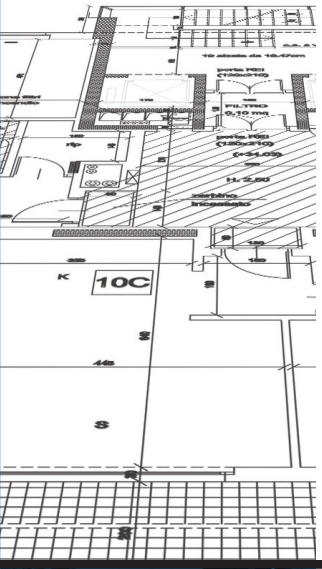
ARCHITECTURAL SOLUTIONS

H

DESIGN GUIDE



RESTORATION AND RENOVATION WORK ON MASONRY

www.mapei.com

MAPEI®

ADHESIVES • SEALANTS • CHEMICAL PRODUCTS FOR BUILDING

H specifications of RESTORATION AND RENOVATION WORK ON MASONRY

H.1 PREPARATION OF SUBSTRATES

H.1.1 ELIMINATION OF BIODETERIORATING ORGANISMS

H.1.2 REMOVAL OF PLASTER AND PATCHED AREAS

H.1.3 CUTTING OUT MORTAR JOINTS

H.1.4 DEMOLITION OF PORTIONS OF RENDER

H.1.5 HYDRO-CLEANING SURFACES

H.2 APPLICATION OF ZINC-PLATED METALLIC REINFORCEMENT MESH

H.2.1 APPLICATION OF ZINC-PLATED METALLIC REINFORCEMENT MESH

H.3 CORTICAL CONSOLIDATION OF VARIOUS TYPES OF "WEAK" OR "CRUMBLING" SUBSTRATE BY IMPREGNATION

H.3.1 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, MICRO-EMULSION POLYMER PRIMER IN WATER DISPERSION

H.3.2 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, HIGH ALKALI-RESISTANT, NANO-SOLUTION POLYMER CONSOLIDATOR IN SOLVENT

H.3.3 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, MICRO-EMULSION, MICRONIZED ACRYLIC RESIN PRIMER IN WATER DISPERSION

H.3.4 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, SILICATE-MIX CONSOLIDATOR IN WATER SOLUTION

H.4 CONSOLIDATION OF MASONRY STRUCTURES AND RENDER BY INJECTING SLURRY

H.4.1 COCONSOLIDATION OF UNEVEN AND/OR IRREGULAR CORE WALLS
Procedure

H.4.2 RESTORING THE ADHESION BETWEEN MASONRY SUBSTRATES AND RENDER, INCLUDING FRESCOED WALLS

H.5 RESTORATION OF MASONRY BY PATCHING AND CLADDING

H.5.1 APPLICATION OF MASONRY MORTAR PREPARED ON SITE WITH SALT-RESISTANT LIME AND ECO-POZZOLAN HYDRAULIC BINDER MIXED WITH AGGREGATES IN VARIOUS GRAIN SIZES

H.5.2 APPLICATION OF SALT-RESISTANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

H.5.3 APPLICATION OF HIGH-STRENGTH, FIBRE-REINFORCED, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

H.6 APPLICATION OF THE FIRST SCRATCH-COAT LAYER

H.6.1 MANUAL AND/OR MACHINE APPLICATION OF LIME AND ECO-POZZOLAN SCRATCH-COAT MORTAR

H.6.2 MANUAL APPLICATION OF POZZOLANIC-ACTION, SCRATCH-COAT MORTAR MADE

FROM SPECIAL, HIGHLY SALT-RESISTANT HYDRAULIC BINDERS

H.6.3 MACHINE APPLICATION OF POZZOLANIC-ACTION, SCRATCH-COAT MORTAR MADE FROM SPECIAL, HIGHLY SALT-RESISTANT HYDRAULIC BINDERS

H.7 RENOVATION OF MASONRY SUBJECT TO CAPILLARY RISING DAMP

H.7.1 HORIZONTAL CHEMICAL BARRIERS

H.7.2 RENOVATION OF MASONRY SUBJECT TO CAPILLARY RISING DAMP
Procedure

H.8 TRANSPIRANT RENDER

H.8.1 APPLICATION OF TRANSPIRANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN RENDER ON NEW AND EXISTING MASONRY, INCLUDING ON BUILDINGS OF HISTORICAL INTEREST

H.8.2 APPLICATION OF TRANSPIRANT, HIGH-PERFORMANCE, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN RENDERING MORTAR

H.9 REINFORCED "STRUCTURAL" RENDER

H.9.1 APPLICATION OF HIGH-PERFORMANCE, FIBRE-REINFORCED, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN RENDERING MORTAR

H.10 SKIMMING COATS ON DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.10.1 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, ULTRA FINE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

H.10.2 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, FINE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

H.10.3 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, COARSE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

H.10.4 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, FINE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

H.11 BRICK, STONE, TUFF AND MIXED MASONRY

H.11.1 APPLICATION OF SALT-RESISTANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

H.11.2 APPLICATION OF HIGH-STRENGTH, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MORTAR FOR INSTALLING MASONRY

H.12 POINTING MASONRY JOINTS ON "EXPOSED" MASONRY

H.12.1 POINTING MASONRY JOINTS USING SALT-RESISTANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

H.13 PROTECTIVE WATER-REPELLENT TREATMENTS FOR "EXPOSED" MASONRY AND RENDER

H.13.1 PAINTING AND COATING RENDER WITH A PAINTED SURFACE

H.13.2 APPLICATION OF TRANSPARENT, WATER-REPELLENT, SILANE AND SILOXANE BASED IMPREGATOR IN WATER EMULSION

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.1 PAINTING AND COATING EXTERNAL SURFACES AND DEHUMIDIFYING RENDER

H.14.2 PROTECTING AND DECORATING USING SILOXANE-BASED PRODUCTS

H.14.3 PROTECTING AND DECORATING USING ACRYLIC PRODUCTS WITH QUARTZ

H.14.4 PROTECTING AND DECORATING USING PURE ACRYLIC, MODIFIED ACRYLIC RESIN AND SYNTHETIC RESIN PRODUCTS

H.15 RENOVATION AND CONSOLIDATION OF WOODEN STRUCTURES

H.15.1 RECONSTRUCTING DAMAGED WOODEN HEADS AND STRUCTURAL ELEMENTS BY SPLICING IN AND BONDING INSERTS

H.15.2 CONSOLIDATION AND STRENGTHENING OF WOODEN TRUSSES AND MAIN SUPPORT ELEMENTS

H.1 PREPARATION OF SUBSTRATES

H.1.1 ELIMINATION OF BIODETERIORATING ORGANISMS

Disinfestation and cleaning of render and brick, stone or tuff masonry infested with biodeteriorating organisms, by applying a wide-spectrum, water-based, anti-mould and anti-mildew biocide solution with a brush, roller or spray (such as **Silancolor Cleaner Plus** produced by MAPEI S.p.A.) before painting render or applying water-repellent treatments on "exposed" masonry.
The product must have the following performance characteristics:

Consistency:	fluid liquid
Colour:	transparent
Density (g/cm³):	approx. 1.01
Dilution ratio:	1:3 with water
Drying:	in the open air
Ready for painting over:	8-12 h
Consumption (kg/m²):	0.2-1

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– all costs for protecting surrounding surfaces;
– per m² *.....(€/m²)*

H.1.2 REMOVAL OF PLASTER AND PATCHED AREAS

Manual removal (using a hammer and chisel or a facing hammer) or mechanical removal (using a vibro-pick, vibro-chisel or a small pneumatic hammer) of plaster and areas patched-up during repair work with an unsuitable composition, to obtain a sound, compact substrate with no crumbling or unstable areas and no saline efflorescence, dust or mildew without compromising the integrity of the face of the wall.
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- costs for taking precautions to prevent damage to structures and to protect service lines and units during execution of the work;
- suitable demolition tools and equipment;
- low-pressure hydro-cleaning of treated surfaces;
- cleaning of walkways and removal and transport of all debris and waste material to an authorised waste disposal site.
- for layers up to 2 cm thick

– per m² *.....(€/m²)*

H.1.3 CUTTING OUT MORTAR JOINTS

Manual removal (using a hammer and chisel or a facing hammer) or mechanical removal (using a vibro-pick, vibro-chisel or a small pneumatic hammer) of deteriorated mortar joints in “exposed” or similar brick, stone, tuff or mixed masonry, to obtain a sound, compact substrate with no crumbling or unstable areas and no saline efflorescence, dust or mildew without compromising the integrity of the face of the wall.
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- costs for taking precautions to prevent damage to structures and to protect service lines and units during execution of the work;
- suitable demolition tools and equipment;
- low-pressure hydro-cleaning of treated surfaces;
- cleaning of walkways and removal and transport of all debris and waste material to an authorised waste disposal site.
- for layers up to 2 cm thick and to a depth of up to 3 cm

– per m² *.....(€/m²)*

H.1.4 DEMOLITION OF PORTIONS OF RENDER

Partial or total demolition of render using hand tools (hammer and chisel or a facing hammer) or mechanical tools (vibro-pick, vibro-chisel or a small pneumatic hammer), removed layer by layer until the entire thickness of the deteriorated render is eliminated and the masonry is "exposed" without compromising the integrity of the remaining areas of render, to prepare the area of adhesion between the substrate and the new render.
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- costs for taking precautions to prevent damage to structures and to protect service lines and units during execution of the work;
- suitable demolition tools and equipment;
- all costs for mobile swing platforms;
- low-pressure hydro-cleaning of treated surfaces;
- cleaning of walkways and removal and transport of all debris and waste material to an authorised waste disposal site.
- for layers up to 2 cm thick

– per m² *.....(€/m²)*

H.1.5 HYDRO-CLEANING SURFACES

Pressurised hydro-cleaning of brick, stone, tuff or mixed masonry using a 4-6 bar hydro-cleaner, to completely remove layers of micro-organisms, saline efflorescence, loose and crumbling portions, dust, mildew, rain deposits previous painting treatments. This operation is also necessary to saturate the substrate before applying rendering or masonry mortar, to improve its grip and prevent the substrate drawing water from the mortar and compromising the final performance characteristics of the mortar. Excess water must be left to evaporate, so that the masonry is saturated and the surface is dry (s.s.d. condition). Compressed air may be used to speed up this process.
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– supply and disposal of all water;
– use of compressed air.
– all costs
– per m² *.....(€/m²)*

H.2.1 APPLICATION OF ZINC-PLATED METALLIC REINFORCEMENT MESH

Supply and application of zinc-plated steel mesh dimensioned according to design specifications (for any diameter of steel wire and any size of mesh) with relative certificate of origin and quality, to reinforce thixotropic, natural hydraulic lime structural mortar in renovation and cladding work.
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– trimming;
– all costs for cutting to shape;
– wire to bind the mesh;
– spacers;
– waste material.
a) Mesh anchored to the structure with fixing plugs
– per kg *.....(€/kg)*
b) Mesh anchored to the structure with steel nails and binding
– per kg *.....(€/kg)*

H.3 CORTICAL CONSOLIDATION OF VARIOUS TYPES OF "WEAK" OR "CRUMBLING" SUBSTRATE BY IMPREGNATION

H.3.1 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, MICRO-EMULSION POLYMER PRIMER IN WATER DISPERSION

Supply and application of high-penetration, microemulsion polymer primer in water dispersion containing very fine particles, including on surfaces with low porosity (such as **Primer 3296** produced by MAPEI S.p.A.), for cortical consolidation of various types of "weak" or "crumbling" substrate, including those of historical or artistic interest (porous stone, bricks, tuff, installation mortar, render, etc.), by impregnation.

The consolidating product must be odourless and non-irritant so it may be applied in internal environments where people are present or which are soon to be inhabited and, if applied externally, must protect substrates against aggression from atmospheric agents (rain, moisture, sunlight, etc.), to form a strong, durable surface.

Apply the product after adequate preparation of the substrate (not included) by low-pressure hydro-cleaning the surface, where possible, to remove all traces of grease, oil, paint and any other substance which could prevent the product penetrating into the substrate, to obtain a clean, sound, compact substrate with no loose portions and no traces of dust, dirt, mildew or soluble salts.

Apply several coats of the product on the dry substrate by spray with low-pressure, manual spray equipment, with a brush or by roller, according to the absorption and porosity of the substrate.

The product must have the following performance characteristics:

Consistency:	fluid
Colour:	opalescent
Density (g/cm³):	1.01
Dry solids content (%):	15
Brookfield Viscosity (mPa·s):	20 (# 1-10 rpm)
Dilution ratio:	neat, or 1:1 or 1:2 with water (according to the absorption of the substrate)
Drying time:	24 h
Consumption (kg/m²):	0.1-0.5 (according to the absorption of the substrate)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

– low-pressure hydro-cleaning of surfaces with water;

– application of the product.

– per m² *.....(€/m²)*

H.3 CORTICAL CONSOLIDATION OF VARIOUS TYPES OF "WEAK" OR "CRUMBLING" SUBSTRATE BY IMPREGNATION

H.3.2 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, HIGH ALKALI-RESISTANT, NANO-SOLUTION POLYMER CONSOLIDATOR IN SOLVENT

Supply and application of high-penetration, nano-solution polymer consolidator dissolved in solvent solution, with a very small size of molecule and excellent resistance to alkalis, including on surfaces with particularly small pores (such as **Consolidante 8020** produced by MAPEI S.p.A.), for cortical consolidation of various types of "weak" or "crumbly" substrate, including those of historical or artistic interest (porous stone, bricks, tuff, installation mortar and lime-based paint), by impregnation.
The consolidating product must leave the pores open and not significantly alter the vapour permeability of the substrate, and must protect the substrate against aggression from atmospheric agents (rain, moisture, sunlight, etc.) to form a strong, durable surface. The product must also be reversible a number of years after application, with the active substance solubilising after applying one or two coats of organic solvent with swabs.
Apply the product after adequate preparation of the substrate (not included) by low-pressure hydro-cleaning the surface, where possible, to remove all traces of grease, oil, paint and any other substance which could prevent the product penetrating into the substrate, to obtain a clean, sound, compact substrate with no loose portions and no traces of dust, dirt, mildew or soluble salts. On particularly high quality substrates, remove traces of atmospheric pollution and oily substances using swabs, laser treatment or other non-destructive systems (not included).
Apply several coats of the product on the dry substrate, or with very low moisture content, by spray with low-pressure, manual spray equipment held at least 10 cm from the surface, with a brush or by roller, according to the absorption and porosity of the substrate.
The product must have the following performance characteristics:

Consistency:	super-fluid
Colour:	colourless
Density (g/cm³):	0.81
Dry solids content (%):	3
Viscosity (s):	10 (Ø 4 Ford cup)
Consumption (kg/m²):	0.1-1.0 (according to the type of substrate and depth to be consolidated)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– low-pressure hydro-cleaning of surfaces with water;
– application of the product.
– per m² *.....(€/m²)*

H.3 CORTICAL CONSOLIDATION OF VARIOUS TYPES OF "WEAK" OR "CRUMBLING" SUBSTRATE BY IMPREGNATION

H.3.3 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, MICRO-EMULSION, MICRONIZED ACRYLIC RESIN PRIMER IN WATER DISPERSION

Supply and application of high-penetration, microemulsion, micronized acrylic resin primer in water dispersion, including on surfaces with particularly small pores, (such as **Malech** produced by MAPEI S.p.A.), for cortical consolidation of various types of "weak" or "crumbling" substrate, including those of historical or artistic interest (porous stone, bricks, tuff, installation mortar, render, etc.), by impregnation.

