PALLADIO®
RINFORZA FRCM

Ready-to-use structural, rheoplastic, controlled-shrinkage, fibre-reinforced mortar based on NHL 5 natural hydraulic lime and selected aggregates with a grain size of up to 1.2 mm, specifically formulated as an inorganic matrix for FRCM reinforcement systems.

Product description

PALLADIO RINFORZA FRCM is a structural, re-plastic, fibre-reinforced mortar with controlled shrinkage, based on NHL 5 natural hydraulic lime and micronised calcium carbonate aggregates with a grain size of up to 1.2 mm.
PALLADIO RINFORZA FRCM complies with UNI EN 998-2 as masonry mortar with strength class M15 and complies with UNI EN 998-1 as plaster with class CSIV.
PALLADIO RINFORZA FRCM is specifically developed as inorganic matrix for FRCM reinforcement systems, in combination with PALLADIO GLASS AR glass fibre mesh AR0245.
It is also suitable for interventions on brick, natural stone and tuff masonry, which require high resistance without compromising mechanical and material compatibility, such as reinforced joints or the execution of a breathable smoothing for regularization and reinforcement.
Compatibility with historic masonry is guaranteed by the low modulus of elasticity and absence of organic components.

Supply and storage

PALLADIO RINFORZA FRCM is supplied in special bags on pallets with stretch wrapping.
Store in a cool, dry and non-ventilated place. Keep the packaging intact.
The product in its original packaging and correctly stored will keep for 12 months from the date of the production batch.

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Features

- Specification for FRCM inorganic matrix reinforcement systems
- High material compatibility with historical masonry. Does not contribute water-soluble salts and does not react in the presence of sulphates. Free of organic components
- High breathability thanks to the composition based on natural hydraulic lime NHL 5
- High mechanical compatibility with historic masonry due to low modulus of elasticity
- Mechanical resistance to compression at the end of curing greater than 15 N/mm2
- Very workable, versatile and easy to apply

Fields of application

PALLADIO RINFORZA FRCM is a mortar specifically developed for use with GLASS AR0245 in the definition of a fibre-reinforced composite system with inorganic matrix (FRCM), for low thickness structural reinforcement and, in particular, for:

- Static and seismic improvement of masonry, arches, vaults and domes in solid and perforated brickwork, natural stone and tuff
- The execution of an anti-liftoff system for walls and curtain walls

The reinforcement system provides the masonry with a resource against tensile stresses, maintaining a low thickness (theoretical maximum of 15 mm). In this way, the increase in strength is accompanied by limited increases in weight and stiffness and does not alter the structural behaviour. The system is highly compatible with historic buildings, both from a material and aesthetic point of view, and from a structural point of view, since it does not replace the masonry in its resistant function and does not deprive it of its structural dignity.
PALLADIO RINFORZA FRCM is also a suitable mortar for:

- Repair of cracks or reinforcement of exposed mutations using the reinforced joint reinforcement technique
- Repairing wounds using the ‘stitch-stitch’ technique
- Breathable levelling and reinforcement compounds

Media preparation

Structural reinforcement work must be preceded by a correct analysis and preparation of the substrate in a workmanlike manner, according to the design indications and the prescriptions of the Works Director.
In general, the objective is to obtain a monolithic body, in which the reinforcement and the existing masonry work together homogeneously for the structural behaviour.
To do this, the following steps must be followed, always and in any case in accordance with the project regulations and the project manager:

1. In the case of work on walls and vault intradoses, completely remove the existing plasterwork, expose the structural elements of the structure to be reinforced, until a sound and compact support is obtained. In the case of extradossal reinforcement of vaults, remove the flooring and backing.
2. If necessary, and in accordance with the design provisions and the supervision of works, repair the masonry using materials that correspond as closely as possible to the originals, or repair the masonry by “stitching and gluing” until a surface suitable for reinforcement is obtained. In the case of disordered masonry, with the presence of cavities and loose material, evaluate the intervention with a consolidating injection.
3. In any case, immediately before applying the inorganic matrix, clean and saturate the support surface by means of low-pressure washing, allowing excess surface water to evaporate and taking care to remove dust and loose parts, as well as traces of oil, grease, waxes, etc. Remove any efflorescence and saline concretions by washing or mechanical means (brushing, sandblasting, hydro-sandblasting), taking care to remove the residues from the foot of the masonry. The substrate must be clean, sound and compact, with an adequate degree of roughness.

