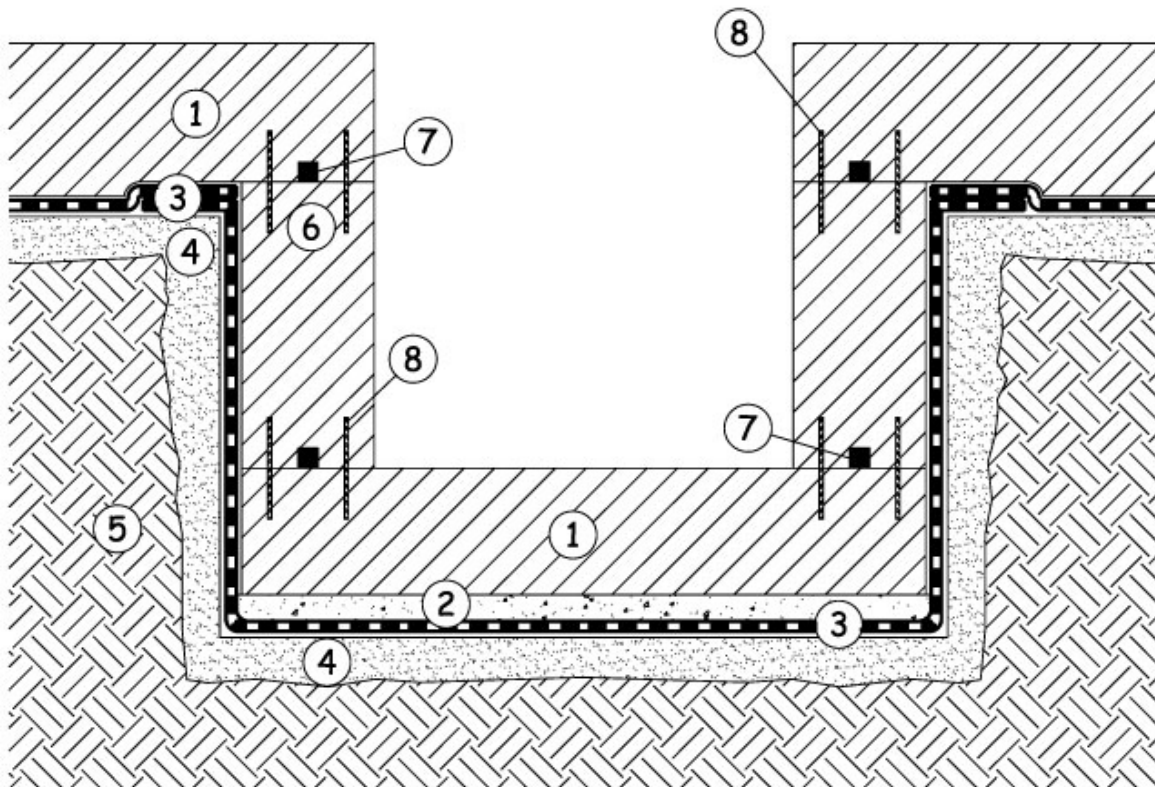
Mapei Quality System
ISO 9001 Certified
Certiquality No. 250

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MAPEI
ADESIVI SIGILLANTI PRODOTTI CHIMICI PER L'EDILIZIA

Lift well

Code:
ATE N SQ 006

- | | |
|--|---------------------------------|
| ① Reinforced concrete foundation slab | ⑤ Ground |
| ② Protective concrete layer with the same f_{ck} as the foundation pad concrete resistance | ⑥ Reinforced concrete structure |
| ③ MAPEPROOF | ⑦ IDROSTOP B25 |
| ④ Regulating layer of lean concrete | ⑧ Fixing rods |



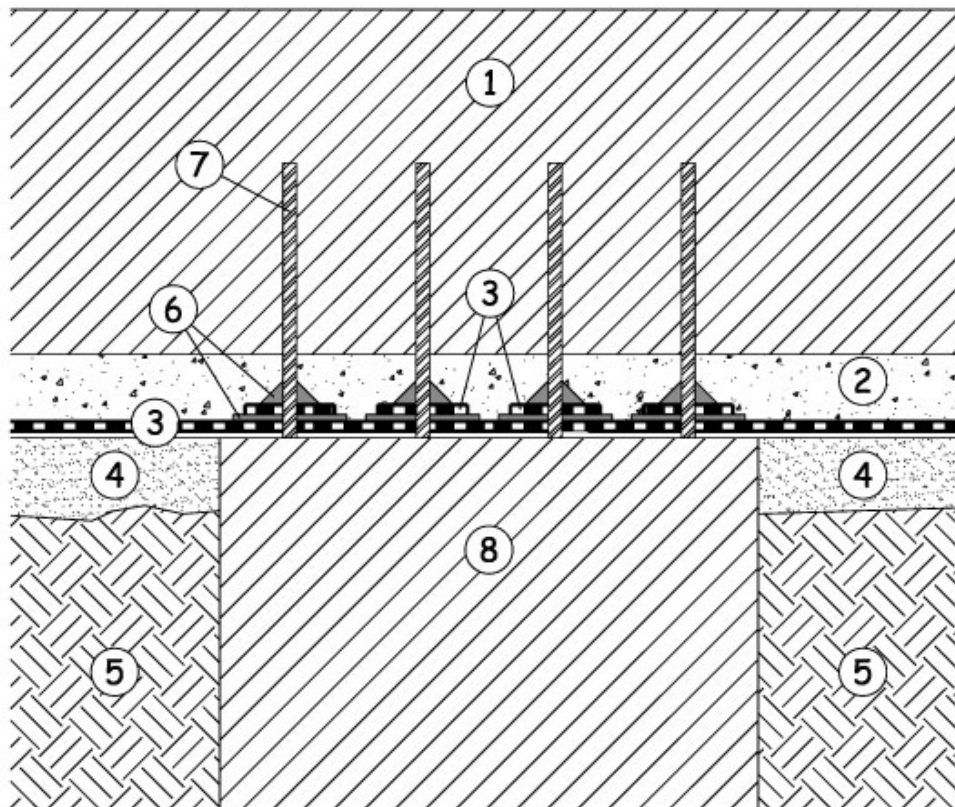
Mapei Quality System
ISO 9001 Certified
Certiquality No. 250

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Foundation piles - pile head below waterproofing sheet level

Code:
ATE N SQ 007

- | | |
|--|--------------------|
| ① Reinforced concrete foundation slab | ⑤ Ground |
| ② Protective concrete layer with the same Rck as the foundation pad concrete | ⑥ MAPEPROOF MASTIC |
| ③ MAPEPROOF | ⑦ Steel rebar |
| ④ Regulating layer of lean concrete | ⑧ Foundation pile |



Mapei Quality System
ISO 9001 Certified
Certiquality No. 250

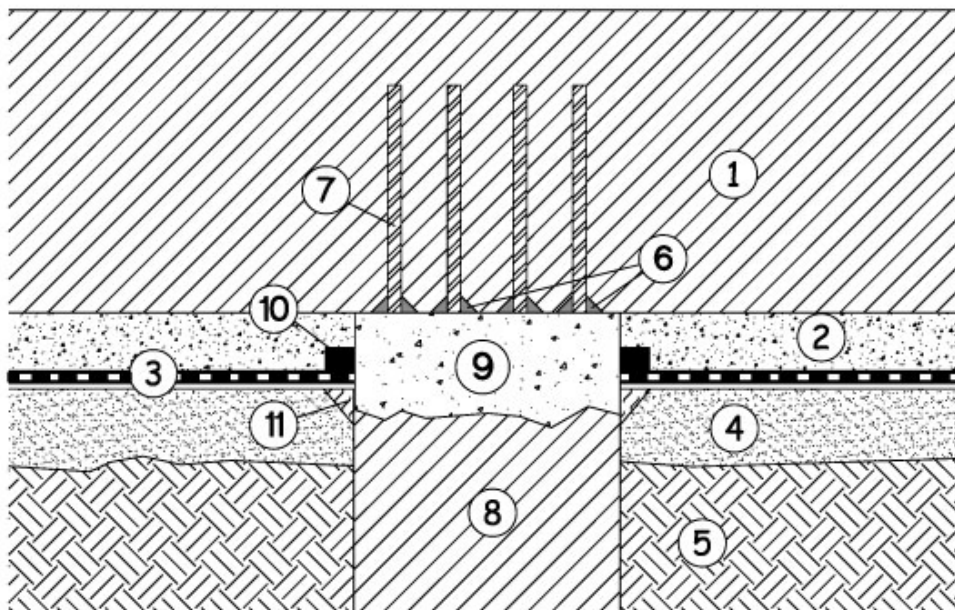
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Foundation piles

pile head above waterproofing sheet level

Code:
ATE N SQ 008

- | | |
|--|---------------------|
| ① Reinforced concrete foundation slab | ⑦ Steel rebar |
| ② Protective concrete layer with the same Rck as the foundation pad concrete | ⑧ Foundation pile |
| ③ MAPEPROOF | ⑨ MAPEGROUT HI-FLOW |
| ④ Regulating layer of lean concrete | ⑩ IDROSTOP B25 |
| ⑤ Ground | ⑪ MAPEPROOF SEAL |
| ⑥ MAPEPROOF MASTIC | |

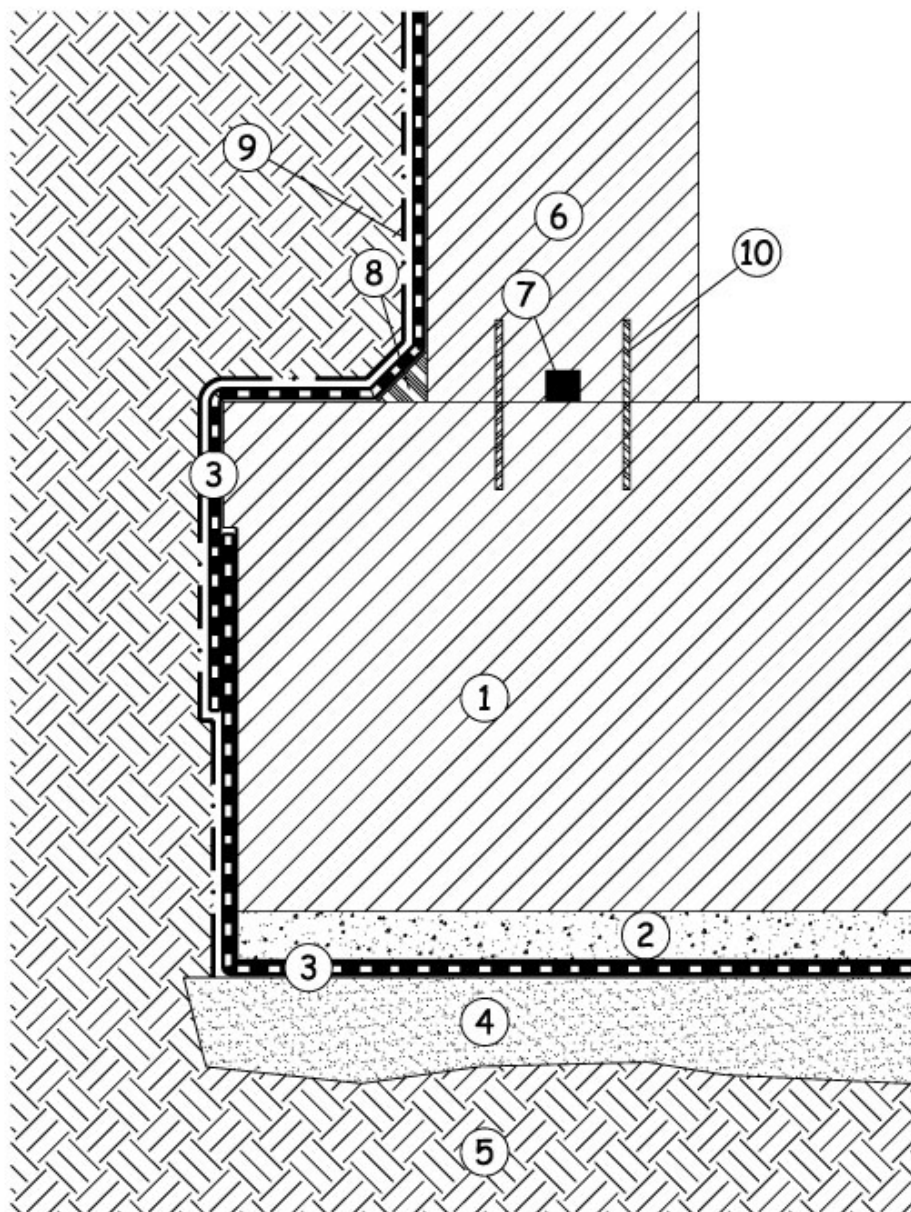


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Waterproofing sheet applied after pouring