The consolidating product must be odourless and non-irritant so it may be applied in internal environments where people are present or which are soon to be inhabited and, if applied externally, must protect substrates against aggression from atmospheric agents (rain, moisture, sunlight, etc.), to form a strong, durable surface and slow down the formation of efflorescence.

Apply the product after adequate preparation of the substrate (not included) by low-pressure hydro-cleaning the surface, where possible, to remove all traces of grease, oil, paint and any other substance which could prevent the product penetrating into the substrate, to obtain a clean, sound, compact substrate with no loose portions and no traces of dust, dirt, mildew or soluble salts.

Apply the product on a dry substrate by airless spray, roller or brush.

The product must have the following performance characteristics:

Consistency:	fluid
Colour:	transparent
Density (g/cm³):	1.01
Dry solids content (%):	15
Viscosity (mPa·s):	20 (# 1-100 rpm)
Drying time:	24 h
Consumption (kg/m²):	0.1-0.15 (according to the absorption of the substrate)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

– low-pressure hydro-cleaning of surfaces with water;

– application of the product.

– per m² *.....(€/m²)*

H.3 CORTICAL CONSOLIDATION OF VARIOUS TYPES OF "WEAK" OR "CRUMBLING" SUBSTRATE BY IMPREGNATION

H.3.4 CORTICAL CONSOLIDATION USING HIGH-PENETRATION, SILICATE-MIX CONSOLIDATOR IN WATER SOLUTION

Supply and application of high-penetration, low viscosity, silicate-mix consolidator in water dispersion, including on surfaces with particularly small pores, (such as **Prosfas** produced by MAPEI S.p.A.), for cortical consolidation of various types of "weak" or "crumbling" substrate, including those of historical or artistic interest (porous stone, bricks, tuff, installation mortar, render, etc.), by impregnation.

The consolidating product must protect substrates against aggression from atmospheric agents (rain, moisture, sunlight, etc.), to form a strong, durable surface.

Apply the product after adequate preparation of the substrate (not included) by low-pressure hydro-cleaning the surface, where possible, to remove all traces of grease, oil, paint and any other substance which could prevent the product penetrating into the substrate, to obtain a clean, sound, compact substrate with no loose portions and no traces of dust, dirt, mildew or soluble salts.

Apply several coats of the product on the dry substrate by spray, roller or brush, according to the absorption and porosity of the substrate.

The product must have the following performance characteristics:

Consistency:	super-fluid
Colour:	transparent
Density (g/cm³):	1.19
Dry solids content (%):	24
Brookfield Viscosity (mPa·s):	10
pH:	12
Drying time:	24 h
Consumption (kg/m²):	0.5-0.7 (according to the type of substrate and depth to be consolidated)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

– low-pressure hydro-cleaning of surfaces with water;

– application of the product.

– per m² ……*(€/m²)*

H.4 CONSOLIDATION OF MASONRY STRUCTURES AND RENDER BY INJECTING SLURRY

H.4.1 COCONSOLIDATION OF UNEVEN AND/OR IRREGULAR CORE WALLS

Procedure

Preparation of substrates

Cutting out deteriorated mortar from joints, where required, in brick, stone, tuff or mixed masonry, to obtain a sound, compact substrate with no crumbly or unstable areas and no saline efflorescence, dust or mildew, without compromising the integrity of the face of the wall.

Hydro-clean the surface to remove all traces of material and substances which could compromise the adhesion of any products or systems applied later.

Drilling the injection holes

Drilling of 20-40 mm diameter holes to a depth of 2/3 of the thickness of the wall, preferably at a square pitch of 50x50 cm. If the wall is thicker than 60 cm, it is better to drill holes from both sides of the wall.

Fastening the tubes or injectors in place

Fastening tubes or injectors in place to inject slurry made from masonry mortar (**Mape-Antique Rinzaffo**, **Mape-Antique Allettamento** or **Mape-Antique Strutturale NHL**), cement-free, lime and Eco-Pozzolan slurry (**Mape-Antique I** or **Mape-Antique F21**), **Mapegrout BM** or **Mapegrout T60**, or cementitious slurry (**Stabilcem** or **Stabilcem ARS**).

On “exposed-finish” masonry, point the mortared joints with salt-resistant, natural hydraulic lime and Eco-Pozzolan masonry mortar (such as **Mape-Antique Allettamento** produced by MAPEI S.p.A.) (see section ***H.12***), to grout and seal any cracks and uneven areas on the face of the wall from which the slurry could seep through. If a new layer of dehumidifying, transpirant or structural render needs to be applied, first apply a 5 mm thick scratch-coat (see section ***H.6.1.1***) to prevent the injected slurry from seeping through the face of the wall.

“Cleaning” the inside of the masonry

The day before injecting the slurry, we recommend saturating all the inside of the structure with water through the tubes or injectors previously fastened in place. Saturate the wall starting with the holes in the highest position. Make sure the structure has absorbed all the injected water before injecting the slurry.

Injecting the slurry

Inject the selected slurry: **Mape-Antique I** (see section ***H.4.1.1***) or **Mape-Antique F21** (see section ***H.4.1.2***) or **Stabilcem** (see section ***H.4.1.3***) or **Stabilcem ARS** (see section ***H.4.1.4***) through the tubes or injectors previously fastened in place with a manual or electronic pump at a pressure of up to 1 bar at the nozzle. Inject the product starting from the bottom working upwards to help expel air in the structure and fill all the cavities. When the slurry seeps out of a tube or injector near the one being injected, stop injecting, close the injector used and continue the operation from the tube or injector from which the slurry seeped out. Follow this pattern until the slurry seeps out of the highest hole.

When the consolidation procedure has been completed, remove all tubes and injectors and grout the holes with a suitable mortar from the Mape-Antique range.

H.4 CONSOLIDATION OF MASONRY STRUCTURES AND RENDER BY INJECTING SLURRY

H.4.1.1 Injecting fluid, salt-resistant, lime and Eco-Pozzolan slurry

Supply and application of ultra fine-grained, salt-resistant, cement-free, lime and Eco-Pozzolan hydraulic binder with fillers to make a fluid injection slurry (such as **Mape-Antique I** produced by MAPEI S.p.A.) for consolidating brick, stone, tuff and mixed masonry.
The hydraulic binder with fillers must be suitable for use on site to make a salt-resistant, volumetrically-stable, fluid injection slurry which is easy to inject using a manual or electronic pump or by gravity casting into structures with cracks, voids and cavities, of all sizes.
Inject the slurry after adequate preparation of the substrate (not included) by grouting and "sealing" all cracks and gaps in the face of the wall through which the slurry could seep out. 20-40 mm diameter holes must also be drilled in the wall to a depth of 2/3 of the thickness of the wall, preferably at a square pitch of 50x50 cm. If the wall is thicker than 60 cm, it is better to drill holes from both sides of the wall for fastening the tubes or injectors in place to inject the slurry. The day before injecting the slurry, we recommend saturating all the inside of the structure with water through the tubes or injectors previously fastened in place. Saturate the wall starting with the holes in the highest position. Make sure the structure has absorbed all the injected water before injecting the slurry, which must be carried out starting at the bottom of the wall working upwards. Remove the tubes or injectors and grout the holes using a suitable mortar from the Mape-Antique range.
The product must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate: (EN 1015-1) (µm)	100
Bleeding (NorMaL M33-87):	absent
Fluidity of mix (EN 445) (s):	< 30 (initial) < 30 (after 60 min)
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,900
Compressive strength (after 28 days) (EN 196-1) (N/mm²):	18
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Reaction to fire (EN 13501-1):	Class A1
Consumption (kg/dm³):	approximately 1.40 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– hydro-cleaning the surfaces;
– drilling the injection holes;
– supply and fastening the tubes or injectors in place;
– "cleaning" the inside of the masonry;
– injecting the slurry;
– removing the tubes or injectors;
– grouting the holes.
– per 100 kg dry weight of injected slurry *.....(€/100 kg)*

The following are not included:

- cutting out deteriorated mortar from joints, where required;
- removal of deteriorated mortar from joints where required on “exposed-finish” masonry or application of a transpirant scratch-coat to prevent the slurry seeping out;
- scaffolding or mobile equipment to carry out the injection phase.

H.4.1.2 Injecting super-fluid, salt-resistant, lime and Eco-Pozzolan slurry

Supply and application of ultra fine-grained, salt-resistant, cement-free, lime and Eco-Pozzolan hydraulic binder with fillers to make super-fluid injection slurry (such as **Mape-Antique F21** produced by MAPEI S.p.A.) for consolidating brick, stone, tuff and mixed masonry.
The hydraulic binder with fillers must be suitable for use on site to make salt-resistant, volumetrically-stable, super-fluid injection slurry which is easy to inject using a manual or electronic pump or by gravity casting into structures with cracks, voids and cavities, including small sized ones.
Inject the slurry after adequate preparation of the substrate (not included) by grouting and "sealing" all cracks and gaps in the face of the wall through which the slurry could seep out. 20-40 mm diameter holes must also be drilled in the wall to a depth of 2/3 of the thickness of the wall, preferably at a square pitch of 50x50 cm. If the wall is thicker than 60 cm, it is better to drill holes on both sides of the wall. Includes fastening the tubes or injectors in place to inject the slurry. The day before injecting the slurry, we recommend saturating all the inside of the structure with water through the tubes or injectors previously fastened in place. Saturate the wall starting with the holes in the highest position. Make sure the structure has absorbed all the injected water before injecting the slurry, which must be carried out starting at the bottom of the wall working upwards. Remove the tubes or injectors and grout the holes using a suitable mortar from the Mape-Antique range.
The product must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate:	
(EN 1015-1) (µm)	< 100
Bleeding (NorMaL M33-87):	absent
Fluidity of mix (EN 445) (s):	< 30 (initial)
	< 30 (after 60 min)
Bulk density of fresh mortar:	
(EN 1015-6) (kg/m³)	1,650
Compressive strength (after 28 days)	
(EN 196-1) (N/mm²):	10
Resistance to sulphates	
(Anstett test):	high
Saline efflorescence	
(after semi-immersion in water):	absent
Reaction to fire	
(EN 13501-1):	Class A1
Consumption (kg/dm³):	1.04 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– hydro-cleaning the surfaces;
– drilling the injection holes;
– supply and fastening the tubes or injectors in place;
– "cleaning" the inside of the masonry;
– injecting the slurry;
– removing the tubes or injectors;
– grouting the holes.
– per 100 kg dry weight of injected slurry *…….(€/100 kg)*

The following are not included:

- cutting out deteriorated mortar from joints where required;
- removal of deteriorated mortar from joints where required on “exposed-finish” masonry or application of a transpirant scratch-coat to prevent the slurry seeping out;
- scaffolding or mobile equipment to carry out the injection phase.

H.4.1.3 Injecting super-fluid, cementitious slurry

Supply and application of expansive, powdered cementitious binder with special additives to make super-fluid injection slurry (such as **Stabilcem** produced by MAPEI S.p.A.) for consolidating brick, stone, tuff and mixed masonry.
The expansive, cementitious binder must be suitable for use on site to make super-fluid injection slurry which does not shrink or bleed, and which is easy to inject using a manual or electronic pump or by gravity casting into structures with cracks, voids and cavities.
Inject the slurry after adequate preparation of the substrate (not included) by grouting and "sealing" all cracks and gaps in the face of the wall through which the slurry could seep out. 20-40 mm diameter holes must also be drilled in the wall to a depth of 2/3 of the thickness of the wall, preferably at a square pitch of 50x50 cm. If the wall is thicker than 60 cm, it is better to drill holes on both sides of the wall for fastening the tubes or injectors in place to inject the slurry using a suitable thixotropic, cementitious mortar from the Mapegrout range produced by MAPEI S.p.A. The day before injecting the slurry, we recommend saturating all the inside of the structure with water through the tubes or injectors previously fastened in place. Saturate the wall starting with the holes in the highest position. Make sure the structure has absorbed all the injected water before injecting the slurry, which must be carried out starting at the bottom of the wall working upwards. Remove the tubes or injectors and grout the holes using a suitable mortar from the Mapegrout range.
The product must have the following performance characteristics:

Fluidity of mix (EN 445) (s):	20-30
Compressive strength (after 28 days) (EN 196-1) (N/mm²):	> 80
Flexural strength (after 28 days) (EN 196-1) (N/mm²):	> 8
Expansion during plastic phase (UNI 8996/89) (%):	≥ 0.3
Consumption (kg/dm³):	1.6 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– hydro-cleaning the surfaces;
– drilling the injection holes;
– supply and fastening the tubes or injectors in place;
– "cleaning" the inside of the masonry;
– injecting the slurry;
– removing the tubes or injectors;
– grouting the holes.
– per 100 kg dry weight of injected slurry *…….(€/100 kg)*
The following are not included:

- cutting out deteriorated mortar from joints where required;
- removal of deteriorated mortar from joints where required on "exposed-finish" masonry or application of a transpirant scratch-coat to prevent the slurry seeping out;
- scaffolding or mobile equipment to carry out the injection phase.