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Methods of application

Product preparation

PALLADIO RINFORZA FRCM is prepared in a concrete mixer by mixing each 25 kg bag with a maximum of approx. 4.75 litres of water (approx. 19%).

1. Place clean water in the concrete mixer at a rate of about 4 litres per bag of RINFORZA FRCM.
2. Introduce the mortar powder, adding it slowly and in a continuous flow, mixing for about 3 minutes until a lump-free and homogeneous mixture is obtained, taking care to remove the deposited powder from the walls of the mixer.
3. Add the remaining clean water, approx. 0.75 litres per bag, up to the maximum total of 4.75 litres per bag (approx. 19%).
4. Mix for about 3 minutes more, until a plastic and perfectly homogeneous mixture is obtained.

Use the prepared mortar completely, avoiding mixing any remaining quantity with the next mix.

Esempio n. 1: Sistema di rinforzo FRCM

After proper preparation of the substrate, proceed according to the following steps:

1. Drill holes of a suitable diameter. As a reference, between 2 and 4 connectors per m2 can be used, to be arranged in quincunxes. The number of holes must be estimated taking into account the thickness of the wall and its quality, and must be evaluated during the design phase and in accordance with the provisions of the Works Director. In the case of reinforcement on only one side of the panel, the depth of the hole must be sufficient to reach the outermost layer of the side opposite to that of application of the reinforcement, and must be defined during the design phase and in accordance with the provisions of the Works Director.
2. Clean the holes with compressed air, avoiding washing with water in order not to compromise the fixing of the connectors with the organic-based structural adhesives of the PALLADIO line.
3. Install the AR PALLADIO GLASS CONNECTOR 10AR fibreglass cord connectors inside the holes, after adequate preparation. For anchorage we recommend the use of structural adhesives based on organic resins of the PALLADIO line. As an alternative, it is possible to evaluate the use of PALLADIO GLASS CONNECTOR L connectors, L-shaped preformed bars in ECR glass fibre and thermosetting epoxy resin. Please refer to the product data sheets for preparation and installation instructions.
4. Apply, by means of a notched stainless steel trowel, a first layer of PALLADIO RINFORZA FRCM mortar, directly on the surface to be consolidated, correctly prepared, for an average thickness of 6 - 7 mm, after levelling the support, smoothing the application in a suitably flat layer and keeping it rough.
5. If the mortar applied is still damp, lay the alkali-resistant glass fibre mesh GLASS AR0245, taking care to ensure it is completely impregnated and to avoid the formation of voids. In order to ensure correct adhesion between the first and second layers of the matrix, apply the necessary pressure on the mesh to make the mortar slightly protrude from the mesh. In the case of side-by-side or longitudinal reinforcement of portions of the mesh, care must be taken to overlap the two layers by at least 20 cm. In the case of vault reinforcements, turn the net flaps over the shutters by at least 40 cm.
6. Open the end flakes of PALLADIO GLASS CONNECTOR AR, arranging them in a fan shape and fixing them to the net by impregnation with the inorganic matrix.
7. Apply the second layer of mortar, ensuring complete coverage of the mesh for a minimum thickness of a further 6 - 7 mm.

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Example 2: Repairing cracks with reinforced reinforcement
The intervention takes place in the following stages:

1. Use a circular hose, scrapers or chisels to mill off the bedding joints to a depth of approximately 3 to 4 cm, taking care not to damage the face elements. The length of the fleshing will be the same as that of the bar to be installed, and will be centred so as to intersect the lesion in the middle.
2. Clean the joint properly with compressed air and low pressure water, removing all loose parts. Check that the bottom is sound and compact, free of residues and salification.
3. Extend the joint by filling it about 2/3 of the thickness with PALLADIO RINFORZA FRCM.
4. Insert the PALLADIO HELICAL BAR in the bedded joint, applying the necessary pressure to make part of the bedding mortar escape laterally, so as to guarantee the correct drowning of the bar.
5. Grout the joint with the same mortar, applying it fresh on fresh and sealing the joint completely.