Code:
ATE N SQ 009



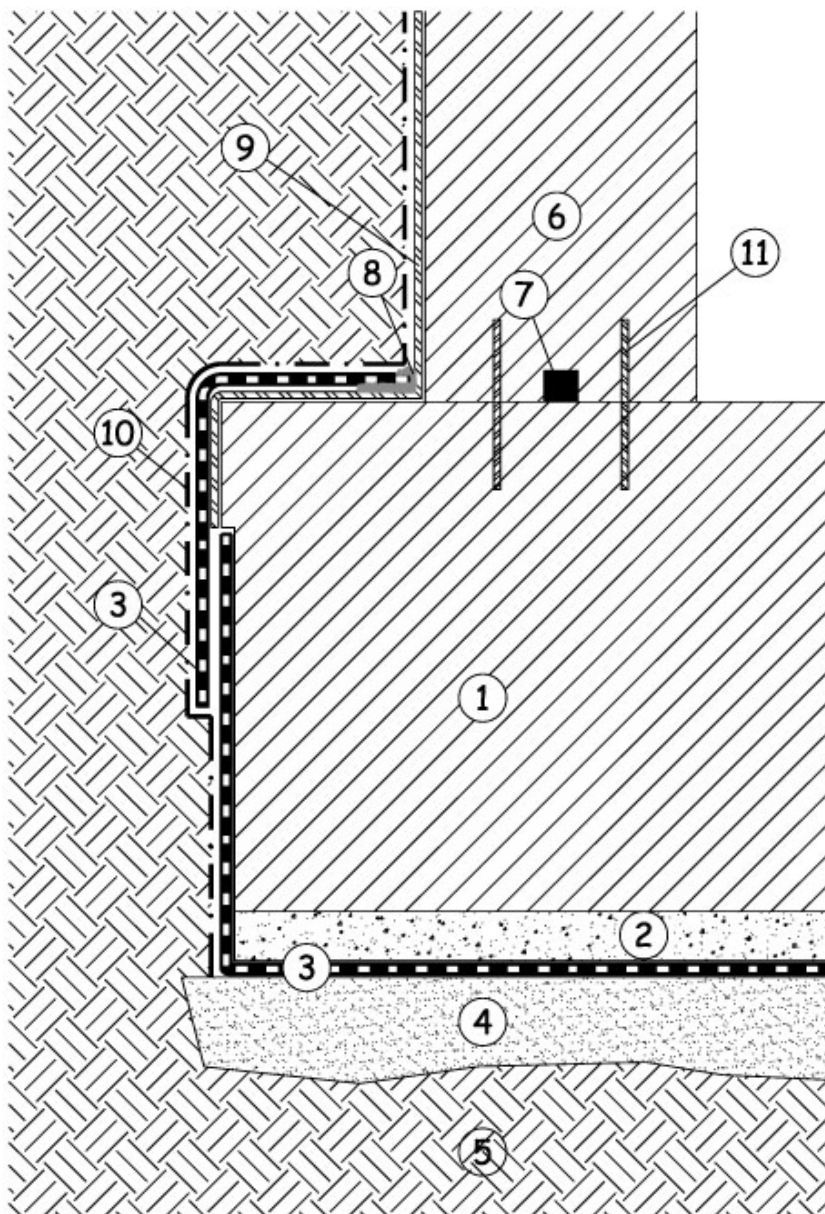
- ① Reinforced concrete foundation slab
- ② Protective concrete layer with the same Rck as the foundation pad concrete
- ③ MAPEPROOF
- ④ Regulating layer of lean concrete
- ⑤ Ground
- ⑥ Reinforced concrete wall
- ⑦ IDROSTOP B25
- ⑧ Shell made from with MAPEGROUT or PLANITOP 400
- ⑨ Spun-bound non-woven fabric $\geq 250 \text{ g/m}^2$
- ⑩ Fixing rods

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MAPEPROOF on slab and MAP. FOUNDATION on wall

Code:
ATE N SQ 011



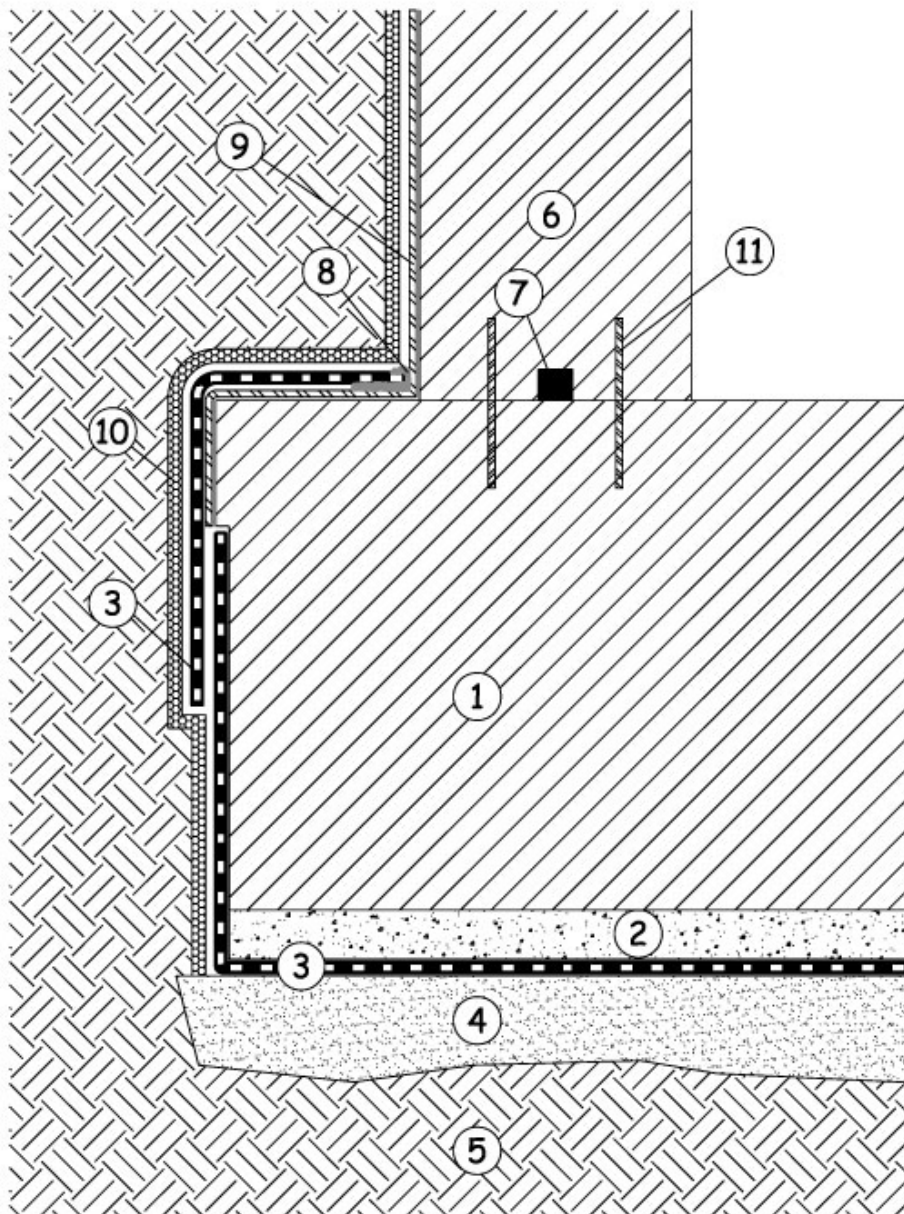
- ① Reinforced concrete foundation slab
- ② Protective concrete layer with the same Rck as the foundation pad concrete
- ③ MAPEPROOF
- ④ Regulating layer of lean concrete
- ⑤ Ground
- ⑥ Reinforced concrete wall
- ⑦ IDROSTOP B25
- ⑧ MAPEPROOF MASTIC
- ⑨ MAPELASTIC FOUNDATION
- ⑩ Spun-bound non-woven fabric $\geq 250 \text{ g/m}^2$
- ⑪ Fixing rods

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MAPEPROOF under the foundation slab and waterproofing layer from the PLASTIMUL range on the wall

Code:
ATE N SQ 023



- ① Reinforce concrete slab
- ② Protective concrete layer with the same Rck as the foundation pad concrete
- ③ MAPEPROOF
- ④ Regulating layer of lean concrete
- ⑤ Ground
- ⑥ Reinforced concrete wall
- ⑦ IDROSTOP B25
- ⑧ MAPEPROOF MASTIC
- ⑨ Waterproofing layer from the PLASTIMUL range
- ⑩ Drainage layer
- ⑪ Fixing rods

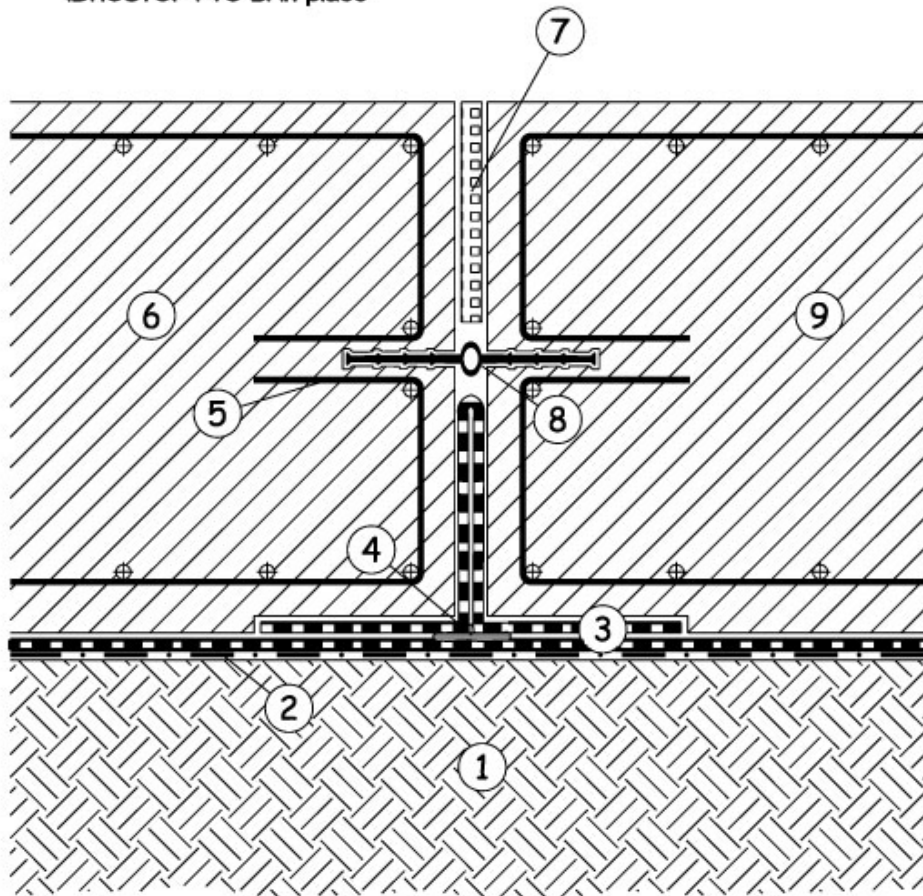
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Structural joint with IDROSTOP PVC BI

Code:
ATE N SQ 017

- | | |
|--|--|
| ① Ground | ⑥ Reinforced concrete structure |
| ② Spun-bound non-woven fabric $\geq 250 \text{ g/m}^2$ | ⑦ Separating element |
| ③ MAPEPROOF | ⑧ Idrostop PVC BI |
| ④ MAPEPROOF MASTIC | ⑨ Adjacent reinforced concrete structure |
| ⑤ Bent rods to fix IDROSTOP PVC BI in place | |