H.4 CONSOLIDATION OF MASONRY STRUCTURES AND RENDER BY INJECTING SLURRY

H.4.1.4 Injecting fluid, highly salt-resistant cementitious slurry

Supply and application of powdered cementitious binder with special additives to make fluid injection slurry (such as **Stabilcem ARS** produced by MAPEI S.p.A.) for consolidating brick, stone, tuff and mixed masonry.
The cementitious binder must be suitable for use on site to make fluid injection slurry which does not shrink or bleed, and which is easy to inject using a manual or electronic pump or by gravity casting into structures with cracks, voids and cavities.
Inject the slurry after adequate preparation of the substrate (not included) by grouting and "sealing" all cracks and gaps in the face of the wall through which the slurry could seep out. 20-40 mm diameter holes must also be drilled in the wall to a depth of 2/3 of the thickness of the wall, preferably at a square pitch of 50x50 cm. If the wall is thicker than 60 cm, it is better to drill holes on both sides of the wall for fastening the tubes or injectors in place to inject the slurry using a suitable thixotropic, cementitious mortar from the Mapegrout range produced by MAPEI S.p.A. The day before injecting the slurry, we recommend saturating all the inside of the structure with water through the tubes or injectors previously fastened in place. Saturate the wall starting with the holes in the highest position. Make sure the structure has absorbed all the injected water before injecting the slurry, which must be carried out starting at the bottom of the wall working upwards. Remove the tubes or injectors and grout the holes using a suitable mortar from the Mapegrout range.
The product must have the following performance characteristics:

Fluidity of mix (EN 445) (s):	< 15
Compressive strength (after 28 days) (EN 196-1) (N/mm²):	> 50
Consumption (kg/dm³):	1.45 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– hydro-cleaning the surfaces;
– drilling the injection holes;
– supply and fastening the tubes or injectors in place;
– "cleaning" the inside of the masonry;
– injecting the slurry;
– removing the tubes or injectors;
– grouting the holes.
– per 100 kg dry weight of injected slurry *…….(€/100 kg)*
The following are not included:

- cutting out deteriorated mortar from joints, where required;
- removal of deteriorated mortar from joints where required on "exposed-finish" masonry or application of a transpirant scratch-coat to prevent the slurry seeping out;
- scaffolding or mobile equipment to carry out the injection phase.

H.4 CONSOLIDATION OF MASONRY STRUCTURES AND RENDER BY INJECTING SLURRY

H.4.2 RESTORING THE ADHESION BETWEEN MASONRY SUBSTRATES AND RENDER, INCLUDING FRESCOED WALLS

H.4.2.1 Injecting super-fluid, salt-resistant, lime and Eco-Pozzolan slurry

Supply and application of ultra fine-grained, salt-resistant, cement-free, lime and Eco-Pozzolan hydraulic binder with fillers to make super-fluid injection slurry (such as **Mape-Antique F21** produced by MAPEI S.p.A.) to restore the adhesion between masonry substrates and render, including frescoed walls.

The hydraulic binder with fillers must be suitable for use on site to make salt-resistant, volumetrically-stable, super-fluid injection slurry which is also easy to inject manually using a large-capacity syringe, such as those used in veterinary applications, or by gravity casting.

On structures with frescoed render and/or of historical or artistic interest, while grouting and "sealing" the cracks and gaps in the substrate (not included), fasten small pieces of soft, rubber tube in place at a suitable pitch. In this case, we recommend that the inside of the structure is not "wetted", in that it could cause irreparable damage to the frescoes. In fact, **Mape-Antique F21** contains special water-retention additives which hold the mixing water in the slurry to make it easier to flow, including in structures which have not been wetted beforehand.

Inject the product starting from the bottom working upwards to help expel air in the structure and fill all the cavities. When the slurry seeps out of a tube or injector near the one being injected, stop injecting, close the injector used and continue the operation from the tube or injector from which the slurry seeped out. Follow this pattern until the slurry seeps out of the highest hole. When the consolidation procedure has been completed, remove all tubes and injectors and grout the holes with a suitable mortar from the Mape-Antique range.

The product must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate:	
(EN 1015-1) (μm)	< 100
Bleeding (NorMaL M33-87):	absent
Fluidity of mix (EN 445) (s):	< 30 (initial)
	< 30 (after 60 min)
Bulk density of fresh mortar:	
(EN 1015-6) (kg/m³)	1,650
Compressive strength (after 28 days) (EN 196-1) (N/mm²):	10
Resistance to sulphates	
(Anstett test):	high
Saline efflorescence	
(after semi-immersion in water):	absent
Reaction to fire	
(EN 13501-1):	Class A1
Consumption (kg/dm³):	1.04 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– drilling the injection holes;
– supply and fastening the small rubber tubes in place;
– injecting the slurry;
– removing the tubes or injectors;
– grouting the holes.
– per kg dry weight of injected slurry *……(€/kg)*
The following are not included:
– scaffolding or mobile equipment to carry out the injection phase.

H.5.1 APPLICATION OF MASONRY MORTAR PREPARED ON SITE WITH SALT-RESISTANT LIME AND ECO-POZZOLAN HYDRAULIC BINDER MIXED WITH AGGREGATES IN VARIOUS GRAIN SIZES

Supply and application of salt-resistant, cement-free, lime and Eco-Pozzolan hydraulic binder with fine-grained fillers, special additives and micro-fibres (such as **Mape-Antique LC** produced by MAPEI S.p.A.), mixed with aggregates in various grain sizes to repair missing or damaged portions and/or cracks and gaps on deteriorated wall faces.

The hydraulic binder must be suitable for use on site in combination with aggregates in various grain sizes to make plastic-thixotropic, trowelable masonry mortar which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater, and is used to repair the wall faces using the "patching" or "cladding" application techniques.

Restoring masonry using the "patching" or "cladding" techniques is necessary when the face of the wall is particularly deteriorated, if elements such as stone, bricks or tuff are missing or if there are cracks or poor joints between portions of the masonry. After making the structure safe using suitable temporary supports (not included), remove all the elements which are particularly loose and/or poorly bonded. "Break out" the areas of the wall where there are cracks or gaps, starting from the bottom working upwards, by removing deteriorated and/or cracked elements, all the unsuitable installation mortar and any other elements or objects which could compromise restoration of the masonry. While carrying out this operation, put all the elements in good condition and which may be reused to restore and "patch up" the masonry together on one side. Also, while removing the deteriorated areas, leave rough edges to offer better grip between the areas of new masonry and existing masonry. Clean all support and jointing surfaces with a low-pressure hydro-cleaner, where possible, to help the mortar adhere to the substrate.

"Patch" or "clad" the face of the wall by creating an "installation bed" of mortar and then lay the elements on the mortar (either the original ones previously removed or new ones with the same shape and size of the existing elements to prevent physical or chemical incompatibility). Press the elements down slightly so they form a better grip with the existing ones. Remove excess mortar with a trowel.

The product must have the following performance characteristics:

Appearance:	powder		
Colour:	white		
Composition (kg/m³):	sand	sand	gravel
	0.5-2.5 mm	0.5-5 mm	0-8 mm
– Mape-Antique LC:	500	450	400
– aggregate:	1,000	1,150	1,300
– water:	225	210	200
Bulk density of fresh mortar:			
(EN 1015-6) (kg/m³)	1,725	1,810	1,900
Compressive strength (after 28 days) (EN 196-1) (N/mm²):	4	5	6
Thermal conductivity ($\lambda_{10,dry}$):			
(EN 1745) (W/m·K)	0.70	0.77	0.83

Reaction to fire (EN 13501-1):	Class A1
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²) (per cm of thickness):	Approximately: – 5 (with 0.5-2.5 mm fine sand); – 4.5 (with 0.5-5 mm coarse sand); – 4 (with 0-8 mm gravel).

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director: :
– "demolition" of the deteriorated masonry;
– removal of deteriorated, unsuitable construction elements;
– cleaning and/or hydro-cleaning of surfaces;
– creation of an "installation bed" of masonry mortar;
– installation of construction elements;
– per m² per cm of thickness *.....(€/m²·cm)*
The following are not included:
– making the structure safe;
– new construction elements.

H.5.2 APPLICATION OF SALT-RESISTANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

Supply and application of salt-resistant, cement-free, natural hydraulic lime and Eco-Pozzolan hydraulic binder with natural sand, special additives and micro-fibres (such as **Mape-Antique Allettamento** produced by MAPEI S.p.A.), to restore missing or damaged portions and/or cracks and gaps on deteriorated wall faces.

The mortar must be suitable for use on site to make plastic-thixotropic, trowelable masonry mortar which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater, and is used to repair wall faces using the "patching" or "cladding" application technique.

Restoring masonry using the "patching" or "cladding" techniques is necessary when the face of the wall is particularly deteriorated, if elements such as stone, bricks or tuff are missing or if there are cracks or poor joints between portions of the masonry. After making the structure safe using suitable temporary supports (not included), remove all the elements which are particularly loose and/or poorly bonded. "Break out" the areas of the wall where there are cracks or gaps, starting from the bottom working upwards, by removing deteriorated and/or cracked elements, all the unsuitable installation mortar and any other elements or objects which could compromise restoration of the masonry. While carrying out this operation, put all the elements in good condition and which may be reused to restore and "patch up" the masonry together on one side. Also, while removing the deteriorated areas, leave rough edges to offer better grip between the areas of new masonry and existing masonry. Clean all support and jointing surfaces with a low-pressure hydro-cleaner, where possible, to help the mortar adhere to the substrate.

"Patch" or "clad" the face of the wall by creating an "installation bed" of mortar and then lay the elements on the mortar (either the original ones previously removed or new ones with the same shape and size of the existing elements to prevent physical or chemical incompatibility). Press the elements down slightly so they form a better grip with the existing ones. Remove excess mortar with a trowel.

The product must meet the minimum requirements of EN 998-2 Standards, classified G (Guaranteed-performance, general-purpose masonry mortar for external use on elements with structural requirements) class M 5, and must have the following performance characteristics:

Appearance:	powder
Colour:	straw yellow
Maximum size of aggregate: (EN 1015-1) (mm)	1.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,950
Porosity of the mortar while still fresh: (EN 1015-7) (%)	6
Compressive strength after 28 days: (EN 1015-11)	Class M 5
Adhesion to substrate: (EN 1015-12) (N/mm²)	> 0.5 Failure mode (FB) = B

Initial shear strength:	
(EN 998-2 Appendix C) (N/mm²)	0.15
Capillary action water absorption:	
(EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.3
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	15/35
Thermal conductivity ($\lambda_{10,dry}$):	
(EN 1745) (W/m·K)	0.77
Reaction to fire:	
(EN 13501-1)	Class A1
Resistance to sulphates	
(ASTM C 1012 mod.) (°C):	< 0.02
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²):	16.5 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– "demolition" of the deteriorated masonry;
– removal of deteriorated, unsuitable construction elements;
– cleaning and/or hydro-cleaning of surfaces;
– creation of an "installation bed" of masonry mortar;
– installation of construction elements;

– per m² per cm of thickness *.....(€/m²·cm)*

The following are not included:
– making the structure safe;
– new construction elements;

H.5.3 APPLICATION OF HIGH-STRENGTH, FIBRE-REINFORCED, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

Supply and application of high-strength, cement-free, natural hydraulic lime and Eco-Pozzolan masonry mortar with natural sand, special additives, micro-fibres and glass fibres (such as **Mape-Antique Strutturale NHL** produced by MAPEI S.p.A.), to restore missing or damaged portions and/or cracks and gaps on deteriorated wall faces.

The mortar must be suitable for use on site to make plastic-thixotropic, fibre-reinforced, trowelable masonry mortar with glass fibres, and is used to repair wall faces, including those with an "exposed" finish, using the "patching" or "cladding" application technique.

Restoring masonry using the "patching" or "cladding" techniques is necessary when the face of the wall is particularly deteriorated, if elements such as stone, bricks or tuff are missing or if there are cracks or poor joints between portions of the masonry. After making the structure safe using suitable temporary supports (not included), remove all the elements which are particularly loose and/or poorly bonded. "Break out" the areas of the wall where there are cracks or gaps, starting from the bottom working upwards, by removing deteriorated and/or cracked elements, all the unsuitable installation mortar and any other elements or objects which could compromise restoration of the masonry. While carrying out this operation, put all the elements in good condition and which may be reused to restore and "patch up" the masonry together on one side. Also, while removing the deteriorated areas, leave rough edges to offer better grip between the areas of new masonry and existing masonry. Clean all support and jointing surfaces with a low-pressure hydro-cleaner, where possible, to help the mortar adhere to the substrate.

"Patch" or "clad" the face of the wall by creating an "installation bed" of mortar and then lay the elements on the mortar (either the original ones previously removed or new ones with the same shape and size of the existing elements to prevent physical or chemical incompatibility). Press the elements down slightly so they form a better grip with the existing ones. Remove excess mortar with a trowel.