Safety instructions

Consult the safety data sheet before use.
The product may cause eye damage, skin irritation or allergic reactions.
During use, it is recommended to wear protective gloves and goggles and to follow the safety instructions for the workplace.

Warnings

- The product is free of organic components.
- As the overall percentage of organic components in an FRCM system increases, including those covering the reinforcing mesh, there may be a decline in permeability, durability and fire behaviour.
- Do not add any additives, binders, aggregates or other components other than the mixing water.
- Do not apply to existing plasterwork and substrates that are not adequately clean and compact.
- Apply PALLADIO RINFORZA FRCM at a temperature between +5°C and +30°C; in case of low temperatures (5°C÷10°C) it is advisable to mix the material with lukewarm water (30°C÷40°C).
- Wait for the plaster to cure completely before proceeding with finishing operations. It is advisable to proceed with a reinforced smoothing coat once the plaster has fully cured.

For the application of this product and the corresponding reinforcement system, it is recommended to rely on companies with specific and proven skills in the application of composite materials on masonry and concrete structures. In particular, the personnel in charge of installation must have specific training in the application of reinforcement systems for structural purposes. The contractors must also check that the products comply with the requirements indicated by the Designer and, in the event of unavailability of materials with the requirements indicated, must agree possible alternatives with the Designer and/or the Works Manager. The indications contained in this technical data sheet are of an indicative, general and non-binding nature, do not constitute specifications and do not in any way replace the design phases.

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Specifications

Repair, structural reinforcement, improvement or seismic upgrading of buildings and structures in masonry, tuff, natural stone, using a fibre-reinforced composite system with inorganic matrix (FRCM). The system will be made with a plaster and masonry mortar with high mechanical resistance, Class M15 according to UNI EN 998-2, based on natural hydraulic lime NHL 5 (such as PALLADIO RINFORZA FRCM by Fornaci Calce Grigolin S.p.A.), without organic additives, with a maximum grain size of 1.2 mm, adhesion to the brick of not less than 0.8 N/mm2, W2 water absorption, to be applied in a double layer, fresh on fresh, with a maximum total thickness of 15 mm, with a 243 g/m2 bi-directional balanced AR alkali-resistant glass fibre mesh in between and a 25 x 25 mm mesh (such as GLASS AR0245 by Fornaci Calce Grigolin S.p.A.).
The mesh must be monolithically fixed to the support by means of AR alkali-resistant glass fibre rope connectors and external elastic braid (such as PALLADIO GLASS CONNECTOR 10AR by Fornaci Calce Grigolin S.p.A.), to be previously impregnated with fluid epoxy resin (such as PALLADIO IMPREGNANTE EPOX) and to be fixed by means of structural adhesive based on epoxy resins or vinylester (such as PALLADIO INIEZIONE VE).

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TECHNICAL DATA	PERFORMANCE
Technical Data	CR-CSIV-W2
Specific weight	1550 kg/m3 deter. in free fall
Maximum diameter	1.2 mm
Mixing water	19% approx.
Compressive strength at 7 days	≥ 10 N/mm^2
Compressive strength at 28 days	≥ 15 N/mm^2
Flexural strength at 7 days	≥ 3 N/mm^2
Flexural strength at 28 days	≥ 4 N/mm^2
Elastic modulus at 28 days	10 GPa
Theoretical consumption	16 kg/m2 approx. per cm thickness
Water vapour permeability μ	15
Reaction to fire	class A1
Adhesion on brick	> 0.8 N/mm^2
Type of fracture	A
Water absorption	W2
Thermal conductivity λ	0.77 W/mK

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