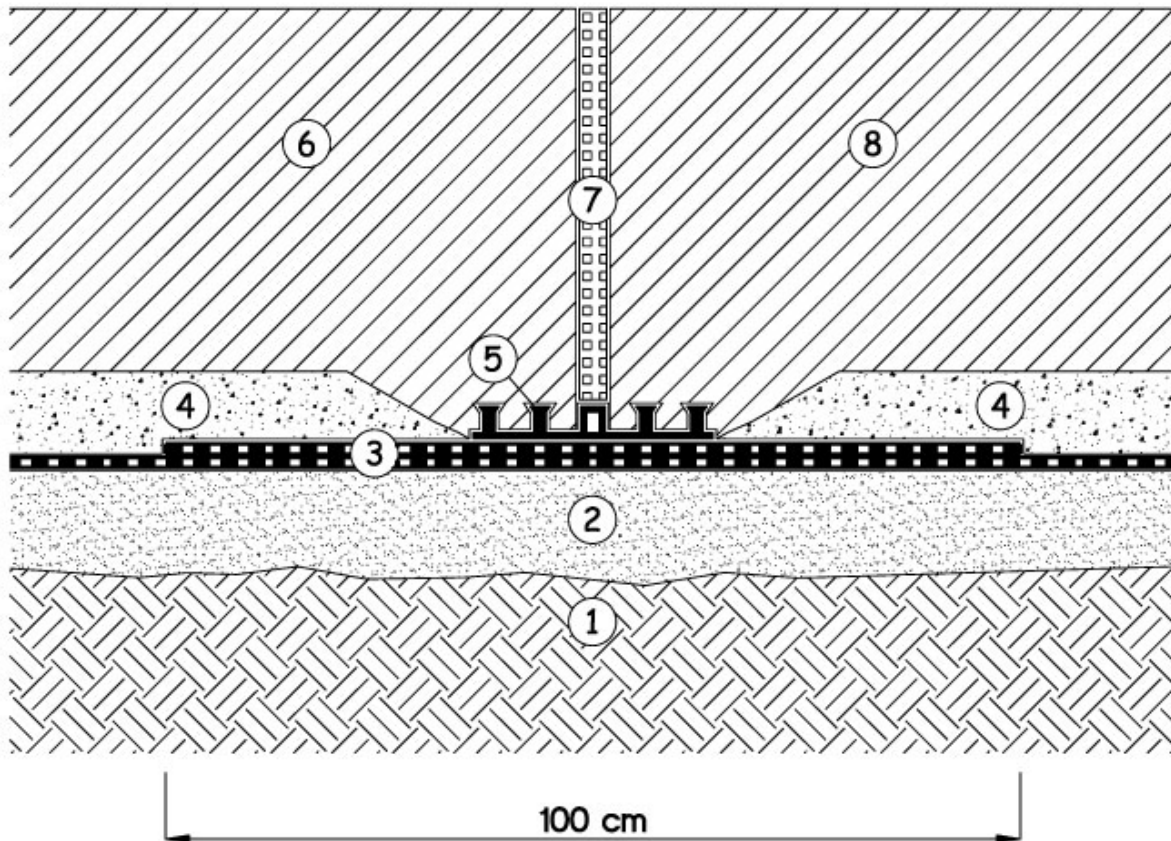
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Structural joint with IDROSTOP PVC BE

Code:
ATE N SQ 016

- | | |
|---|--|
| ① Ground | ⑤ IDROSTOP PVC BE |
| ② Regulating layer of lean concrete | ⑥ Reinforced concrete wall |
| ③ MAPEPROOF | ⑦ Separating element |
| ④ Protective concrete layer
with the same f_{ck} as the
foundation pad concrete | ⑧ Adjacent reinforced concrete structure |



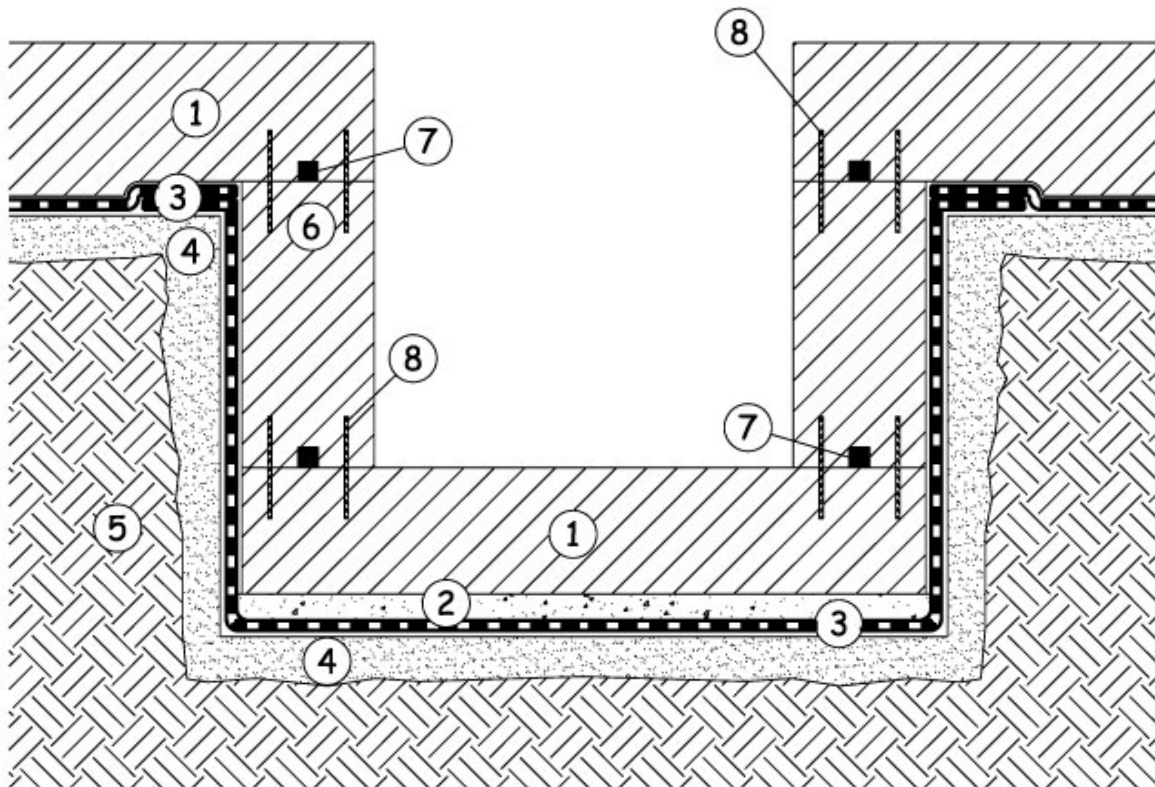
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Lift well

Code:
ATE N SQ 006

- | | |
|--|---------------------------------|
| ① Reinforced concrete foundation slab | ⑤ Ground |
| ② Protective concrete layer with the same R_{ck} as the foundation pad concrete resistance | ⑥ Reinforced concrete structure |
| ③ MAPEPROOF | ⑦ IDROSTOP B25 |
| ④ Regulating layer of lean concrete | ⑧ Fixing rods |



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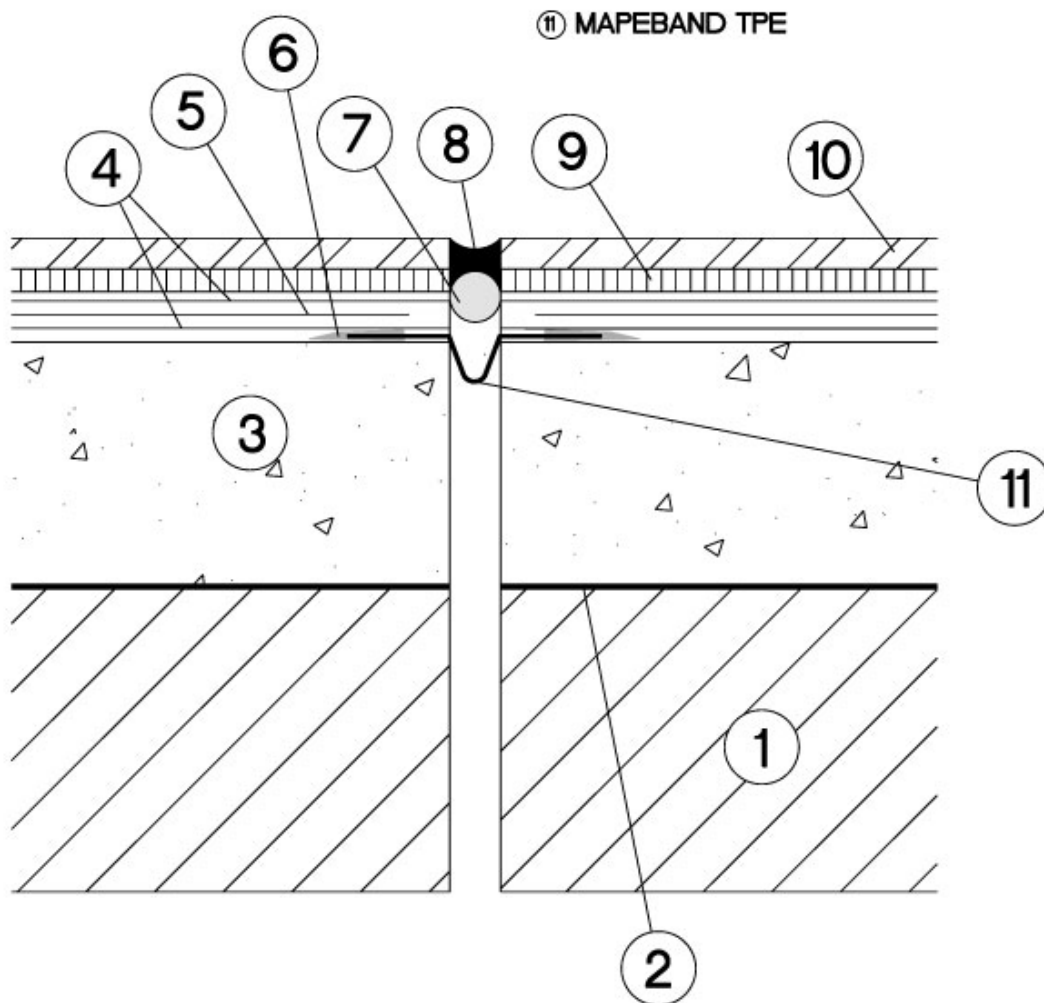
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Sealing a structural joint

MAPEBAND TPE

Code:
ATE N FQ 004

- | | |
|---|---|
| ① Reinforced concrete substrate | ⑥ ADESILEX PG4
(surface dusted with quartz sand) |
| ② bonding slurry
(PLANICRETE+TOPCEM+water) | ⑦ MAPEFOAM |
| ③ TOPCEM
(screed) | ⑧ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ④ MAPELASTIC | ⑨ KERAFLEX MAXI S1 (cementitious adhesive) |
| ⑤ MAPENET 150 | ⑩ balcony flooring grouted with
ULTRACOLOR PLUS |
| | ⑪ MAPEBAND TPE |



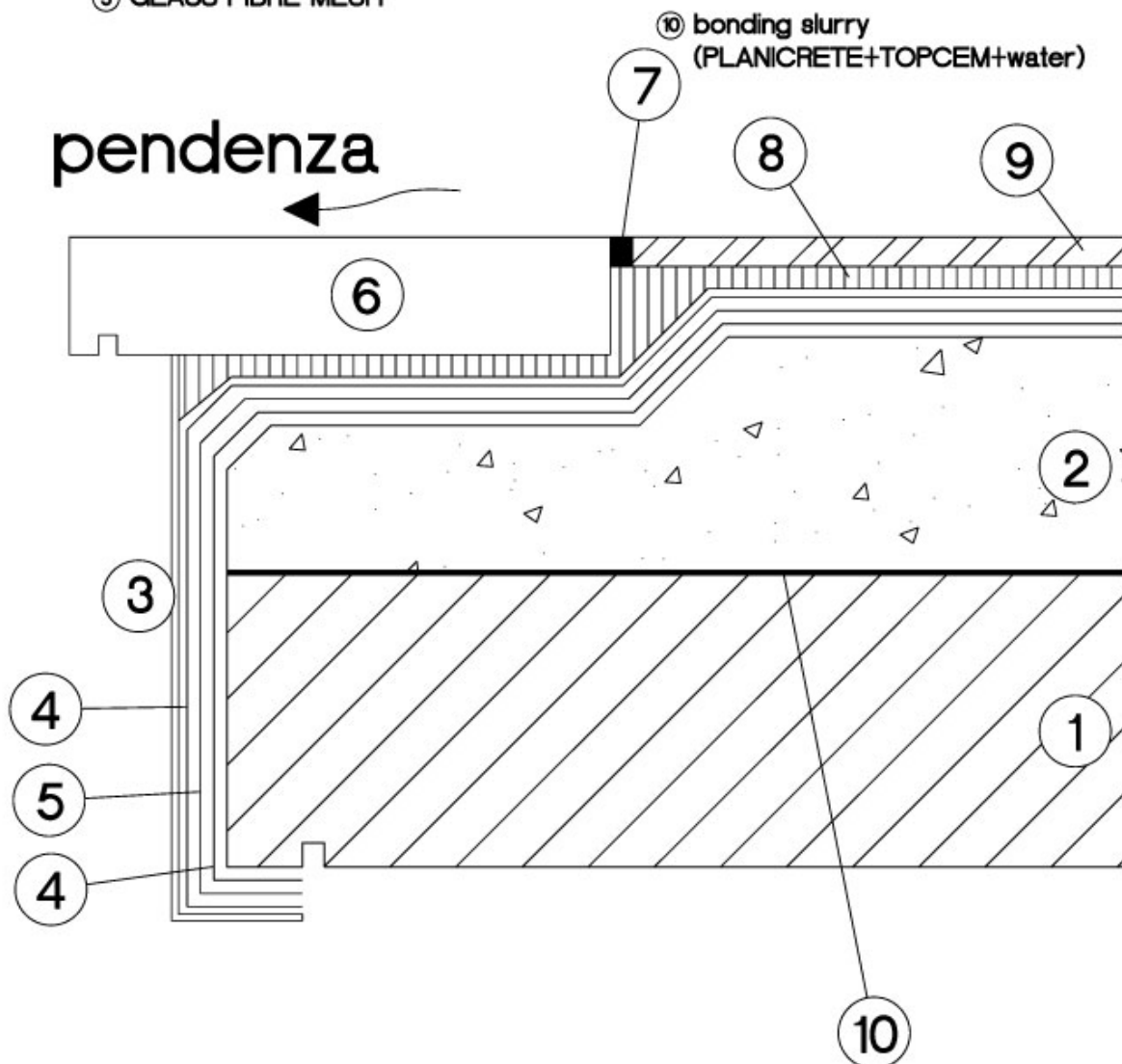
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Front edge of a balcony - marble sill