The product must meet the minimum requirements of EN 998-2 Standards, classified G (Guaranteed-performance, general-purpose masonry mortar for external use on elements with structural requirements) class M 15, and must have the following performance characteristics:

Appearance:	powder
Colour:	light hazel
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	2,000
Porosity of the mortar while still fresh: (EN 1015-7) (%)	7
Compressive strength after 28 days: (EN 1015-11)	> 15 Class M 15
Adhesion to substrate (brickwork): (EN 1015-12) (N/mm²)	≥ 0.7 Failure mode (FB) = A/C

Initial shear strength (f_{vok}):	
(EN 998-2 Appendix C) (N/mm²)	0.15
Static modulus of elasticity (after 28 days):	
(EN 13412) (N/mm²)	10,000
Capillary action water absorption:	
(EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.2 Category W 2
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	60
Thermal conductivity ($\lambda_{10,dry}$):	
(EN 1745) (W/m·K)	1
Reaction to fire:	
(EN 13501-1):	Class E
Consumption (kg/m²):	approx. 17 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– "demolition" of the deteriorated masonry;
– removal of deteriorated, unsuitable construction elements;
– cleaning and/or hydro-cleaning of surfaces;
– creation of an "installation bed" of masonry mortar;
– installation of construction elements;
– per m² per cm of thickness *……(€/m²·cm)*
The following are not included:
– making the structure safe;
– new construction elements;

H.6 APPLICATION OF THE FIRST SCRATCH-COAT LAYER

H.6.1 MANUAL AND/OR MACHINE APPLICATION OF LIME AND ECO-POZZOLAN SCRATCH-COAT MORTAR

Supply and application of transpirant, salt-resistant, cement-free, lime and Eco-Pozzolan scratch-coat mortar with natural sand, special additives and micro-fibres (such as **Mape-Antique Rinzaffo** produced by MAPEI S.p.A.), used as the first layer when applying dehumidifying, transpirant and "structural" render for renovating buildings, including those of historical interest.
The mortar must be suitable for use on site to make transpirant scratch-coat mortar applied by trowel or with a continuous-feed rendering machine, used as the first layer when applying dehumidifying, transpirant and "structural" render to even out the absorption of the substrate, improve adhesion of render and slow down transfer of salts.
Apply the scratch-coat layer by trowel or with a rendering machine after adequate preparation of the substrate (not included). Clean surfaces with a low-pressure hydro-cleaner to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts. Repeat this operation several times if necessary. Saturate the substrate with water to prevent it drawing off water from the mortar and compromising its final performance characteristics. Eliminate any excess water with compressed air.
Apply a 5 mm thick layer of scratch-coat mortar by trowel or with a rendering machine starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat mortar starts to set, then apply the selected render (dehumidifying, transpirant or "structural") to improve its adhesion, even out absorption of the substrate and slow down transfer of salts.
The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,850
Porosity of the mortar while still fresh: (EN 1015-7) (%)	6
Compressive strength after 28 days: (EN 1015-11)	> 10 Category CS IV
Adhesion to substrate: (EN 1015-12) (N/mm²)	≥ 0.7 Failure mode (FB) = B

Capillary action water absorption:	
(EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 1
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	≤ 30
Thermal conductivity ($\lambda_{10,dry}$):	
(EN 1745) (W/m·K)	0.73
Reaction to fire:	
(EN 13501-1):	Class E
Resistance to sulphates	
(Anstett test):	high
Saline efflorescence	
(after semi-immersion in water):	absent
Consumption (kg/m²):	7.5 (per 5 mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;
- application of scratch-coat mortar by trowel or rendering machine;

– per m² per 5 mm of thickness ……*(€/m²·5 mm)*

H.6.2 MANUAL APPLICATION OF POZZOLANIC-ACTION, SCRATCH-COAT MORTAR MADE FROM SPECIAL, HIGHLY SALT-RESISTANT HYDRAULIC BINDERS

Supply and application of transpirant, salt-resistant scratch-coat mortar with special pozzolanic-action hydraulic binders, natural sand and special additives (such as **PoroMap Rinzaffo** produced by MAPEI S.p.A.), used as the first layer when applying dehumidifying and transpirant render for renovating buildings.

The mortar must be suitable for use on site to make transpirant, trowelable scratch-coat mortar, used as the first layer when applying dehumidifying and transpirant render to even out the absorption of the substrate, improve the adhesion of render and slow down transfer of salts.

Apply the scratch-coat layer by trowel after adequate preparation of the substrate (not included). Clean surfaces with a low-pressure hydro-cleaner to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts. Repeat this operation several times if necessary. Saturate the substrate with water to prevent it drawing off water from the mortar and compromising its final performance characteristics. Eliminate any excess water with compressed air.

Apply a 5 mm thick layer of scratch-coat mortar by trowel starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat mortar starts to set, then apply the selected render (dehumidifying or transpirant) to improve its adhesion, even out absorption of the substrate and slow down transfer of salts.

The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	light grey
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,700-1,900
Porosity of the mortar while still fresh: (EN 1015-7) (%)	4-8
Compressive strength after 28 days: (EN 1015-11)	10-15 Category CS IV
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 0
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	< 20
Reaction to fire: (EN 13501-1):	Class A1
Consumption (kg/m²):	7.5-8 (per 5 mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;
- application of scratch-coat mortar by trowel;

– per m² per 5 mm of thickness ……(€/m²·5 mm)

H.6.3 MACHINE APPLICATION OF POZZOLANIC-ACTION, SCRATCH-COAT MORTAR MADE FROM SPECIAL, HIGHLY SALT-RESISTANT HYDRAULIC BINDERS

Supply and application of transpirant, salt-resistant scratch-coat mortar with special pozzolanic-action hydraulic binders, natural sand and special additives (such as **PoroMap Rinzaffo Macchina** produced by MAPEI S.p.A.), used as the first layer when applying dehumidifying and transpirant render for renovating buildings.

The mortar must be suitable for use on site to make transpirant scratch-coat mortar applied with a continuous-feed rendering machine, used as the first layer when applying dehumidifying and transpirant render to even out the absorption of the substrate, improve the adhesion of render and slow down transfer of salts.

Apply the scratch-coat layer with a continuous-feed rendering machine after adequate preparation of the substrate (not included). Clean surfaces with a low-pressure hydro-cleaner to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts. Repeat this operation several times if necessary. Saturate the substrate with water to prevent it drawing off water from the mortar and compromising its final performance characteristics. Eliminate any excess water with compressed air.

Apply a 5 mm thick layer of scratch-coat mortar with a rendering machine starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat mortar starts to set, then apply the selected render (dehumidifying or transpirant) to improve its adhesion, even out absorption of the substrate and slow down transfer of salts.

The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	light grey
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,900
Porosity of the mortar while still fresh: (EN 1015-7) (%)	4-8
Compressive strength after 28 days: (EN 1015-11)	10-15 Category CS IV
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 0
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	< 20
Reaction to fire (EN 13501-1):	Class A1
Consumption (kg/m²):	7.5-8 (per 5 mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;
- application of scratch-coat mortar with a rendering machine;

– per m² per 5 mm of thickness *.....(€/m²·5 mm)*

H.7.1 HORIZONTAL CHEMICAL BARRIERS

H.7.1.1 Forming hydrophobising, horizontal chemical barriers

Supply and application of solvent-free, concentrated silane and siloxane microemulsion with extremely fine particles (such as **Mapestop** produced by MAPEI S.p.A.), to form hydrophobising, horizontal chemical barriers on existing masonry, including those of historical and artistic interest, or on recently constructed masonry as long as it is compact, has no gaps or internal cavities, subject to capillary rising damp.

The injection agent must be suitable for use on site to make concentrated silane and siloxane microemulsion diluted at a ratio of 1:15-19 with water, with the capacity of blocking and/or reducing rising damp from elements below ground level, by forming a horizontal barrier through impregnation using slow-diffusion propagators or with a suitable low-pressure pump.

For structures with uneven core-wall masonry or with voids, all internal cavities must be filled by injecting fluid or super-fluid slurry (not included) (see section ***H.4.1***).

Drill a series of holes at a downward angle of around 20° to a depth of 2/3 the thickness of the wall. The holes should be around 10 mm diameter for injection with a low-pressure pump and around 15-30 mm diameter for slow-diffusion propagators. Drill the holes around 15-20 cm above floor or ground level at a pitch of 10-25 cm.

For walls with a thickness of less than 60 cm, or which are accessible from one side only, drill two staggered rows of holes and form the chemical barrier on one side only, while for walls thicker than 60 cm, we recommend making a barrier on both sides using the same procedure as described previously.

Clean out the holes with compressed air to remove all traces of dust and residues of material.

Fasten the propagators or injectors in place, according to the injection method chosen, using suitable masonry mortar, which must then be removed together with the propagators or injectors after injecting the chemical barrier. Inject the solution in each hole until the structure is completely saturated.

The microemulsion must have the following characteristics:

Consistency:	liquid
Colour:	straw yellow-brown
Density (g/cm³):	0.98
Dilution ratio:	1:15-19 with water
Silane/siloxane content (%):	100
Viscosity (mPa·s):	7
Pot life of mix:	24 h
Consumption (kg/m):	according to the absorption of the masonry. Approximately: 8-9 kg/m of solution for a 40 cm thick wall, corresponding to 0.4-0.6 kg/m of neat **Mapestop**.

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– drilling the holes;
– cleaning the holes;
– fastening the propagators or injectors in place with suitable mortar;
– injection of the microemulsion;
– removal of the propagators or injectors and mortar.
– per m per cm of thickness *.....(€/m·cm)*

H.7.2 RENOVATION OF MASONRY SUBJECT TO CAPILLARY RISING DAMP Procedure

Preparation of substrates

On masonry with capillary rising damp, completely remove the deteriorated render either manually or with mechanical means to a height of approximately 50 centimetres above the deteriorated area, and in all cases to a height of at least twice the thickness of the wall. Remove all traces of loose or crumbly material and all traces of dust, mildew and any other element which could compromise adhesion of the dehumidifying cycle until the substrate is clean, sound and compact. Then clean the wall with low-pressure water jets to remove any efflorescence or soluble salts present on the surface. Repeat this operation several times if necessary.

Repair any gaps or voids in the masonry using the "patching" or "cladding" technique, with **Mape-Antique LC** masonry mortar mixed with various grade aggregates (see section ***H.5.1***), **Mape-Antique Allettamento** (see section ***H.5.2***) or **Mape-Antique Strutturale NHL** (see section ***H.5.3***), together with stone, pieces of brick or tuff with similar characteristics to the original material as possible. Saturate the substrate with water to prevent it drawing off water from the mortar and compromising its final performance characteristics. Excess water must be left to evaporate off, so that the masonry is saturated and the surface is dry (s.s.d. condition). Compressed air may be used to speed up this process. If the substrate cannot be saturated with water, we recommend that it is at least dampened to allow the mortar to adhere correctly.

Application of the first scratch-coat layer

If there is capillary rising damp, before applying the macro-porous dehumidifying render, always apply a first scratch-coat layer (see section ***H.6***) approximately 5 mm thick to completely cover the substrate to be rendered, to improve its adhesion, even out absorption of the substrate and slow down transfer of salts.

On mixed masonry or masonry out of plumb by more than 4-5 cm, which would lead to the layer of render having an irregular thickness, we recommend inserting Ø2 mm zinc-plated metallic mesh with a mesh size of 5x5 cm (see section ***H.2***) before applying the scratch-coat layer. The mesh must be fixed in place to the wall with nails and/or plugs with a small gap between the wall so that it becomes embedded in the middle of the layer of render.

Form levelling strips with the dehumidifying render or place vertical guides in position to define the correct planarity and thickness of the render.

Application of the macro-porous dehumidifying render

Wait until the scratch-coat mortar starts to "set" then apply the at least 20 mm thick lime and Eco-Pozzolan-based dehumidifying render (starting from the bottom working upwards) made on site from **Mape-Antique LC** mixed with various grades of agglomerate (see section ***H.7.2.1***), **Mape-Antique MC** (see section ***H.7.2***) or **Mape-Antique CC** (see section ***H.7.2.3***), or made from special salt-resistant, pozzolanic-reaction hydraulic binders such as **Poromap Intonaco** (see section ***H.7.3.4***) or **Poromap Intonaco Macchina** (see section ***H.7.2.5***).

If the thickness required is higher than 30 mm, the dehumidifying render must be applied in several layers. Each layer must be applied without tamping the previous layer. After applying the render, wait a few minutes and level the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with render.

Finish off the surface of the render with a plastic, wooden or sponge float a few hours after application, according to the surrounding temperature and conditions. Never press down on the surface of the render or porosity could be reduced and, therefore, impede evaporation of the moisture in the masonry.

Even though dehumidifying render contains products which contrast the formation of micro-cracks, it is good practice to apply the render when the wall is not exposed to direct sunlight and/or wind. In such cases, such as during hot and/or particularly windy weather, take special care when curing the render, especially during the first 36-48 hours. Spray water on the surface or employ other systems to prevent the mixing water evaporating off too quickly.

If a smoother finish than a normal tamped surface is required, apply a transpirant skimming mortar (see section ***H.10***), a coat of paint or a thin layer of coloured coating (see section ***H.14.1*** or ***H.14.2***).

For constructions particularly exposed to rain, if the render does not require any dressing coat, it may be protected with a transparent, transpirant water-repellent product, such as **Antipluviol S** (see section ***H.13.1***) or **Antipluviol W** (see section ***H.13.2***).

H.7.2.1 Application of salt-resistant, dehumidifying render prepared on site with lime and Eco-Pozzolan hydraulic binder mixed with aggregates in various grain sizes

Supply and application of salt-resistant, cement-free, lime and Eco-Pozzolan hydraulic binder with fine-grained fillers, special additives and micro-fibres (such as **Mape-Antique LC** produced by MAPEI S.p.A.), mixed on site with aggregates in various grain sizes to renovate buildings with capillary rising damp, including those of historical and artistic interest.
The hydraulic binder must be suitable for use on site in combination with aggregates in various grain sizes to make trowelable, macro-porous, dehumidifying render which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater.
Apply the dehumidifying render by trowel after adequate preparation of the substrate (not included), and only after applying a first scratch-coat layer (such as **Mape-Antique Rinzaffo** produced by MAPEI S.p.A.) (see section ***H.6.1***), to even out absorption of the substrate, improve adhesion of the render and slow down transfer of salts. Hydro-clean the surfaces to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts.
Apply a 5 mm thick layer of scratch-coat mortar by trowel or with a rendering machine starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat layer starts to set then apply a single layer up to 25 mm thick of dehumidifying render by trowel, starting from the bottom working upwards. If the thickness required is higher than 25 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.
The product must have the following performance characteristics:

Appearance:	powder		
Colour:	white		
Composition (kg/m³):	sand	sand	gravel
	0.5-2,5 mm	0.5-5 mm	0-8 mm
– Mape-Antique LC:	500	450	400
– aggregate:	1,000	1,150	1,300
– water:	225	210	200
Bulk density of fresh mortar:			
(EN 1015-6) (kg/m³)	1,725	1,810	1,900
Compressive strength after 28 days:			
(EN 1015-11)	4	5	7
Thermal conductivity ($\lambda_{10,dry}$):			
(EN 1745) (W/m·K)	0.70	0.77	0.83

Reaction to fire: (EN 13501-1):	Class A1
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²) (per cm of thickness):	Approximately: -5 (with 0.5-2.5 mm fine sand); -4.5 (with 0.5-5 mm coarse sand); -4 (with 0-8 mm gravel)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

– hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;

– application of the first scratch-coat layer;

– application of the dehumidifying render by trowel;

– levelling off surfaces with a straight edge and final tamping;

– careful curing of the mortar for the first 24-36 hours by spraying water on the surface;

– per m² per cm of thickness *.....(€/m²·cm)*

H.7.2.2 Application of white-coloured, salt-resistant, lime and Eco-Pozzolan dehumidifying render

Supply and application of white-coloured, salt-resistant, cement-free, lime and Eco-Pozzolan, dehumidifying rendering mortar with natural sand, special additives and micro-fibres (such as **Mape-Antique MC** produced by MAPEI S.p.A.), to renovate buildings with capillary rising damp, including those of historical and artistic interest.
The mortar must be suitable for use on site to make trowelable, macro-porous, dehumidifying render which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater.
Apply the dehumidifying render by trowel after adequate preparation of the substrate (not included), and only after applying a first scratch-coat layer (such as **Mape-Antique Rinzaffo** produced by MAPEI S.p.A.) (see section ***H.6.1***), to even out absorption of the substrate, improve adhesion of the render and slow down transfer of salts. Hydro-clean the surfaces to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts.
Apply a 5 mm thick layer of scratch-coat mortar by trowel or with a rendering machine starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat layer starts to set then apply a single layer up to 25 mm thick of dehumidifying render by trowel, starting from the bottom working upwards. If the thickness required is higher than 25 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.
The product must meet the minimum requirements of EN 998-1 Standards, classified R (Restoration mortar. Mortar for internal/external render applied on damp masonry containing soluble salts in water), category CS II, and must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,700
Porosity of the mortar while still fresh: (EN 1015-7) (%)	> 20
Compressive strength after 28 days: (EN 1015-11)	Category CS II
Adhesion to substrate: (EN 1015-12) (N/mm²)	= 0.4 Failure mode (FB) = B

Capillary action water absorption:	
(EN 1015-18) (kg/m²)	3.5
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	= 10
Thermal conductivity ($?_{10,dry}$):	
(EN 1745) (W/m·K)	0.61
Reaction to fire:	
(EN 13501-1):	Class A1
Resistance to sulphates	
(Anstett test):	high
Saline efflorescence	
(after semi-immersion in water):	absent
Consumption (kg/m²):	15 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director: :

– hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;

– application of the first scratch-coat layer;

– application of the dehumidifying render by trowel;

– levelling off surfaces with a straight edge and final tamping;

– careful curing of the mortar for the first 24-36 hours by spraying water on the surface;

– per m² per cm of thickness *.....(€/m²·cm)*

H.7.2.3 Application of brick-coloured, salt-resistant, lime and Eco-Pozzolan dehumidifying render

Supply and application of brick-coloured, salt-resistant, cement-free, lime and Eco-Pozzolan, dehumidifying rendering mortar with natural sand, special additives and micro-fibres (such as **Mape-Antique CC** produced by MAPEI S.p.A.), to renovate buildings with capillary rising damp, including those of historical and artistic interest.
The mortar must be suitable for use on site to make trowelable, macro-porous, dehumidifying render which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater.
Apply the dehumidifying render by trowel after adequate preparation of the substrate (not included), and only after applying a first scratch-coat layer (such as **Mape-Antique Rinzaffo** produced by MAPEI S.p.A.) (see section ***H.6.1***), to even out absorption of the substrate, improve adhesion of the render and slow down transfer of salts. Hydro-clean the surfaces to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbly portions and no traces of dust, dirt, mildew or soluble salts.
Apply a 5 mm thick layer of scratch-coat mortar by trowel or with a rendering machine starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat layer starts to set then apply a single layer up to 25 mm thick of dehumidifying render by trowel, starting from the bottom working upwards. If the thickness required is higher than 25 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.
The product must meet the minimum requirements of EN 998-1 Standards, classified R (Restoration mortar. Mortar for internal/external render applied on damp masonry containing soluble salts in water), category CS II, and must have the following performance characteristics:

Appearance:	powder
Colour:	brick
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,700
Porosity of the mortar while still fresh: (EN 1015-7) (%)	> 20
Compressive strength after 28 days: (EN 1015-11)	Category CS II
Adhesion to substrate: (EN 1015-12) (N/mm²)	= 0.4 Failure mode (FB) = B

Capillary action water absorption:	
(EN 1015-18) (kg/m²)	3.5
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	= 10
Thermal conductivity ($?_{10,dry}$):	
(EN 1745) (W/m·K)	0.61
Reaction to fire:	
(EN 13501-1):	Class A1
Resistance to sulphates	
(Anstett test):	high
Saline efflorescence	
(after semi-immersion in water):	absent
Consumption (kg/m²):	15 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

– hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;

– application of the first scratch-coat layer;

– application of the dehumidifying render by trowel;

– levelling off surfaces with a straight edge and final tamping;

– careful curing of the mortar for the first 24-36 hours by spraying water on the surface;

– per m² per cm of thickness ……*(€/m²·cm)*

H.7.2.4 Trowel-applied, pozzolanic-action, dehumidifying render made from special, salt-resistant hydraulic binders

Supply and application of pozzolanic-action, dehumidifying rendering mortar made from special salt-resistant, hydraulic binders with natural sand, lightweight aggregates and special additives (such as **PoroMap Intonaco** produced by MAPEI S.p.A.), to renovate buildings with capillary rising damp.
The mortar must be suitable for use on site to make trowelable, macro-porous, dehumidifying render which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater.
Apply the dehumidifying render by trowel after adequate preparation of the substrate (not included), and only after applying a first scratch-coat layer (such as **PoroMap Rinzaffo** produced by MAPEI S.p.A.) (see section ***H.6.2***), to even out absorption of the substrate, improve adhesion of the render and slow down transfer of salts. Hydro-clean the surfaces to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts.
Apply a 5 mm thick layer of scratch-coat mortar by trowel starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat layer starts to set then apply a single layer up to 30 mm thick of dehumidifying render by trowel, starting from the bottom working upwards. If the thickness required is higher than 30 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.
The product must meet the minimum requirements of EN 998-1 Standards, classified R (Restoration mortar. Mortar for internal/external render applied on damp masonry containing soluble salts in water), category CS II, and must have the following performance characteristics:

Appearance:	powder
Colour:	light grey
Maximum size of aggregate: (EN 1015-1) (mm)	1
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,300
Porosity of the mortar while still fresh: (EN 1015-7) (%)	> 25
Compressive strength after 28 days: (EN 1015-11)	Category CS II
Adhesion to substrate (brickwork): (EN 1015-12) (N/mm²)	≤ 0.4 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) (kg/m²)	2.5
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	≤ 10
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	0.38

Reaction to fire:
(EN 13501-1): Class A1
Consumption (kg/m²): 10-11.5 (per cm of thickness)
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;
- application of the first scratch-coat layer;
- application of the dehumidifying render by trowel;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar for the first 24-36 hours by spraying water on the surface;

– per m² per cm of thickness .....(€/m²·cm)

H.7.2.5 Machine-applied, pozzolanic-action, dehumidifying render made from special, salt-resistant hydraulic binders

Supply and application of pozzolanic-action, dehumidifying rendering mortar made from special salt-resistant, hydraulic binders with natural sand, lightweight aggregates and special additives (such as **PoroMap Intonaco Macchina** produced by MAPEI S.p.A.), to renovate buildings with capillary rising damp.

The mortar must be suitable for use on site to make macro-porous, dehumidifying render applied with a continuous-feed rendering machine which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles and the leaching action of rainwater.

Apply the dehumidifying render with a continuous-feed rendering machine after adequate preparation of the substrate (not included), and only after applying a first scratch-coat layer (such as **PoroMap Intonaco Macchina** produced by MAPEI S.p.A.) (see section ***H.6.3***), to even out absorption of the substrate, improve adhesion of the render and slow down transfer of salts. Hydro-clean the surfaces to remove all traces of material and substances which could compromise adhesion of products applied later, to obtain a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts.

Apply a 5 mm thick layer of scratch-coat mortar with a continuous-feed rendering machine starting from the bottom of the masonry working upwards, until the substrate to be rendered is completely covered. Wait until the scratch-coat layer starts to set then apply a single layer up to 30 mm thick of dehumidifying render with a continuous-feed rendering machine, starting from the bottom working upwards. If the thickness required is higher than 30 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.

The product must meet the minimum requirements of EN 998-1 Standards, classified R (Restoration mortar. Mortar for internal/external render applied on damp masonry containing soluble salts in water), category CS II, and must have the following performance characteristics:

Appearance:	powder
Colour:	light grey
Maximum size of aggregate: (EN 1015-1) (mm)	1
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,300
Porosity of the mortar while still fresh: (EN 1015-7) (%)	> 25
Compressive strength after 28 days: (EN 1015-11)	Category CS II
Adhesion to substrate (brickwork): (EN 1015-12) (N/mm²)	≤ 0.4 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) (kg/m²)	2.5
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	≤ 10
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	0.38

Reaction to fire: Class A1
Consumption (kg/m²): 11.5-13 (per cm of thickness)
Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the first scratch-coat layer;
- application of the first scratch-coat layer;
- application of the dehumidifying render with a continuous-feed rendering machine;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar for the first 24-36 hours by spraying water on the surface;

– *per m² per cm of thickness* *.....(€/m²·cm)*

H.8 TRANSPIRANT RENDER

H.8.1 APPLICATION OF TRANSPIRANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN RENDER ON NEW AND EXISTING MASONRY, INCLUDING ON BUILDINGS OF HISTORICAL INTEREST

Supply and application of cement-free, natural hydraulic lime and Eco-Pozzolan rendering mortar with natural sand, special additives, micro-fibres and glass fibres with very low emission of volatile organic compounds (such as **Mape-Antique Intonaco NHL** produced by MAPEI S.p.A.), to make transpirant render for use on any type of masonry.
The mortar must be suitable for use on site to make transpirant render applied by trowel or with a continuous-feed rendering machine on new or existing masonry, including those of historical and artistic interest.
Apply the transpirant render after adequate preparation of the substrate (not included), on a clean, sound, compact substrate with no crumbling portions and no traces of dust, dirt, mildew or soluble salts. Hydro-clean the surface to remove all traces of material and substances which could compromise the adhesion of any products or systems applied later.
In the case of particularly difficult walls, such as stone or mixed walls, we recommend applying an initial 5 mm thick scratch-coat of the same product or **Mape-Antique Rinzaffo** (not included) (see section ***H.6.1***), to even out the absorbency of the substrate and improve adhesion of the render.
Wait until the scratch-coat layer starts to set, if applied, then apply a single layer up to 30 mm thick of transpirant render by trowel or with a continuous-feed rendering machine, starting from the bottom working upwards. If the thickness required is higher than 30 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.
The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS II, and must have the following performance characteristics:

Appearance:	powder
Colour:	light hazel
Maximum size of aggregate: (EN 1015-1) (mm)	1.4
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,750
Porosity of the mortar while still fresh: (EN 1015-7) (%)	20
Compressive strength after 28 days: (EN 1015-11)	Category CS II
Adhesion to substrate: (EN 1015-12) (N/mm²)	= 0.3 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 0
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	= 12
Thermal conductivity ($?_{10,dry}$): (EN 1745) (W/m·K)	0.57

Reaction to fire: (EN 13501-1)	Class A1
Consumption (kg/m²):	approx. 14.5 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the mortar;
- application of mortar by trowel or rendering machine;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar for the first 36-48 hours by spraying water on the surface;

– per m² per cm of thickness *.....(€/m²·cm)*

H.8.2 APPLICATION OF TRANSPIRANT, HIGH-PERFORMANCE, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN RENDERING MORTAR

Supply and application of highstrength, cementfree, natural hydraulic lime and EcoPozzolan masonry mortar with natural sand, special additives, microfibres and glass fibres (such as MapeAntique Strutturale NHL produced by MAPEI S.p.A.), to make fibre-reinforced, transpirant render for use on weak stone, brick, tuff or mixed masonry.
The mortar must be suitable for use on site to make high-strength, fibre-reinforced, transpirant render applied by trowel or with a continuous-feed rendering machine.
Apply the transpirant render after adequate preparation of the substrate (not included), on a clean, sound, compact substrate with no crumbly portions and no traces of dust, dirt, mildew or soluble salts. Hydro-clean the surface to remove all traces of material and substances which could compromise the adhesion of any products or systems applied later.
In the case of particularly difficult walls, such as stone or mixed walls, we recommend applying an initial 5 mm thick scratch-coat of the same product or **Mape-Antique Rinzaffo** (not included) (see section ***H.6.1***), to even out the absorbency of the substrate and improve adhesion of the render.
Wait until the scratch-coat layer starts to set, if applied, then apply a single layer up to 25 mm thick of "structural" render by trowel or with a continuous-feed rendering machine, starting from the bottom working upwards. If the thickness required is higher than 25 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.
The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	light hazel
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	2,000
Porosity of the mortar while still fresh: (EN 1015-7) (%)	7
Compressive strength after 28 days: (EN 1015-11)	> 15 Category CS IV
Adhesion to substrate (brickwork): (EN 1015-12) (N/mm²)	> 0.7 Failure mode (FB) = A/C
Initial shear strength (f_{vok}): (EN 998-2 Appendix C) (N/mm²)	0.15
Static modulus of elasticity (after 28 days): (EN 13412) (N/mm²)	10,000
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.2 Category W 2
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	60
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	1

Reaction to fire: (EN 13501-1)	Class E
Consumption (kg/m²):	approx. 17 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the mortar;
- application of mortar by trowel or rendering machine;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar for the first 36-48 hours by spraying water on the surface;

– per m² per cm of thickness *.....(€/m²·cm)*

H.9.1 APPLICATION OF HIGH-PERFORMANCE, FIBRE-REINFORCED, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN RENDERING MORTAR

Supply and application of high-strength, cement-free, natural hydraulic lime and Eco-Pozzolan masonry mortar with natural sand, special additives, micro-fibres and glass fibres (such as **Mape-Antique Strutturale NHL** produced by MAPEI S.p.A.) in combination with zinc-plated steel reinforcement mesh, to make "structural" render for consolidating weak stone, brick, tuff or mixed masonry.

The mortar must be suitable for use on site in combination with zinc-plated steel reinforcement mesh to make high-strength, "structural" transpirant render applied by trowel or with a continuous-feed rendering machine.

Apply the "structural" render after adequate preparation of the substrate (not included), on a clean, sound, compact substrate with no crumbly portions and no traces of dust, dirt, mildew or soluble salts. Hydro-clean the surface to remove all traces of material and substances which could compromise the adhesion of any products or systems applied later.

In the case of particularly difficult walls, such as stone or mixed walls, we recommend applying an initial 5 mm thick scratch-coat of the same product or **Mape-Antique Rinzaffo** (not included) (see section ***H.6.1***), to even out the absorbency of the substrate and improve adhesion of the render.

If "reinforced" render is required, also apply zinc-plated steel mesh dimensioned according to design specifications (diameter of steel wire and size of mesh) (not included) (see section ***H.2***). The mesh must be fixed in place to the wall with steel nails and/or plugs with a small gap between the wall so that it becomes embedded in the middle of the layer of render.

Wait until the scratch-coat layer starts to set, if applied, then apply a single layer up to 25 mm thick of "structural" render by trowel or with a continuous-feed rendering machine, starting from the bottom working upwards. If the thickness required is higher than 25 mm, apply the render in several layers. Apply each layer without tamping the previous layer. After applying the render, wait a few minutes and level off the surface using an aluminium H-type or blade-type straight edge by passing over the surface horizontally and vertically until it is flat. Remove the vertical guides, if they have been used, and fill the gaps with the same product. Finish off the surface of the render with a damp sponge float.