Code:
ATE N FQ 001

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ marble sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |



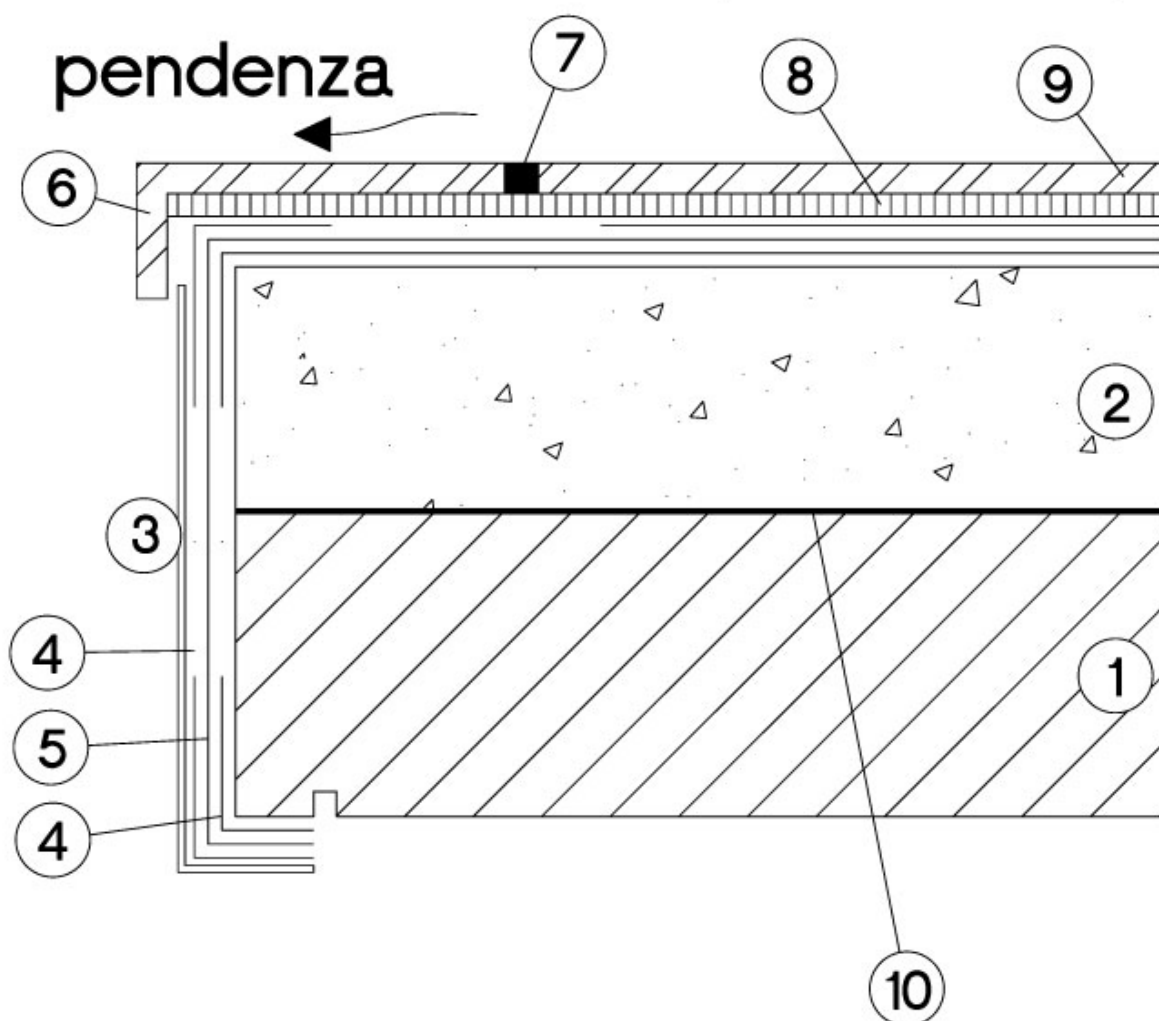
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Front edge of a balcony - Ceramic sill

Code:
ATE N FQ 002

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ Pre-formed ceramic sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |

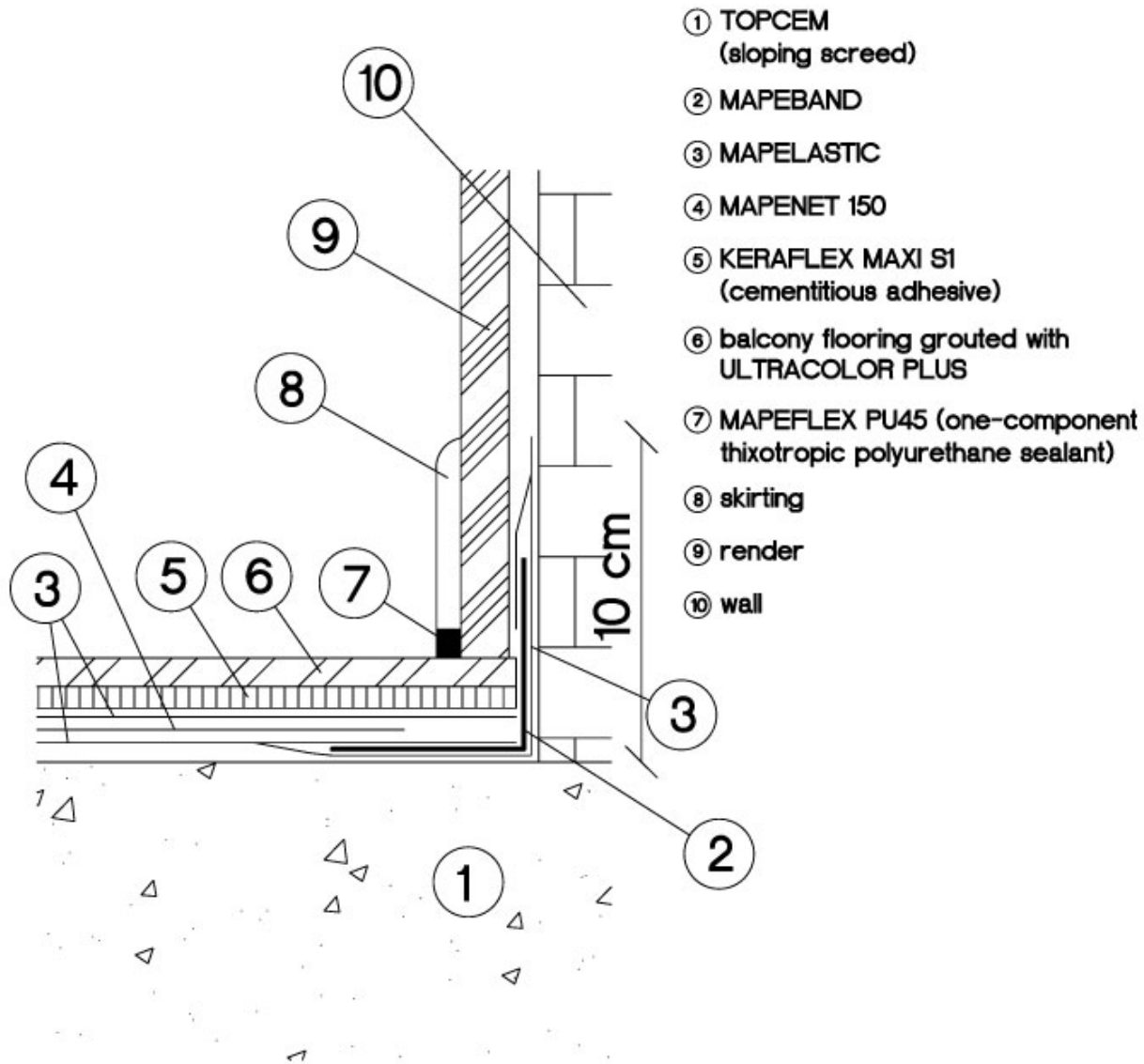


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Floor-wall fillet

Code:
ATE N FQ 003



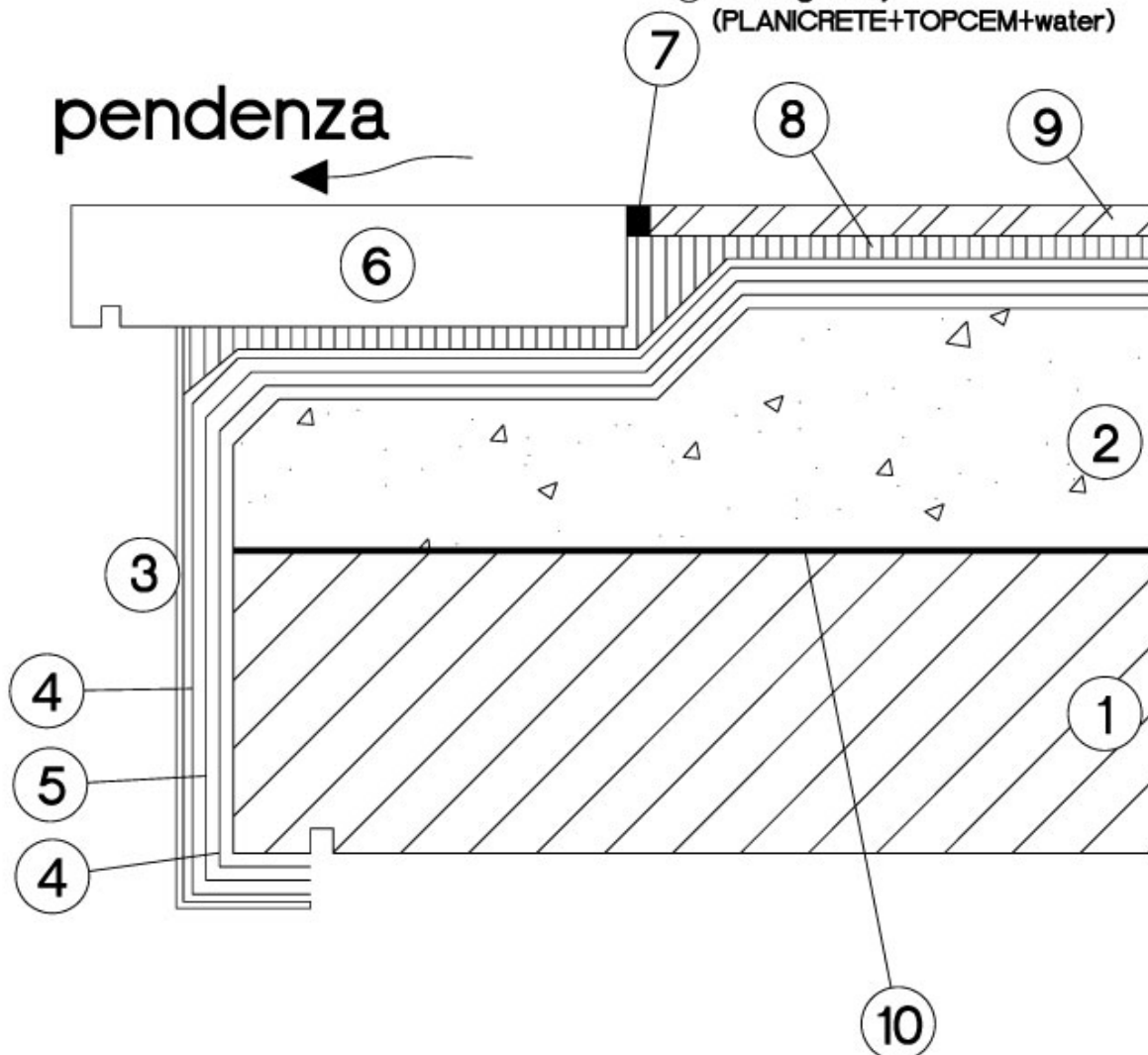
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Front edge of a balcony - marble sill