The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	light hazel
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	2,000
Porosity of the mortar while still fresh: (EN 1015-7) (%)	7
Compressive strength after 28 days: (EN 1015-11)	> 15 Category CS IV

Adhesion to substrate: (EN 1015-12) (N/mm²)	≥ 0.7 Failure mode (FB) = A/C
Initial shear strength (f_{vok}): (EN 998-2 Appendix C) (N/mm²)	0.15
Static modulus of elasticity (after 28 days): (EN 13412) (N/mm²)	10,000
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.2 Category W 2
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	60
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	1
Reaction to fire: (EN 13501-1):	Class E
Consumption (kg/m²):	approx. 17 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of surfaces and saturation of substrate with water immediately before applying the mortar;
- application of mortar by trowel or rendering machine;
- levelling off surfaces with a straight edge and final tamping;
- careful curing of the mortar for the first 36-48 hours by spraying water on the surface;

– per m² per cm of thickness *.....(€/m²·cm)*

H.10 SKIMMING COATS ON DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.10.1 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, ULTRA FINE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

Supply and application of ultra fine-grained, cement-free, lime and Eco-Pozzolan skimming mortar with ultra-fine, natural sand and special additives (such as **Mape-Antique FC Ultrafine** produced by MAPEI S.p.A.), to obtain a smooth finish on render.
The mortar must be suitable for use on site to make salt-resistant, ultra fine-grained, smooth-finish, plastic-consistency, transpirant finishing mortar with good workability using a flat, metal trowel, for application on vertical surfaces and ceilings.
Apply the finishing mortar after adequate preparation of the substrate (not included) by removing all loose or detached areas, to obtain a clean, sound substrate with no traces of dust or crumbling portions. We also recommend that the surface of new render is planed with a metal-tipped cutter to remove any surface laitance and make it easier for the skimming compound to adhere and prevent the formation of air bubbles. Apply the product in 1 mm thick layers on a damp substrate using a flat, metal trowel, pressing down slightly to promote adhesion and remove air bubbles entrapped in the porosity of the render. Apply further layers of the product as soon as the previous finishing coat starts to set, until the required finish is obtained. Once hardened, smooth over **Mape-Antique FC Ultrafine** with a slightly dampened, flat, metal trowel to obtain a mirror finish.
The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS II, and must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate: (EN 1015-1) (μm)	< 100
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,700
Compressive strength (after 28 days): (EN 1015-11)	2.5 Category CS II
Adhesion to substrate (brickwork): (EN 1015-12) (N/mm²)	= 0.8 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 0
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	= 20
Thermal conductivity ($?_{10,dry}$): (EN 1745) (W/m·K)	0.39
Reaction to fire: (EN 13501-1):	Class E
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²):	approx. 1.3 (per mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- planing of surfaces, where required;
- wetting/damping of surfaces immediately before applying the skimming mortar;
- application of the finishing mortar with a flat, metal trowel;
- finishing off the surface with a flat, metal trowel or sponge float.

– per m² ……*(€/m²·mm)*

H.10 SKIMMING COATS ON DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.10.2 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, FINE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

Supply and application of fine-grained, cement-free, lime and Eco-Pozzolan skimming mortar with fine, natural sand and special additives (such as **Mape-Antique FC Civile** produced by MAPEI S.p.A.), to obtain a natural finish on render.
The mortar must be suitable for use on site to make salt-resistant, fine-grained, natural-finish, plastic-consistency, transpirant finishing mortar with good workability using a flat, metal trowel, for application on vertical surfaces and ceilings.
Apply the finishing mortar after adequate preparation of the substrate (not included) by removing all loose or detached areas, to obtain a clean, sound substrate with no traces of dust or crumbling portions. We also recommend that the surface of new render is planed with a metal-tipped cutter to remove any surface laitance and make it easier for the finishing compound to adhere and prevent the formation of air bubbles. Apply the product in layers up to 2 mm thick on a damp substrate using a flat, metal trowel, pressing down slightly to promote adhesion and remove air bubbles entrapped in the porosity of the render. Apply further layers of the product as soon as the previous finishing layer starts to set. The surface of **Mape-Antique FC Civile** may be finished off with a slightly damp sponge float using a rotary movement after the product has started to set.
The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	white or brick
Maximum size of aggregate: (EN 1015-1) (μm)	400
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,800
Compressive strength after 28 days: (EN 1015-11)	10 Category CS IV
Adhesion to substrate: (EN 1015-12) (N/mm²)	≥ 0.6 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 2
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	≤ 15
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	0.67
Reaction to fire: (EN 13501-1):	Class E
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²):	approx. 1.4 (per mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- planing of surfaces, where required;
- wetting/damping of surfaces immediately before applying the finishing mortar;
- application of the finishing mortar with a flat, metal trowel;
- finishing off the surface with a sponge float.

– per m² *.....(€/m²·mm)*

H.10 SKIMMING COATS ON DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.10.3 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, COARSE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

Supply and application of coarse-grained, cement-free, lime and Eco-Pozzolan finishing mortar with coarse, natural sand and special additives (such as **Mape-Antique FC Grosso** produced by MAPEI S.p.A.), to obtain a coarse finish on render.

The mortar must be suitable for use on site to make salt-resistant, coarse-grained, plastic-consistency, transpirant finishing mortar with good workability using a flat, metal trowel, for application on vertical surfaces and ceilings.

Apply the finishing mortar after adequate preparation of the substrate (not included) by removing all loose or detached areas, to obtain a clean, sound substrate with no traces of dust or crumbling portions. We also recommend that the surface of new render is planed with a metal-tipped cutter to remove any surface laitance and make it easier for the finishing compound to adhere and prevent the formation of air bubbles. Apply the product in layers up to 3 mm thick on a damp substrate using a flat, metal trowel, pressing down slightly to promote adhesion and remove air bubbles entrapped in the porosity of the render. Apply further layers of the product as soon as the previous finishing layer starts to set. The surface of **Mape-Antique FC Grosso** may be finished off with a slightly damp sponge float using a rotary movement after the product has started to set.

The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate: (EN 1015-1) (μm)	600
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,700
Compressive strength after 28 days: (EN 1015-11)	6 Category CS IV
Adhesion to substrate: (EN 1015-12) (N/mm²)	≥ 0.5 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 2
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	≤ 15
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	0.45
Reaction to fire: (EN 13501-1):	Class E
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²):	approx. 1.4 (per mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- planing of surfaces, where required;
- wetting/damping of surfaces immediately before applying the finishing mortar;
- application of the finishing mortar with a flat, metal trowel;
- finishing off the surface with a sponge float.

– per m² *.....(€/m²·mm)*

H.10 SKIMMING COATS ON DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.10.4 APPLICATION OF TRANSPIRANT, SALT-RESISTANT, FINE-GRAINED, LIME AND ECO-POZZOLAN SKIMMING MORTAR

Supply and application of fine-grained, cement-free, lime and Eco-Pozzolan finishing mortar with fine, natural sand and special additives (such as **PoroMap Finitura** produced by MAPEI S.p.A.), to obtain a natural finish on render.

The mortar must be suitable for use on site to make salt-resistant, fine-grained, natural-finish, plastic-consistency, transpirant finishing mortar with good workability using a flat, metal trowel, for application on vertical surfaces and ceilings.

Apply the finishing mortar after adequate preparation of the substrate (not included) by removing all loose or detached areas, to obtain a clean, sound substrate with no traces of dust or crumbling portions. We also recommend that the surface of new render is planed with a metal-tipped cutter to remove any surface laitance and make it easier for the finishing compound to adhere and prevent the formation of air bubbles. Apply the product in layers up to 2 mm thick on a damp substrate using a flat, metal trowel, pressing down slightly to promote adhesion and remove air bubbles entrapped in the porosity of the render. Apply further layers of the product as soon as the previous finishing layer starts to set. The surface of **PoroMap Finitura** may be finished off with a slightly damp sponge float using a rotary movement after the product has started to set.

The product must meet the minimum requirements of EN 998-1 Standards, classified GP (General-purpose masonry mortar for internal/external render) Category CS IV, and must have the following performance characteristics:

Appearance:	powder
Colour:	white
Maximum size of aggregate: (EN 1015-1) (μm)	400
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,800
Compressive strength after 28 days: (EN 1015-11)	10 Category CS IV
Adhesion to substrate: (EN 1015-12) (N/mm²)	≥ 0.6 Failure mode (FB) = B
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	Category W 2
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	≤ 15
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	0.67
Reaction to fire: (EN 13501-1):	Class E
Resistance to sulphates (Anstett test):	high
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²):	approx. 1.4 (per mm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- planing of surfaces, where required;
- wetting/damping of surfaces immediately before applying the finishing mortar;
- application of the finishing mortar with a flat, metal trowel;
- finishing off the surface with a sponge float.

– per m² *.....(€/m²·mm)*

H.11.1 APPLICATION OF SALT-RESISTANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

Supply and application of salt-resistant, natural hydraulic lime and Eco-Pozzolan masonry mortar with natural sand, special additives and micro-fibres (such as **Mape-Antique Allettamento** produced by MAPEI S.p.A.), to form transpirant installation layers for both new brick, stone, tuff and mixed load-bearing and buffer masonry and load-bearing and buffer masonry requiring reconstruction, including with an "exposed" finish.

The mortar must be suitable for use on site to make plastic-thixotropic, trowelable installation mortar which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles, the leaching action of rainwater and alkali-aggregate reactions, and is used for building new brick, stone, tuff and mixed masonry and for reconstructing existing masonry, including with an "exposed" finish.

Apply the mortar by trowel after saturating the construction elements (bricks, stone and tuff) to prevent them drawing off water from the product and compromising its performance characteristics. Eliminate any excess water with compressed air. Form a "laying bed" and then lay the construction elements in place while applying a light pressure to make sure they are held in the right position. Remove excess mortar from the laying bed and construction elements with a trowel.

On "exposed-finish" masonry, pass over the mortar joints between the construction elements with a damp sponge. If required, spread a suitable transparent, transpirant, water-repellent treatment over the surface, such as **Antipluviol S** (see section ***H.13.1***) or **Antipluviol W** (see section ***H.13.2***) produced by MAPEI S.p.A.

The product must meet the minimum requirements of EN 998-2 Standards, classified G (Guaranteed-performance, general-purpose masonry mortar for external use on elements with structural requirements) class M 5, and must have the following performance characteristics:

Appearance:	powder
Colour:	straw yellow
Maximum size of aggregate: (EN 1015-1) (mm)	1.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,950
Porosity of the mortar while still fresh: (EN 1015-7) (%)	6
Compressive strength after 28 days: (EN 1015-11)	Class M 5
Adhesion to substrate: (EN 1015-12) (N/mm²)	> 0.5 Failure mode (FB) = B
Initial shear strength: (EN 998-2 Appendix C) (N/mm²)	0.15
Capillary action water absorption: (EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.3
Coefficient of permeability to water vapour: (EN 1015-19) (μ)	15/35
Thermal conductivity ($\lambda_{10,dry}$): (EN 1745) (W/m·K)	0.77

Reaction to fire:	
(EN 13501-1):	Class A1
Resistance to sulphates	
(ASTM 1012 mod.) (%):	< 0.02
Saline efflorescence	
(after semi-immersion in water):	absent
Consumption (kg/m²):	16.5 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- saturation of construction elements;
- creation of a “laying bed” of installation mortar;
- positioning the construction elements;
- removal of excess mortar;

– per m² per cm of thickness *.....(€/m²·cm)*

H.11.2 APPLICATION OF HIGH-STRENGTH, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MORTAR FOR INSTALLING MASONRY

Supply and application of salt-resistant, natural hydraulic lime and Eco-Pozzolan masonry mortar with natural sand, special additives, micro-fibres and glass fibres (such as **Mape-Antique Strutturale NHL** produced by MAPEI S.p.A.), to form transpirant installation layers for both new brick, stone, tuff and mixed load-bearing and buffer masonry and load-bearing and buffer masonry requiring reconstruction, including with an "exposed" finish.

The mortar must be suitable for use on site to make high-strength, fibre-reinforced, plastic-thixotropic, trowelable installation mortar which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles, the leaching action of rainwater and alkali-aggregate reactions, and is used for building new brick, stone, tuff and mixed masonry and for reconstructing existing masonry, including with an "exposed" finish.

Apply the mortar by trowel after saturating the construction elements (bricks, stone and tuff) to prevent them drawing off water from the product and compromising its performance characteristics. Eliminate any excess water with compressed air. Form a "laying bed" and then lay the construction elements in place while applying a light pressure to make sure they are held in the right position. Remove excess mortar from the laying bed and construction elements with a trowel.

On "exposed-finish" masonry, pass over the mortar joints between the construction elements with a damp sponge. If required, spread a suitable transparent, transpirant, water-repellent treatment over the surface, such as **Antipluviol S** (see section ***H.13.1***) or **Antipluviol W** (see section ***H.13.2***) produced by MAPEI S.p.A.

The product must meet the minimum requirements of EN 998-2 Standards, classified G (Guaranteed-performance, general-purpose masonry mortar for external use on elements with structural requirements) class M 15, and must have the following performance characteristics:

Appearance:	powder
Colour:	light hazel
Maximum size of aggregate: (EN 1015-1) (mm)	2.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	2,000
Porosity of the mortar while still fresh: (EN 1015-7) (%)	7
Compressive strength after 28 days: (EN 1015-11)	> 15 Class M 15
Adhesion to substrate (brickwork): (EN 1015-12) (N/mm²)	≥ 0.7 Failure mode (FB) = A/C

Initial shear strength (f_{vok}):	
(EN 998-2 Appendix C) (N/mm²)	0.15
Static modulus of elasticity (after 28 days):	
(EN 13412) (N/mm²)	10,000
Capillary action water absorption:	
(EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.2
	Category W2
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	60
Thermal conductivity ($\lambda_{10,dry}$):	
(EN 1745) (W/m·K)	1
Reaction to fire:	
(EN 13501-1):	Class E
Consumption (kg/m²):	approx. 17 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director: :

- saturation of construction elements;
- creation of a “laying bed” of installation mortar;
- positioning the construction elements;
- removal of excess mortar;

– per m² per cm of thickness *……(€/m²·cm)*

H.12.1 POINTING MASONRY JOINTS USING SALT-RESISTANT, NATURAL HYDRAULIC LIME AND ECO-POZZOLAN MASONRY MORTAR

Supply and application of salt-resistant, cement-free, natural hydraulic lime and Eco-Pozzolan masonry mortar with natural sand, special additives and micro-fibres (such as **Mape-Antique Allettamento** produced by MAPEI S.p.A.), used to point brick, stone, tuff and mixed load-bearing and buffer masonry with an "exposed" finish, including masonry of historical and artistic interest.
The mortar must be suitable for use on site to make plastic-thixotropic, trowelable mortar which is resistant to aggression from various chemical-physical phenomena, in particular the presence of soluble salts, freeze-thaw cycles, the leaching action of rainwater and alkali-aggregate reactions, and is used for pointing between rows of construction elements (bricks, stone and tuff) on "exposed" finish wall faces.
Apply the mortar by trowel after adequate preparation of the substrate (not included) by manually or mechanically cutting out deteriorated mortar from joints, to obtain a sound, compact substrate with no crumbling or unstable areas and no traces of dust or mildew, without compromising the integrity of the face of the wall. Clean the masonry by low-pressure hydro-cleaning to remove all traces of efflorescence and soluble salts from the surface.
Saturate the substrate with water to prevent it drawing off water from the mortar and compromising its final performance characteristics. Eliminate any excess water with compressed air. Apply one or more layers of mortar according to the depth and length of the rows to be filled, pressing down slightly to favour adhesion with the substrate. Remove any excess mortar immediately after application, including from the construction elements. Pass over the mortar joints between the construction elements with a damp sponge. If required, spread a suitable transparent, transpirant, water-repellent treatment over the surface, such as **Antipluviol S** (see section ***H.13.1***) or **Antipluviol W** (see section ***H.13.2***) produced by MAPEI S.p.A.
The product must meet the minimum requirements of EN 998-2 Standards, classified G (Guaranteed-performance, general-purpose masonry mortar for external use on elements with structural requirements) class M 5, and must have the following performance characteristics:

Appearance:	powder
Colour:	straw yellow
Maximum size of aggregate: (EN 1015-1) (mm)	1.5
Bulk density of fresh mortar: (EN 1015-6) (kg/m³)	1,950
Porosity of the mortar while still fresh: (EN 1015-7) (%)	6
Compressive strength after 28 days: (EN 1015-11)	Class M 5
Adhesion to substrate: (EN 1015-12) (N/mm²)	> 0.5 Failure mode (FB) = B

Initial shear strength:	
(EN 998-2 Appendix C) (N/mm²)	0.15
Capillary action water absorption:	
(EN 1015-18) [kg/(m²·min$^{0.5}$)]	< 0.3
Coefficient of permeability to water vapour:	
(EN 1015-19) (μ)	15/35
Thermal conductivity ($\lambda_{10,dry}$):	
(EN 1745) (W/m·K)	0.77
Reaction to fire:	
(EN 13501-1):	Class A1
Resistance to sulphates	
(ASTM C 1012 mod.) (%):	< 0.02
Saline efflorescence (after semi-immersion in water):	absent
Consumption (kg/m²):	1.65 (per cm of thickness)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:

- hydro-cleaning of the masonry;
- saturation of the substrate;
- application of the mortar;
- removal of excess mortar;
- finishing the mortar joints with a sponge;

– per m² per cm of thickness ……*(€/m²·cm)*

H.13 PROTECTIVE WATER-REPELLENT TREATMENTS FOR "EXPOSED" MASONRY AND RENDER

H.13.1 PAINTING AND COATING RENDER WITH A PAINTED SURFACE

Supply and application of transparent, water-repellent, silane and siloxane-based impregnator in solvent (such as **Antipluviol S** produced by MAPEI S.p.A.). Apply one or more generous coats of the product.

The impregnator must have the following special characteristics:

Colour:	transparent
Density (g/cm³):	approx. 0.80
Active substance content (%):	9
Brookfield viscosity (mPa·s):	approx. 5 (rotor 1 - 50 revs)
Consumption (kg/m²):	0.15-2 (according to the absorption of the substrate)
Penetration depth (mm):	4
result/class:	I (< 10 mm)
Water absorption and absorption ratio UNI EN 13580	
Resistance to alkalis compared with untreated areas (%):	2.6
result/class:	compliant (< 7.5%)
Absorption ratio compared with untreated surface after immersion in alkali (%):	6.6
result/class:	compliant (< 10%)
Drying speed by hygrophobing impregnation	
drying speed coefficient (UNI EN 13579) (%):	> 30
result/class:	I (> 30%)
Loss in mass after freeze-thaw cycles with de-icing salts (UNI EN 13581)	
n° of cycles for treated surface:	> 50
n° of cycles for untreated surface:	9
Δ cycles treated - untreated	> 41
result/class:	compliant (Δ cycles > 20)
hazardous substances result/class:	compliant

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

.....(€/m²)

H.13 PROTECTIVE WATER-REPELLENT TREATMENTS FOR "EXPOSED" MASONRY AND RENDER

H.13.2 APPLICATION OF TRANSPARENT, WATER-REPELLENT, SILANE AND SILOXANE BASED IMPREGATOR IN WATER EMULSION

Supply and application of silane and siloxane-based impregnator in watery emulsion (such as **Antipluviol W** produced by MAPEI S.p.A.). Apply several coats of the product until the substrate is saturated.

The finishing product must have the following characteristics:

Appearance:	milky fluid liquid
Active substance content (%):	8
Density (g/cm³):	approx. 1.01
Capillary action water absorption coefficient (W_{24}) (UNI EN 1062-3) [kg/(m²·h$^{0.5}$)]:	
Brick coating:	0.04
Traditional render:	0.03
Tuff stone:	0.06
Cementitious skimming mortar:	0.05

According to UNI EN 1062-3 standards values < 0.1, therefore class III, corresponding to low water absorption.

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.1 PAINTING AND COATING EXTERNAL SURFACES AND DEHUMIDIFYING RENDER

H.14.1.1 Painting

Supply and application of one-component, modified silicate paint with selected fillers and light-resistant pigments (such as Silexcolor Paint produced by MAPEI S.p.A). Apply two coats of the product one after the other by brush, with a roller or by spray after applying a coat of suitable modified silicate primer (such as **Silexcolor Primer** or **Silexcolor Base Coat** produced by MAPEI S.p.A.).
The paint must have the following special characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1.46
Dry solids content (%):	55
Brookfield Viscosity (mPa·s):	14,000 (rotor 6 - 20 revs)
Dusty dry:	20-30 min.
Maximum organic content:	according to DIN 18363
Vapour diffusion resistance coefficient (DIN 52615) (μ):	214
Resistance to passage of vapour of a 100 μm thick layer in equivalent metres of air S_D (DIN 52615) (m):	0.02
Capillary action water absorption coefficient (W_{24}) (DIN 52617) in kg/(m²·h$^{0.5}$):	0.120
Waiting time between each coat:	12 hours (at 20°C)
Drying time:	24 hours
Consumption (kg/m²):	0.35-0.45 (for two coats)

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.1.2 Application of thin coats of coloured coating

Supply and application of transpirant, coloured, modified potassium silicate mineral paste coating (such as **Silexcolor Tonachino** produced by MAPEI S.p.A) after applying a coat of suitable primer (such as **Silexcolor Primer** or **Silexcolor Base Coat** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1.65-1.95 (according to the grain size)
Dry solids content (%):	80
Dusty dry:	20-30 min. in the open air
Vapour diffusion resistance coefficient (DIN 52615) (μ):	39
Resistance to passage of vapour of a 1.5 mm-thick layer in equivalent metres of air S_D (DIN 52615) (m):	0.059
Capillary action water absorption coefficient (W_{24}) (DIN 52617) in kg/(m²·h$^{0.5}$):	0.09
Waiting time between each coat:	12-24 hours
Consumption (kg/m²):	1.7-3.0 (according to grain size of the product and roughness of substrate)

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.1.3 Fine-grained, scratch-effect silicate coating for internal and external use

Supply and application of transpirant, scratch-effect, modified potassium silicate mineral paste coating (such as **Silexcolor Graffiato** produced by MAPEI S.p.A) after applying a coat of suitable primer (such as **Silexcolor Primer** or **Silexcolor Base Coat** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Dry solids content (%):	80
Density (g/cm³):	1.7-1.8 (according to the grain size)
Dusty dry:	20-30 min. in the open air
Vapour diffusion resistance coefficient (DIN 52615) (μ):	39
Resistance to passage of vapour of a 1.5 mm-thick layer in equivalent metres of air S_D (DIN 52615) (m):	0.059
Capillary action water absorption coefficient (W_{24}) (DIN 52617) in kg/(m²·h$^{0.5}$):	0.09
Waiting time between each coat:	12-24 hours
Consumption (kg/m²):	1.9-2.8 (according to grain size of the product and roughness of substrate)

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

.....(€/m²)

H.14.1.4 Application of ultra-fine grained skimming plaster

Supply and application of highly transpirant, fine-grained, modified potassium silicate, mineral plaster with a satin finish, in compliance with DIN 18363 standards (such as **Silexcolor Marmorino** produced by MAPEI S.p.A.). Apply the product using the following procedure after treating the surface with a suitable primer (such as **Silexcolor Primer** produced by MAPEI S.p.A.).

- Spread on the first layer of **Silexcolor Marmorino** using a steel trowel to form an evenly-thick layer.
- When it is dry, go over the surface with fine-grained abrasive paper, and apply a second layer of **Silexcolor Marmorino** in a different colour to the first layer (normally the same tone) using a triangular plasterer's trowel.
- Repeat the operation several times according to requirements, going over the surface with abrasive paper between each layer.
- Polish the surface using the blade edge of a steel trowel.

The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1,610
Dry solids content (%):	67
Vapour diffusion resistance coefficient (DIN 52615) (μ):	50
Resistance to the passage of vapour of a 1 mm thick layer in equivalent metres of air S*D* (DIN 52615):	0.050 m
Capillary action water absorption coefficient (W24) (DIN 52617) (kg/m²·$h^{0.5}$):	0.110
$SD \cdot W_{24} = 0.050 \cdot 0.11$:	0.006 kg/m·$h^{0.5}$
Waiting time before painting over:	12-24 hours

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.2 PROTECTING AND DECORATING USING SILOXANE-BASED PRODUCTS

H.14.2.1 Painting

Supply and application of highly transpirant and highly water-repellent siloxane resin paint in water dispersion (such as **Silancolor Paint** produced by MAPEI S.p.A). Apply two coats of paint one after the other by brush, with a roller or by spray after applying a coat of suitable primer (such as **Silancolor Primer** or **Silancolor Base Coat** produced by MAPEI S.p.A.).
The paint must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1.58
Dry solids content (%):	65
Vapour diffusion resistance coefficient (DIN 52615) (μ):	600
Resistance to passage of vapour of a 100 μm thick layer in equivalent metres of air S_D (DIN 52615):	0.06
Capillary action water absorption coefficient (W_{24}) (DIN 52617) in kg/(m²·h$^{0.5}$):	0.06
Waiting time between each coat:	12-24 hours
Consumption (kg/m²):	0.20-0.30 (for two coats)

All other operations included and calculated in the price for work completed according to specification
.....(€/m²)

H.14.2.2 Application of mould and mildew-resistant paint

Supply and application of highly transpirant, highly water-repellent, mould and mildew-resistant siloxane resin paint in water dispersion (such as **Silancolor Paint Plus** produced by MAPEI S.p.A). Apply at least two coats of paint by brush, with a roller or by spray after applying a coat of suitable primer (such as **Silancolor Primer Plus** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Appearance:	thick liquid
Dry solids content (%):	65
Density (g/cm³):	approx. 1.55
Theoretical yield (m²/kg):	3-5
Damp abrasion:	> 10,000 cycles
Change in colour (white) after 1,000 hours exposure to a Weather-Ometer (according to ASTM G 155 cycle 1):	⊠E < 1
Change in colour (grey) after 1,000 hours exposure to a Weather-Ometer (according to ASTM G 155 cycle 1):	⊠E < 1
Vapour diffusion resistance coefficient (DIN 52615) (μ):	339
Resistance to the passage of vapour of a 0.20 mm thick layer in equivalent metres of air S*D* (DIN 52615) (m):	0.07
Capillary action water absorption coefficient (W_{24}) (DIN 52617) [kg/(m²$h^{0.5}$)]:	0.09
$S_D \cdot W_{24}$ =:	0.006 kg/(m·$h^{0.5}$)

The value of $S_D \cdot W_{24}$ is less than 0.1, therefore Silancolor Paint Plus respects Kuenzle's Theory (DIN 18550).
All other operations included and calculated in the price for work completed according to specification

.....(€/m²)

H.14.2.3 Application of thin layers of coloured coating

Supply and application of highly transpirant and highly water-repellent siloxane resin paste coating in water dispersion (such as **Silancolor Tonachino** produced by MAPEI S.p.A). Apply one or more coats of paste coating using a stainless steel or plastic trowel after applying a coat of suitable primer (such as **Silancolor Primer** or **Silancolor Base Coat** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Dry solids content (%):	approx. 80
Density (g/cm³):	1.65-1.95
Vapour diffusion resistance coefficient (DIN 52615) (μ):	178
Resistance to passage of vapour of a 1.5 mm-thick layer in equivalent metres of air S_D (DIN 52615) (m):	0.267
Capillary action water absorption coefficient: (W_{24}) (DIN 52617) in kg/(m²·h$^{0.5}$):	0.12
$S_D \cdot W_{24}$ = 0.267·0.12:	0.032 kg/(m·h$^{0.5}$)

The value of S_D·W is less than 0.1, therefore **Silancolor Tonachino** respects KUENZLE's Theory (DIN 18550).

Waiting time between each coat:	12-24 hours
Consumption (kg/m²):	1.7-3.0 (according to grain size of the product and roughness of substrate)

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

……*(€/m²)*

H.14.2.4 Application of thin layers of mould and mildew-resistant coloured coating

Supply and application of highly transpirant, highly water-repellent, mould and mildew-resistant siloxane resin paste coating in water dispersion (such as **Silancolor Tonachino Plus** produced by MAPEI S.p.A). Apply one or more layers of paste coating using a stainless steel or plastic trowel after applying a coat of suitable primer (such as **Silancolor Primer Plus** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1.65-1.90
Dry solids content (%):	approx. 80
Vapour diffusion resistance coefficient (DIN 52615) (μ):	178
Resistance to the passage of vapour of a 1.5 mm thick layer in equivalent metres of air S_D (DIN 52615):	0.267
Capillary action water absorption coefficient (W_{24}) (DIN 52617) (kg/m²·h$^{0.5}$):	0.12
$S_D \cdot W_{24}$ = 0.267·0.12:	0.032 kg/(m²·h^{0,5})

The value of $S_D \cdot W_{24}$ is less than 0.1, therefore **Silancolor Tonachino Plus** respects Kuenzle's Theory (DIN 18550).