Code:
ATE N FQ 001

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ marble sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |



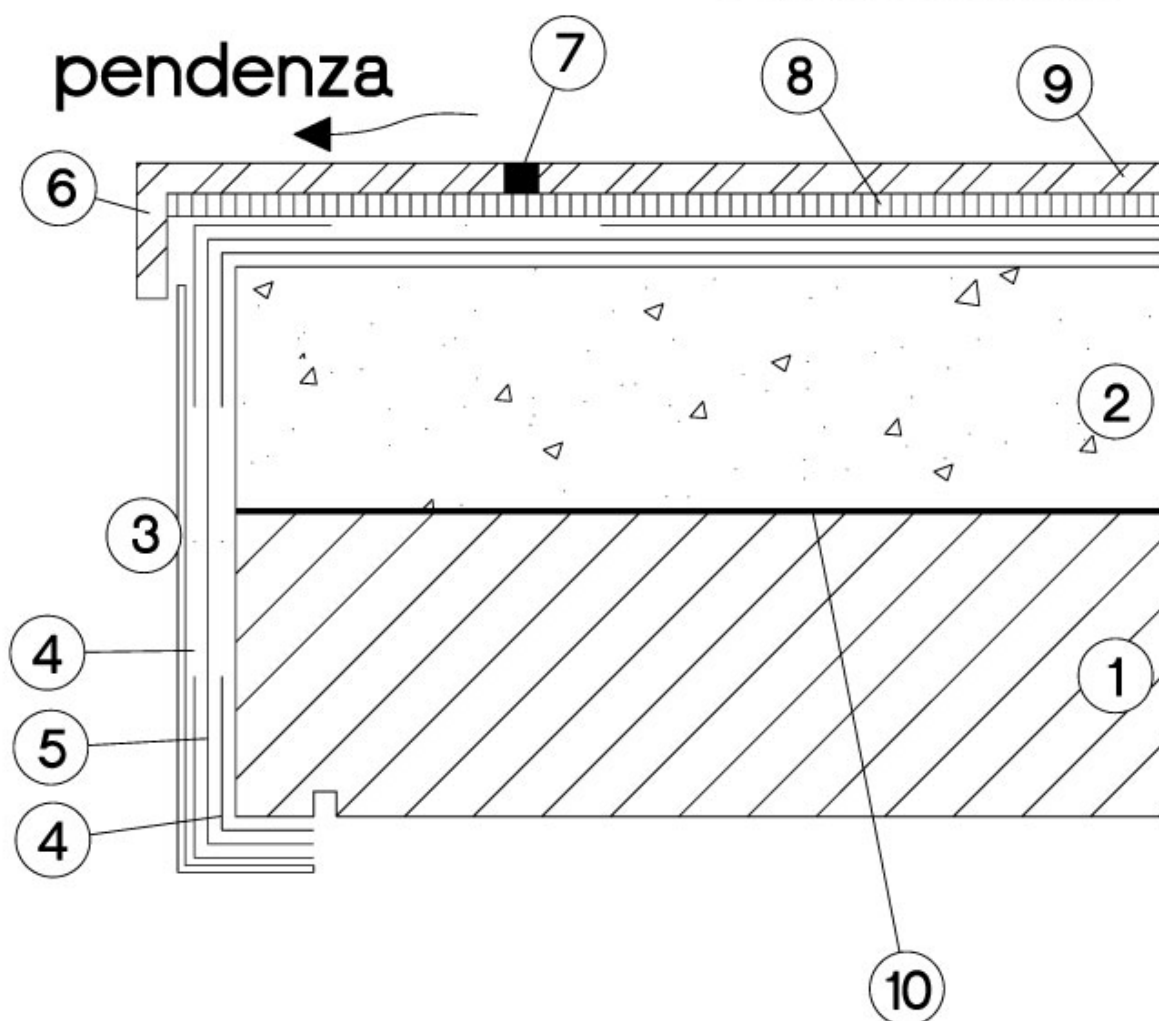
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Front edge of a balcony - Ceramic sill

Code:
ATE N FQ 002

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ Pre-formed ceramic sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |

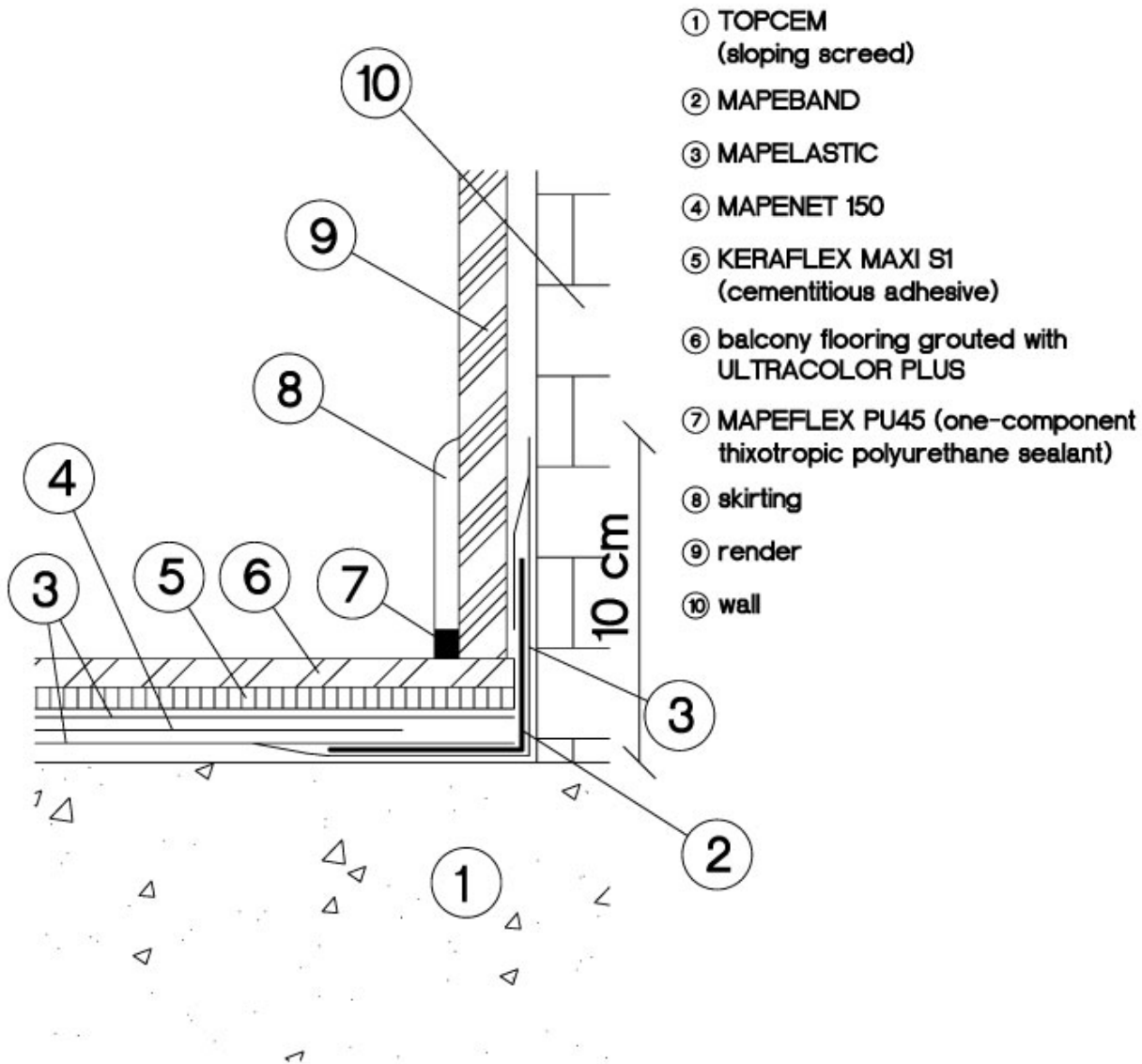


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Floor-wall fillet

Code:
ATE N FQ 003



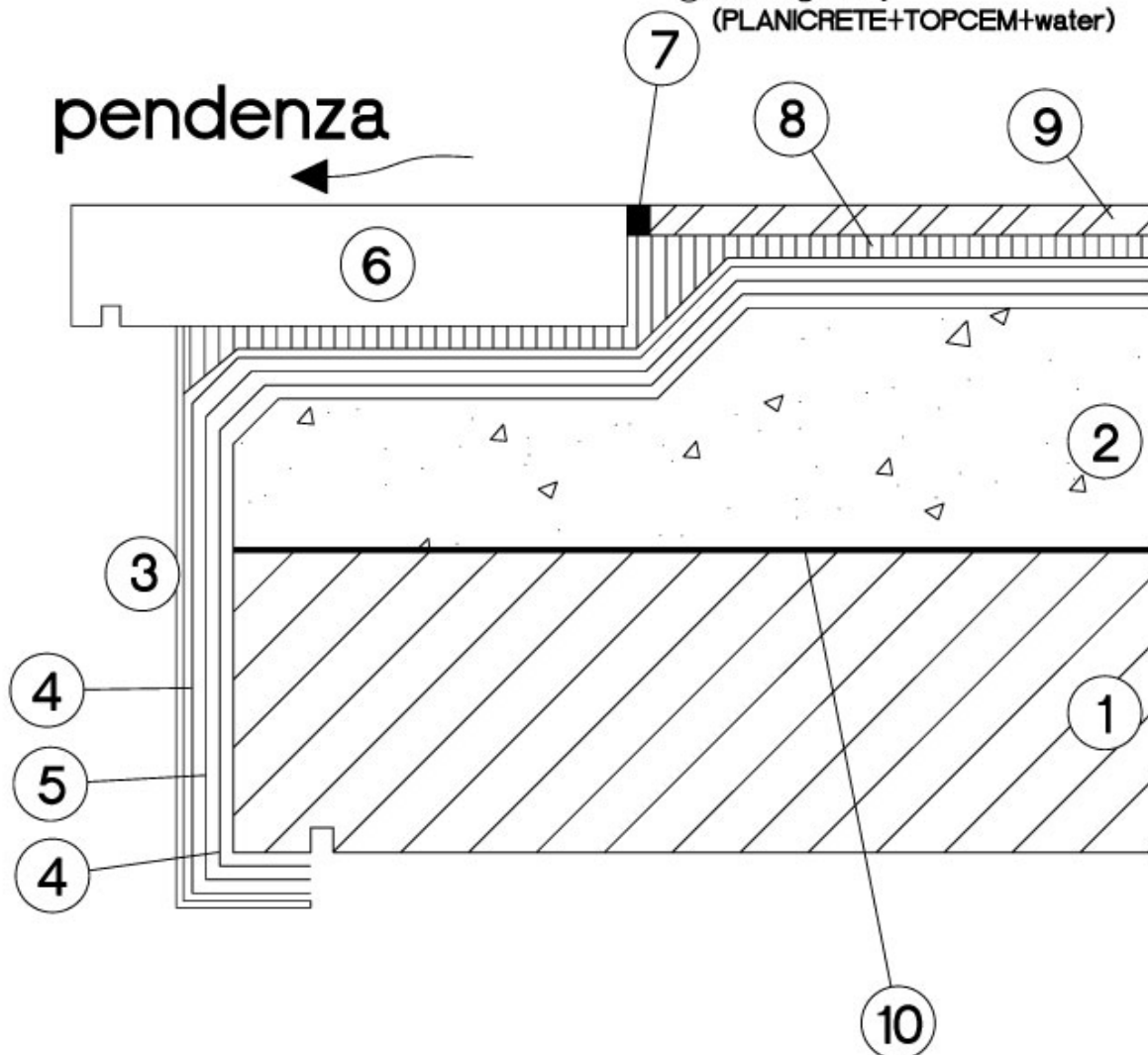
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Front edge of a balcony - marble sill

Code:
ATE N FQ 001

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ marble sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |



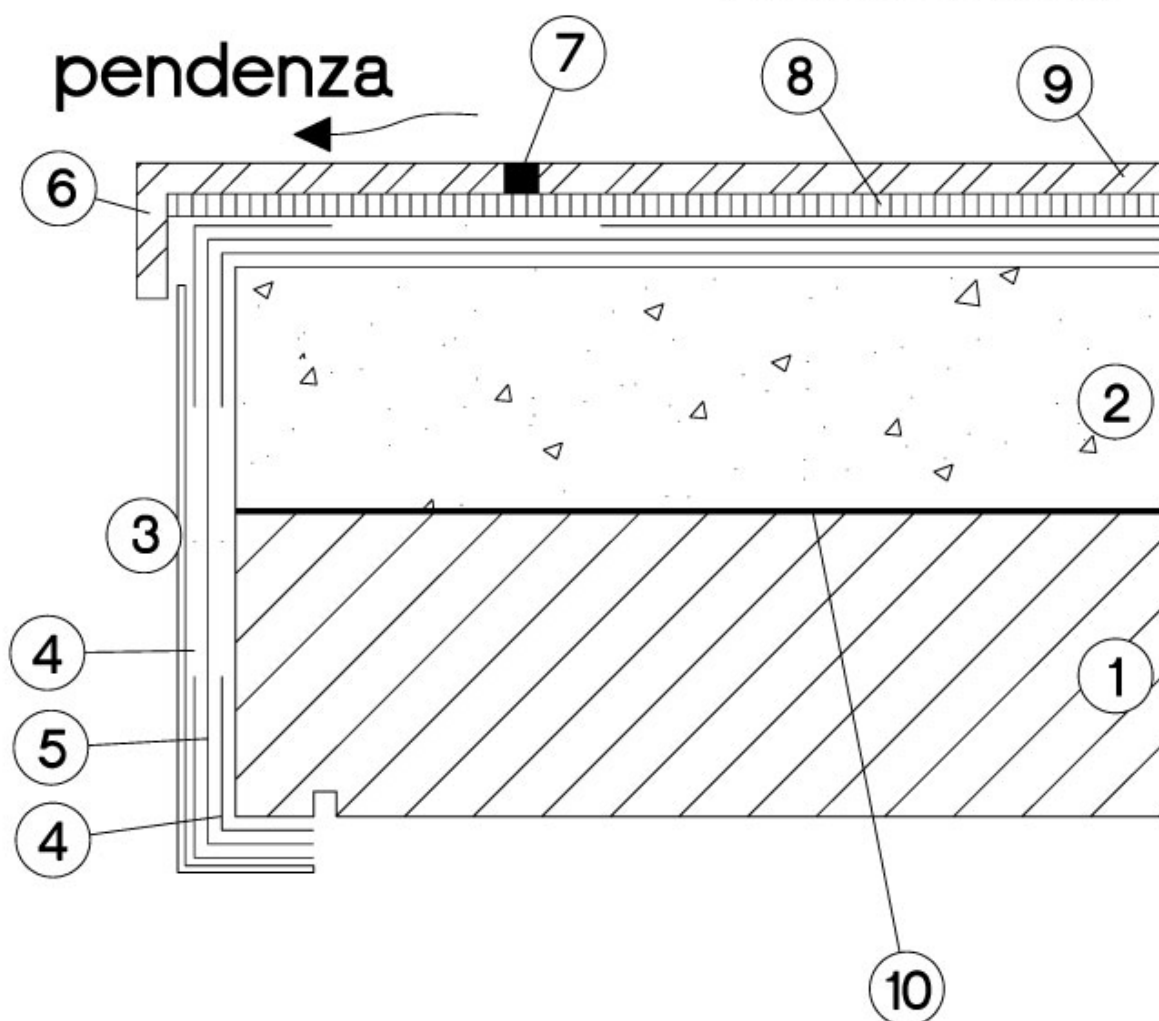
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Front edge of a balcony - Ceramic sill

Code:
ATE N FQ 002

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ Pre-formed ceramic sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |

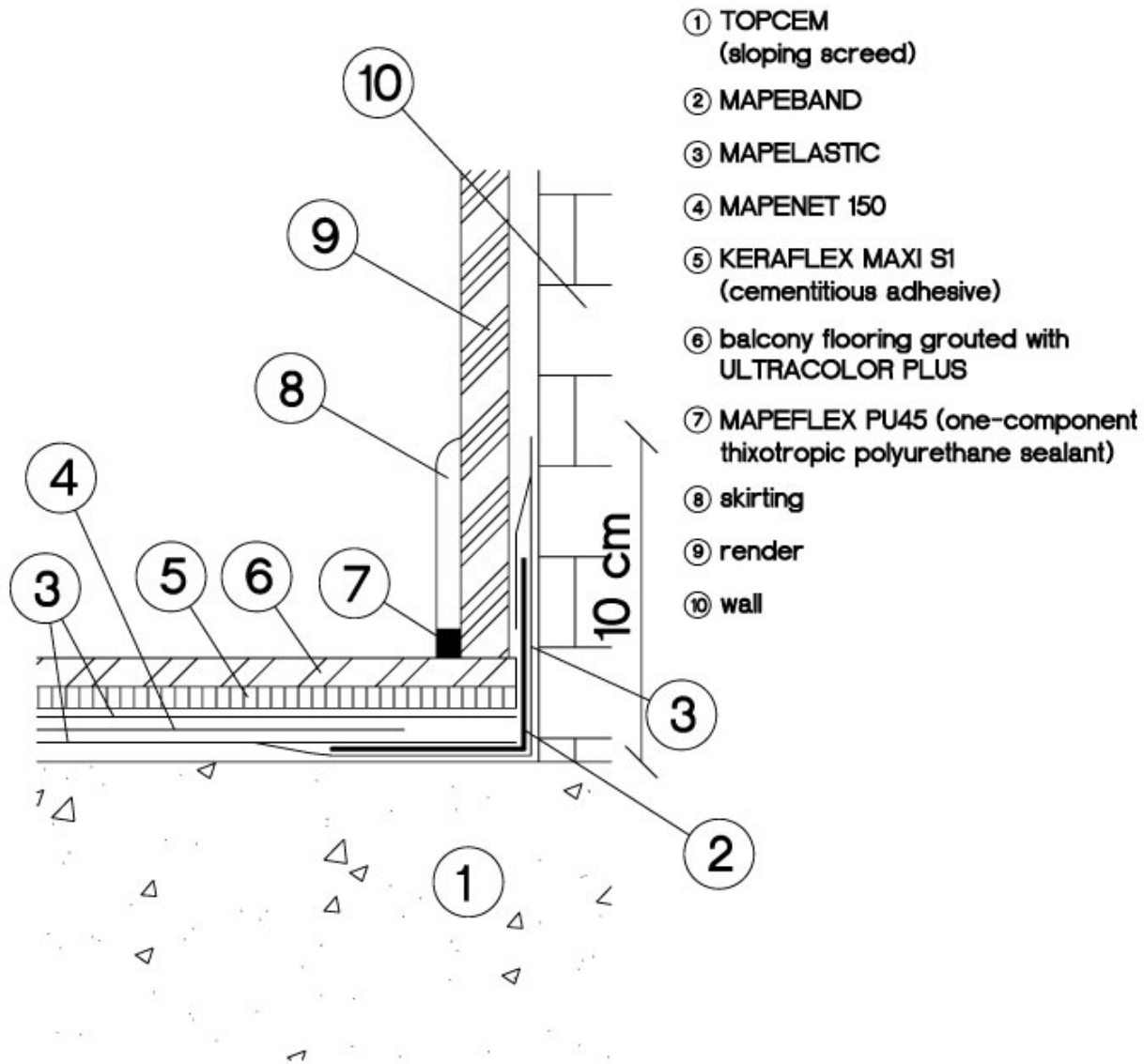


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Floor-wall fillet

Code:
ATE N FQ 003



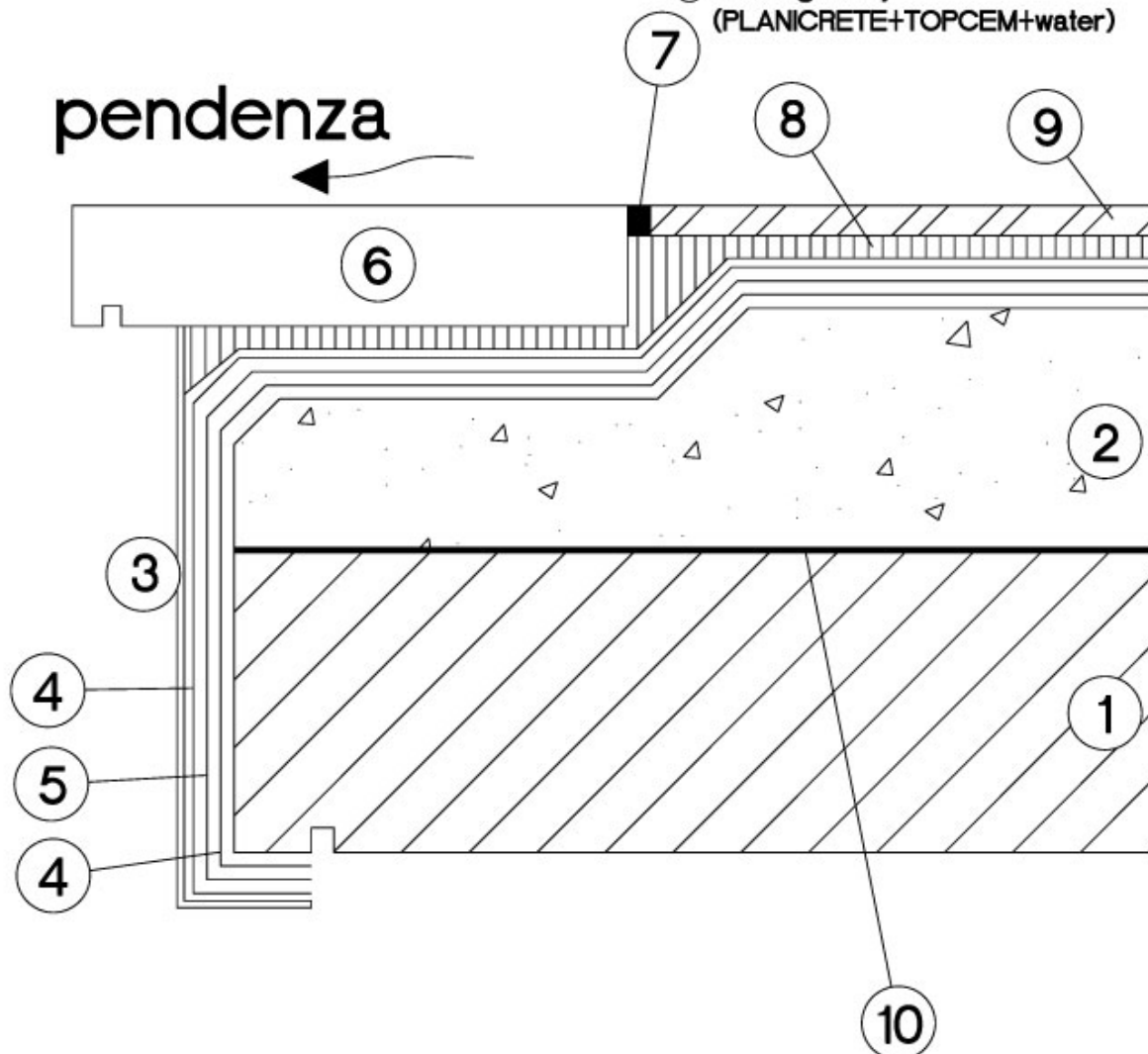
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Front edge of a balcony - marble sill

Code:
ATE N FQ 001

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ marble sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |



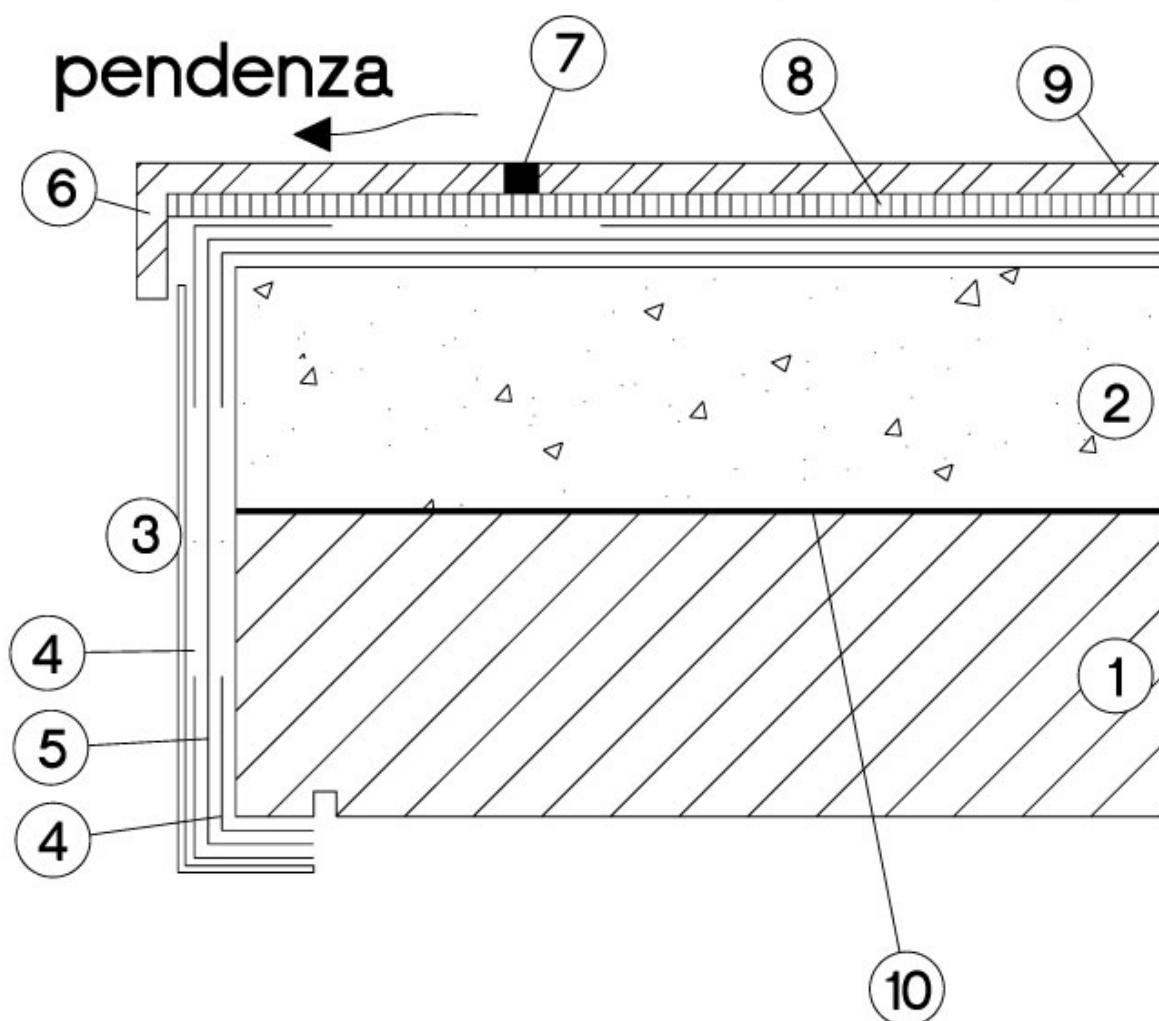
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Front edge of a balcony - Ceramic sill

Code:
ATE N FQ 002

- | | |
|------------------------------|---|
| ① Overhanging floor slab | ⑥ Pre-formed ceramic sill |
| ② TOPCEM
(sloping screed) | ⑦ MAPEFLEX PU45 (one-component
thixotropic polyurethane sealant) |
| ③ ELASTOCOLOR PAINT | ⑧ KERAFLEX MAXI S1 (cementitious adhesive) |
| ④ MAPELASTIC | ⑨ balcony flooring grouted with
ULTRACOLOR PLUS |
| ⑤ GLASS FIBRE MESH | ⑩ bonding slurry
(PLANICRETE+TOPCEM+water) |

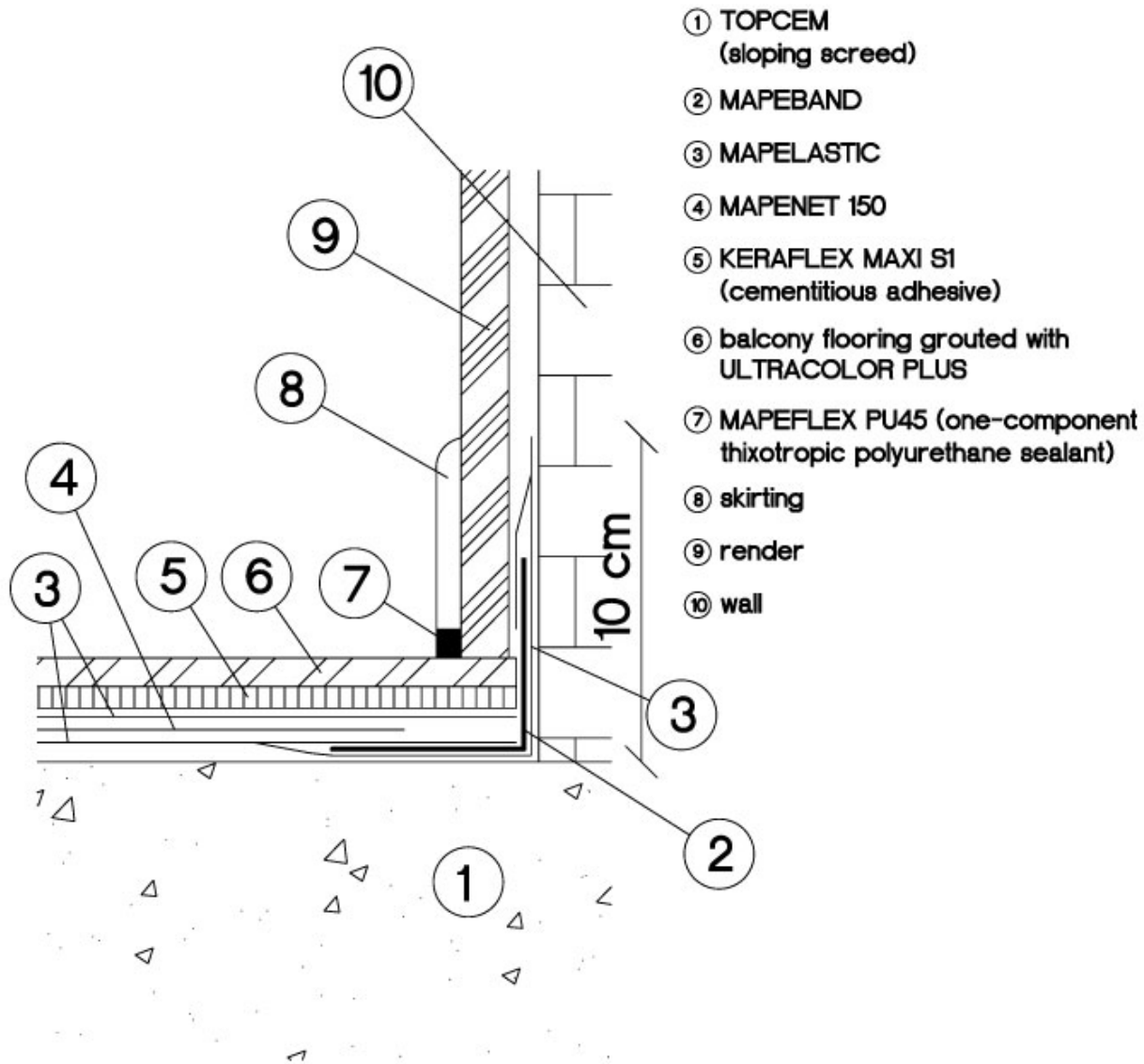


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Floor-wall fillet

Code:
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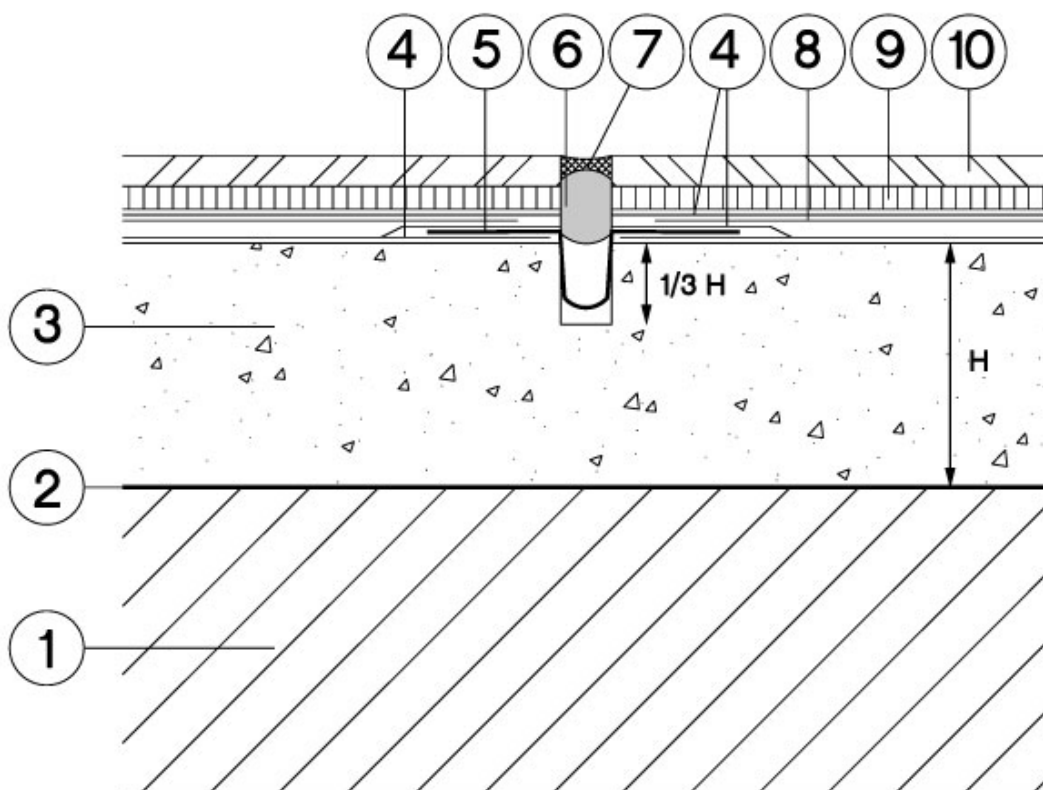
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Sealing a check joint

MAPEBAND

Code:
ATE N FQ 005

- | | |
|---------------------------------|--|
| ① Reinforced concrete substrate | ⑥ MAPEFOAM |
| ② PE sheet (thickness 0.8 mm) | ⑦ MAPESIL AC |
| ③ TOPCEM PRONTO | ⑧ MAPENET 150 |
| ④ MAPELASTIC | ⑨ KERAFLEX MAXI SI/ELASTORAPID |
| ⑤ MAPEBAND | ⑩ Balcony flooring grouted with
ULTRACOLOR PLUS |



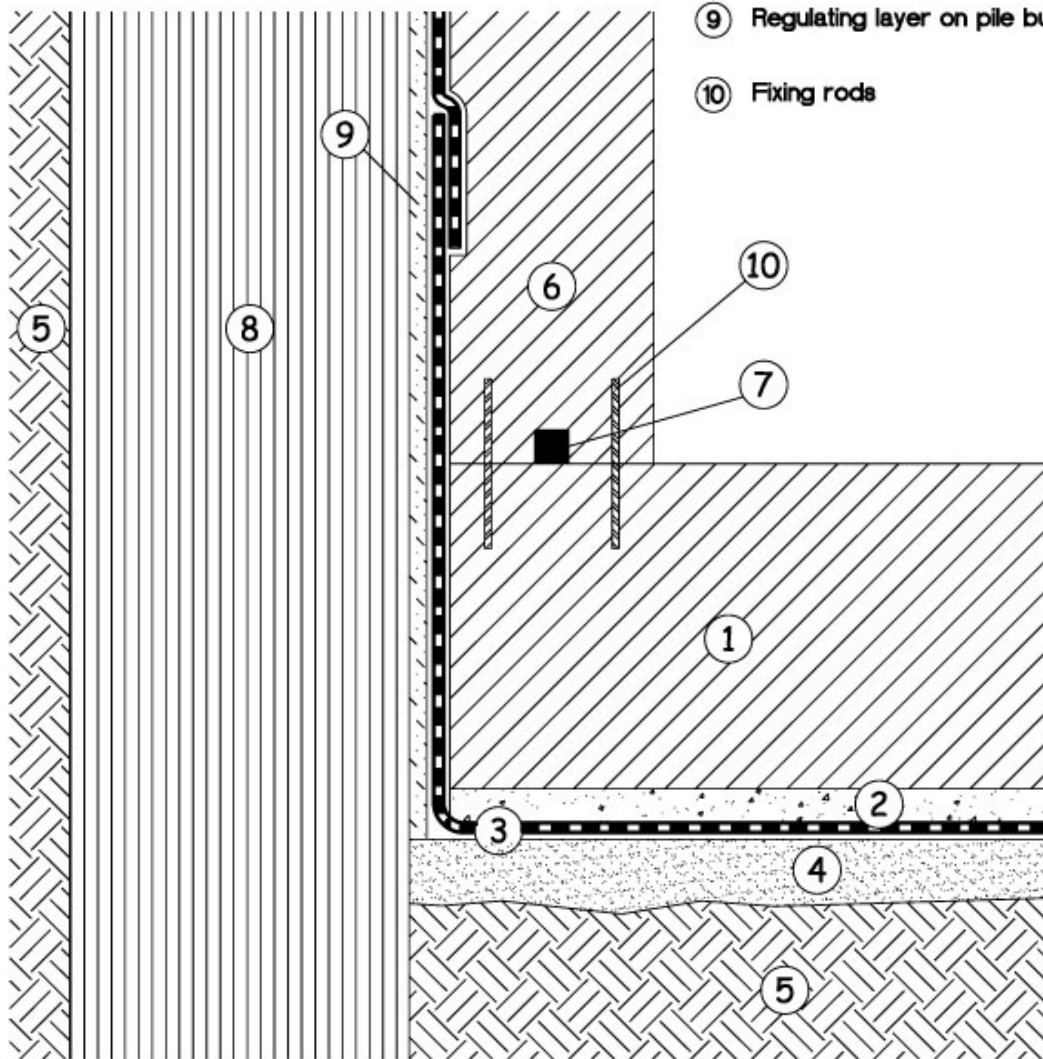
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Waterproofing applied against a pile bulkhead