Waiting time before applying other layers:	12-24 hours
Consumption (kg/m²):	1.7-2.3 (according to the grain size of the product and roughness of the substrate)

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

.....(€/m²)

H.14.2.5 Scratch-effect siloxanic coating for internal and external use

Supply and application of highly transpirant and highly water-repellent, scratch-effect siloxane resin paste coating in water dispersion (such as **Silancolor Graffiato** produced by MAPEI S.p.A). Apply one or more coats of paste coating using a stainless steel or plastic trowel after applying a coat of suitable primer (such as **Silancolor Primer** or **Silancolor Base Coat** produced by MAPEI S.p.A.).

The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1.7-1.8
Dry solids content (%):	approx. 80
Vapour diffusion resistance coefficient (DIN 52615) (μ):	178
Resistance to passage of vapour of a 1.5 mm-thick layer in equivalent metres of air S_D (DIN 52615) (m):	0.267
Capillary action water absorption coefficient (W_{24}) (DIN 52617) in kg/(m²·h$^{0.5}$):	0.12
$S_D \cdot W_{24} = 0.267 \cdot 0.12$:	0.032 kg/(m·h$^{0.5}$)

The value of S_D W_{24} is less than 0.1, therefore **Silancolor Graffiato** respects KUENZLE's Theory (DIN 18550).

Waiting time between each coat:	12-24 hours
Consumption (kg/m²):	1.9-2.8 (according to grain size of the product and roughness of substrate)

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

……*(€/m²)*

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.3 PROTECTING AND DECORATING USING ACRYLIC PRODUCTS WITH QUARTZ

H.14.3.1 Painting

Supply and application of acrylic resin paint in water dispersion with micro-granular quartz, pigments and selected fillers (such as **Quarzolite Paint** produced by MAPEI S.p.A). Apply the product by brush, with a roller or by spray after applying a coat of suitable primer (such as **Malech** or **Quarzolite Base Coat** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Appearance:	thick liquid
Dry solids content (%):	66
Density (g/cm³):	approx. 1.55
Damp abrasion DIN 53778:	> 5,000 cycles
Change in colour (blue) after 800 hours exposure to a Weather-Ometer:	⊠E < 2
Vapour diffusion resistance coefficient S_D *(m) (DIN 52615):*	0.04
Capillary action water absorption coefficient (W_{24}) [(kg/(m²h$^{0.5}$)] (DIN 52617):	1.21
Waiting time before applying other coats:	12-24 hours
Consumption (kg/m²):	0.30-0.40 (for two coats)

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

.....(€/m²)

H.14.3.2 Application of thin layers of coloured coating

Supply and application of acrylic resin paste coating in water dispersion with pigments and selected fillers (such as **Quarzolite Tonachino** produced by MAPEI S.p.A). Apply one or more layers of paste coating with a stainless steel or plastic trowel after applying a coat of suitable primer (such as **Malech** or **Quarzolite Base Coat** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Dry solids content (%):	85
Density (g/cm³):	1.65-1.95 (according to the grain size)
Waiting time before applying other coats:	12-24 hours
Dilution ratio:	ready to use
Consumption (kg/m²):	1.7-3.0 (according to the grain size of the product and roughness of the substrate)

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.3.3 Application of thin layers of mould and mildew-resistant coloured coating

Supply and application of acrylic resin paste coating in water dispersion for walls resistant to the growth of mould and mildew with pigments and selected fillers (such as **Quarzolite Tonachino Plus** produced by MAPEI S.p.A). Apply one or more layers of paste coating using a stainless steel or plastic trowel after applying a coat of suitable primer (such as **Silancolor Primer Plus** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Density (g/cm³):	1.55-1.85 (according to grain size).
Dry solids content (%):	approx. 85
Waiting time before painting over:	12-24 hours
Consumption (kg/m²):	1.9-2.6 (according to the grain size of the product and roughness of the substrate)

All other operations included and calculated in the price for work completed according to specification
.....(€/m²)

H.14.3.4 Application of thin layers of scratch-effect coloured coating

Supply and application of scratch-effect acrylic resin paste coating in water dispersion with pigments and selected fillers (such as **Quarzolite Graffiato** produced by MAPEI S.p.A). Apply one or more layers of paste coating with a stainless steel or plastic trowel after applying a coat of suitable primer (such as **Malech** or **Quarzolite Base Coat** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Dry solids content (%):	85
Density (g/cm³):	1.65-1.95 (according to the grain size)
Waiting time before applying other layers:	12-24 hours
Dilution ratio:	ready to use
Consumption (kg/m²):	1.9-2.8 (according to the grain size of the product and roughness of the substrate)

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.4 PROTECTING AND DECORATING USING PURE ACRYLIC, MODIFIED ACRYLIC RESIN AND SYNTHETIC RESIN PRODUCTS

H.14.4.1 Application of washable, water-based modified acrylic resin paint for internal walls

Supply and application of washable, water-based, modified acrylic resin paint in water dispersion with good covering properties and a smooth, matt finish (such as **Dursilite** produced by MAPEI S.p.A). Apply at least two coats of the product using a brush, roller or by spray after applying a suitable primer (such as **Malech** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Appearance:	thick liquid
Dry solids content (%):	65
Density (g/cm³):	approx. 1.50
Theoretical yield per coat (m²/kg):	5-6
Damp abrasion (UNI 10560) (Gardner cycles):	> 5,000
Vapour diffusion resistance coefficient (UNI EN ISO 7783-2) (μ):	40
Resistance to the passage of vapour of a 0.15 mm thick dry coat S_D (m):	0.06
Dirt pick-up (UNI 10792):	< 2 (low)

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

.....(€/m²)

H.14 PROTECTING AND DECORATING DEHUMIDIFYING, TRANSPIRANT AND "STRUCTURAL" RENDER

H.14.4.2 Application of transpirant, water-based synthetic resin paint for internal walls

Supply and application of transpirant, water-based, synthetic resin paint in water dispersion with good covering properties and a smooth finish (such as **Colorite Matt** produced by MAPEI S.p.A). Apply at least two coats of the product using a brush, roller or by spray after applying a suitable primer (such as **Malech** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:	as specified by the Works Director or according to the manufacturer's colour chart
Appearance:	thick liquid
Dry solids content (%):	65
Density (g/cm³):	approx. 1.65
Theoretical yield per coat (m²/kg):	5-6
Vapour diffusion resistance coefficient (UNI EN ISO 7783-2) (μ):	20
Resistance to the passage of vapour of a 0.15 mm thick dry coat S_D (m):	0.03

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

.....(€/m²)

H.14.4.3 Application of pure acrylic paint for internal and external use

Supply and application of pure acrylic resin paint in water dispersion (such as **Colorite Performance** produced by MAPEI S.p.A.). Apply at least two coats of the product using a brush, roller or by spray after applying a suitable primer (such as **Malech** produced by MAPEI S.p.A.).
The finishing product must have the following characteristics:

Colour:		as specified by the Works Director or according to the manufacturer's colour chart
Consistency:		thick liquid
Dry solids content (EN ISO 3251) (%):		approx. 61
Density (EN ISO 2811-1) (g/cm³):		approx. 1.35
Consumption (kg/m²):		0.3-0.4 (in 2 coats)
Permeability to CO_2	(μ):	1,363,475
(UNI EN 1062-6)	S_D for a 0.00015 m thick dry coat (m)	205
	result/class:	compliant (S_D > 50 m)
Permeability to water vapour	(μ):	2648
(UNI EN 7783-1.2)	S_D for a 0.00015 m thick dry coat (m)	0.4
	result/class:	I (S_D < 5 m)
Permeability to water	(W_{24}) [(kg/(m²h^{0,5})]:	0.01
(UNI EN 1062-3)	result/class:	compliant (W_{24} < 0.1)
Thermal compatibility: ageing	7 days at 70°C	
(UNI EN 1062-11 4.1):	result/class:	compliant adherence: 0.8 N/mm²
Thermal compatibility: freeze-thaw cycles with immersion in de-icing salts		
(UNI EN 13687-1)	result/class:	compliant adherence: ≥ 0.8 N/mm²
Thermal compatibility: storm cycles		
(UNI EN 13687-2)	result/class:	compliant adherence: ≥ 0.8 N/mm²
Thermal compatibility: thermal cycles without immersion in de-icing salts		
(UNI EN 13687-3)	result/class:	compliant adherence: ≥ 0.8 N/mm²
Crack resistance static crack-bridging ability		
(UNI EN 1062-7)	crack bridging (mm)	917
	result/class:	A3 (> 0.5 mm)
Crack resistance dynamic crack-bridging ability		
(UNI EN 1062-7)	result/class:	B1
Direct traction adherence test		
(UNI EN 1542)	result/class:	compliant adherence: ≥ 0.8 N/mm²

Reaction to fire		
(EN 13501-1)	euroclass	B s1 d0
Simulated exposure to atmospheric agents		
(UNI EN 1062-11:2002 4.2):	result/class:	compliant
Diffusion of chloride ions		
(UNI 7928)	penetration (mm):	0.0

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

.....(€/m²)

H.15.1 RECONSTRUCTING DAMAGED WOODEN HEADS AND STRUCTURAL ELEMENTS BY SPLICING IN AND BONDING INSERTS

Supply and application of two-component, solvent-free, thixotropic, epoxy adhesive (such as **Mapewood Paste 140** produced by MAPEI S.p.A.), to consolidate wooden structures by replacing damaged wooden heads and structural elements.

The epoxy adhesive must be suitable for use on site by mixing the two components to form high-strength, high-adhesion, thixotropic epoxy grout, to bond wooden inserts to the original structure in combination with stainless steel or fibreglass threaded bar (such as **Maperod G** produced by MAPEI S.p.A.), to replace damaged sections of the structure. If a castable epoxy adhesive is preferred, use **Mapewood Gel 120** two-component, solvent-free, epoxy adhesive gel.

Apply the epoxy grout using a small metal trowel on the vertical and horizontal surfaces after shoring the structure, freeing the heads of the beams from their grip on the wall, removing the damaged heads with a 45° cut, priming the areas to be bonded with a two-component epoxy primer (such as **Mapewood Primer 100** produced by MAPEI S.p.A.), placing the inserts in position, and forming a series of grooves and holes dimensioned according to design specifications.

Then insert the steel or fibreglass bars, and fill all the grooves and holes with strips of the same wood with the same durability as the element being repaired.

The product must have the following performance characteristics:

Appearance:	thick paste
Colour:	light brown
Density of mix (g/cm³):	1.5
Brookfield Viscosity (mPa·s):	490,000 (Helipath F - 5 rpm)
Workability time (min.):	150 (at 10°C) 60 (at 23°C) 30 (at 30°C)
Setting time (min.):	14-16 h (at 10°C) 4-5 h (at 23°C) 2.5-3 h (at 30°C)
Final hardening time:	7 days
Adhesion (compressive shear) wood/wood (deal): (N/mm²)	10
Tensile strength: (ASTM D 638) (N/mm²)	18
Tensile elongation: (ASTM D 638) (%)	1
Compressive strength: (ASTM D 695) (N/mm²)	45

Flexural strength:	
(ISO 178) (N/mm²)	30
Compressive modulus of elasticity:	
(ASTM D 695) (N/mm²)	3,000
Flexural modulus of elasticity:	
(ISO 178) (N/mm²)	4,000
Consumption (kg/dm³):	1.59 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– shoring the structure;
– freeing the heads of the beams;
– removal of the damaged portions with a 45° cut;
– positioning the inserts;
– cutting the grooves and holes;
– application of the epoxy grout;
– inserting the steel or fibreglass bars;
– positioning the wooden strips;
– per dm³ *.....(€/dm³)*

The following are not included:
– stainless steel or fibreglass bars




H.15.2 CONSOLIDATION AND STRENGTHENING OF WOODEN TRUSSES AND MAIN SUPPORT ELEMENTS

Supply and application of two-component, solvent-free, thixotropic, epoxy adhesive (such as **Mapewood Paste 140** produced by MAPEI S.p.A.), to consolidate and strengthen wooden structures. The epoxy adhesive must be suitable for use on site by mixing the two components to form high-strength, high-adhesion, thixotropic epoxy grout, to consolidate and strengthen wooden trusses and main support elements (struts, king post trusses, struts-pendant posts, struts-purlins, etc.), in combination with stainless steel or fibreglass threaded bar (such as **Maperod G** produced by MAPEI S.p.A.). If a castable epoxy adhesive is preferred, use **Mapewood Gel 120** two-component, solvent-free, epoxy adhesive gel.

Apply the epoxy grout using a small metal trowel on vertical and horizontal surfaces after forming a series of grooves and holes dimensioned according to design specifications and positioning the steel or fibreglass bars. Then fill all the grooves and holes with strips of the same wood with the same durability as the element being repaired.

The product must have the following performance characteristics:

Appearance:	thick paste
Colour:	light brown
Density of mix (g/cm³):	1.5
Brookfield Viscosity (mPa·s):	490,000 (Helipath F - 5 rpm)
Workability time (min.):	150 (at 10°C) 60 (at 23°C) 30 (at 30°C)
Setting time (min.):	14-16 h (at 10°C) 4-5 h (at 23°C) 2.5-3 h (at 30°C)
Final hardening time:	7 days
Adhesion (compressive shear) wood/wood (deal): (N/mm²)	10
Tensile strength: (ASTM D 638) (N/mm²)	18
Tensile elongation: (ASTM D 638) (%)	1
Compressive strength: (ASTM D 695) (N/mm²)	45
Flexural strength: (ISO 178) (N/mm²)	30
Compressive modulus of elasticity: (ASTM D 695) (N/mm²)	3,000
Flexural modulus of elasticity: (ISO 178) (N/mm²)	4,000
Consumption (kg/dm³):	1.59 (of cavities to be filled)

Included and calculated in the price for work completed according to specification and prescriptions by the Works Director:
– cutting the grooves and/or holes;
– inserting the bars;
– application of the epoxy grout;
– positioning the wooden strips;
– per dm³ *.....(€/dm³)*
The following are not included:
– removal and repositioning of the elements;
– masonry work;
– stainless steel or fibreglass bars