Code:
ATE N SQ 002

- | | |
|--|-------------------------------------|
| ① Reinforced concrete foundation slab | ⑤ Ground |
| ② protective concrete layer with the same Rck as the foundation pad concrete | ⑥ Reinforced concrete wall |
| ③ MAPEPROOF | ⑦ IDROSTOP B25 |
| ④ Regulating layer of lean concrete | ⑧ Pile bulkhead |
| | ⑨ Regulating layer on pile bulkhead |
| | ⑩ Fixing rods |



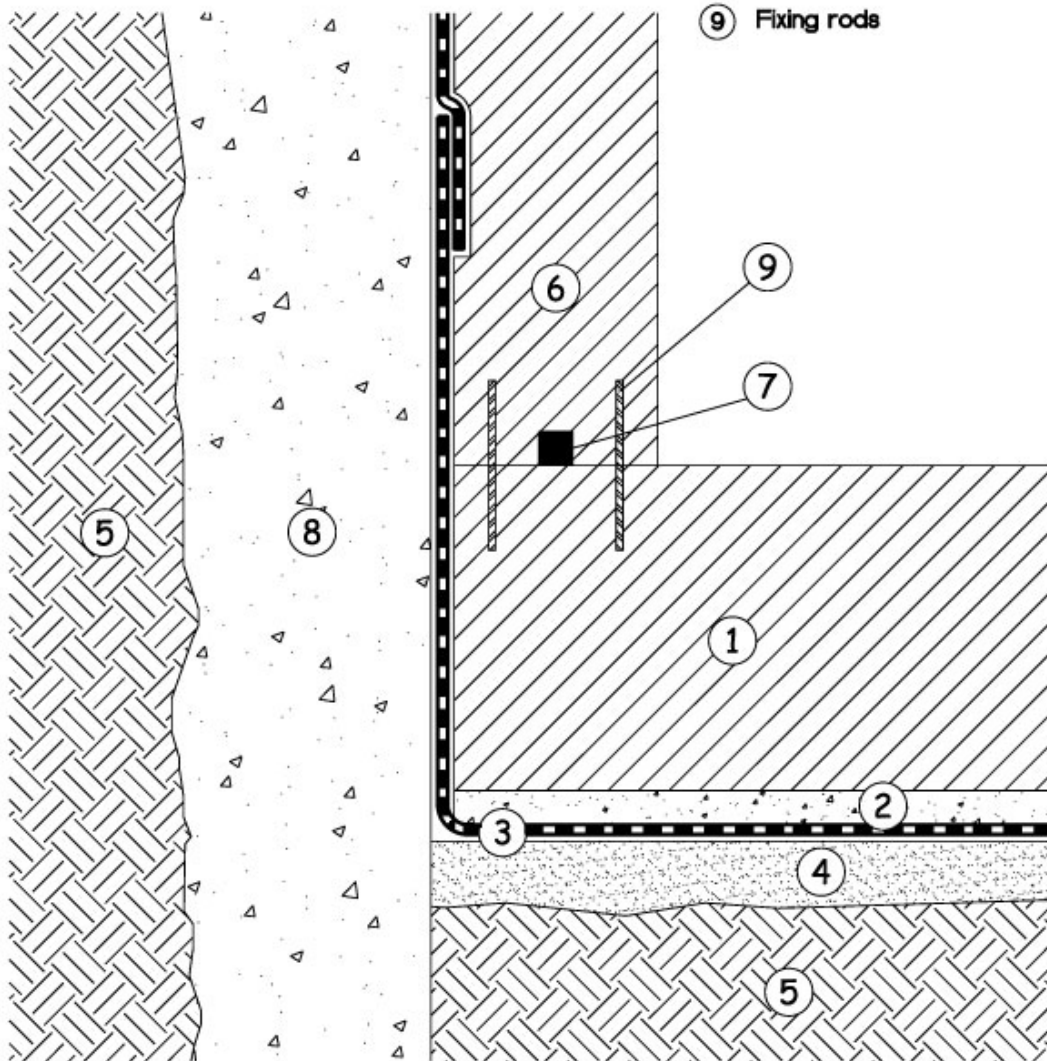
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Waterproofing applied against a diaphragm

Code:
ATE N SQ 005

- | | |
|--|----------------------------|
| ① Reinforced concrete foundation slab | ⑤ Ground |
| ② Protective concrete layer with the same Rck as the foundation pad concrete | ⑥ Reinforced concrete wall |
| ③ MAPEPROOF | ⑦ IDROSTOP B25 |
| ④ Regulating layer of lean concrete | ⑧ Diaphragm |
| | ⑨ Fixing rods |



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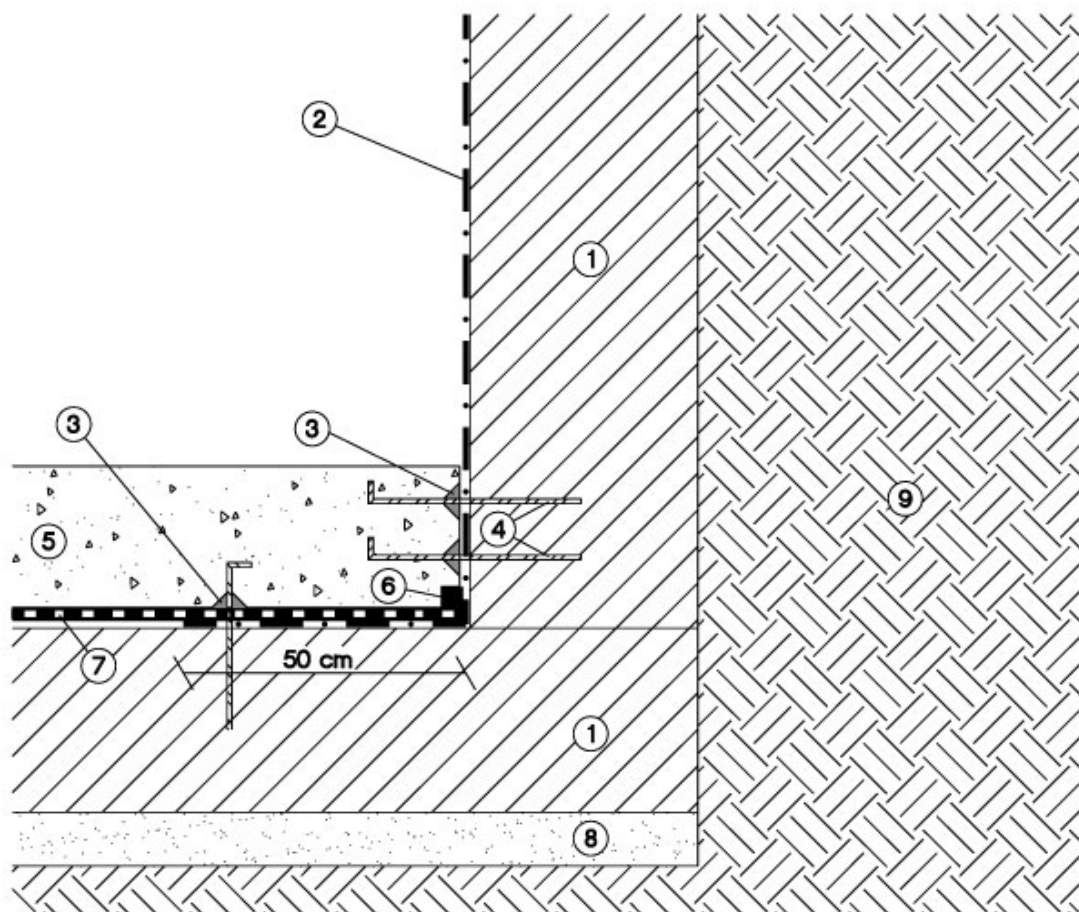
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Internal lining

MAPEPROOF and MAP. FOUNDATION

Code:
ATE R SQ 001

- | | |
|--|-------------------------------------|
| ① Existing reinforced concrete structure | ⑥ IDROSTOP B25 |
| ② MAPELASTIC FOUNDATION | ⑦ MAPEPROOF |
| ③ MAPEPROOF MASTIC | ⑧ Regulating layer of lean concrete |
| ④ Connectors | ⑨ Ground |
| ⑤ New reinforced concrete structure designed to withstand hydraulic pressure | |



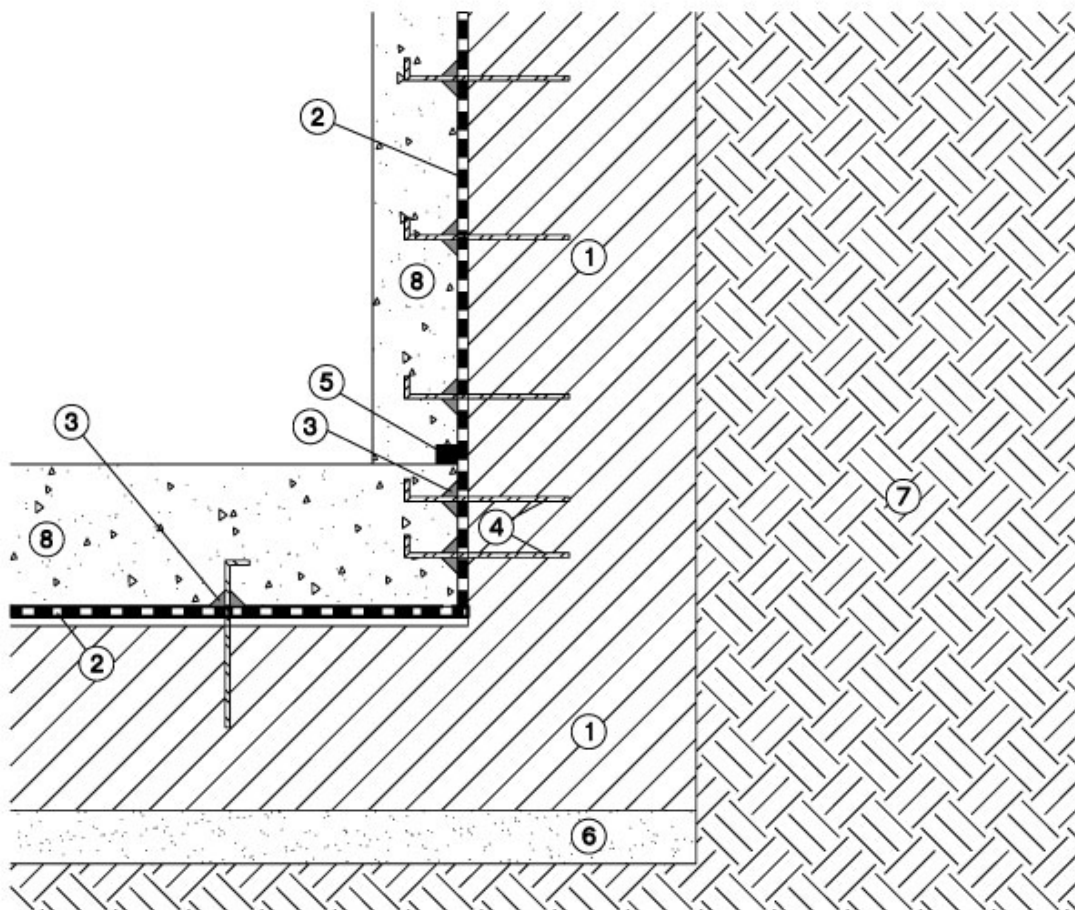
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Internal lining on a foundation slab and wall - MAPEPROOF

Code:
ATE R SQ 004

- | | |
|--|--|
| ① Existing reinforced concrete structure | ⑤ IDROSTOP B25 |
| ② MAPEPROOF | ⑥ Regulating layer of lean concrete |
| ③ MAPEPROOF MASTIC | ⑦ Ground |
| ④ Connectors | ⑧ New reinforced concrete structure designed to withstand hydraulic pressure |



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