

PBO-MESH 105

FRCM strengthening system for concrete consisting of unidirectional PBO mesh weighing 105 g/m² and MX-PBO Concrete inorganic matrix.



FIELDS OF APPLICATION

- Retrofitting and upgrading the static and seismic behaviour of R.C. buildings.
- Retrofitting and upgrading the static and seismic behaviour of R.C. infrastructure.
- Flexural structural strengthening of beams and concrete floor joists.
- Structural strengthening against combined axial and flexural forces in columns.
- Shear structural strengthening of reinforced concrete beams, columns, beam-column joints and walls.
- Confinement of reinforced concrete columns.
- Improving the ductility of reinforced concrete elements.

METHOD OF USE

Preparing the substrate

Repair and prepare the substrate as necessary, in accordance with the following instructions, subject to prior approval of the Works Manager:

- Remove any deteriorated substrate by hydrodemolition of the concrete cover and stripping the reinforcement until reaching a concrete layer that is well-compacted and not carbonated.
- When strengthening the floor joists against flexural force, remove the hollow-core infill block or joist in the bottom part.
- Eliminate any loose material, grease, or oil from the concrete rebars and remove the rust layers by brushing (manually or mechanically). We recommend also sand-blasting the concrete rebars.
- Coat the concrete rebars with a passivating layer, using a paintbrush to apply two coats of an anti-corrosive, cementitious mortar, e.g. **Ruregold Passivator**

(consult the technical data sheet on the web site Ru-regold.com) so that the exposed reinforcements are completely covered.

- Restore the volume of the substrate by repairing the concrete cover using **MX-R4 Repair** type mortar, applying the product in 20-25 mm layers using a trowel while the preceding layer is still wet (consult the technical data sheet on the web site Ruregold.com).
- Before applying the FRCM system, round off the sharp edges of the section (radius ≥ 20 mm see CNR DT215/2018).
- Saturate the substrate before applying the FRCM strengthening system.

Preparing the inorganic matrix

MX-PBO Concrete does not require any additional material and may be prepared using:

- A planetary type mixer.
- A concrete mixer (do not exceed 60% of the nominal load limit and mix with the axis of rotation almost horizontal).
- A screw mixer (e.g. Gras Calce **Turbomalt** mixer).
- The product may also be mixed manually in a bucket using a paddle mixer, pouring in a part of the contents of the bag and adding the appropriate quantity of water.

Mix as follows:

1. Pour in the contents of the bag of **MX-PBO Concrete** and add approx 5.5-6.0 litres of clean water, as specified on the bag.
2. Mix for about 3-4 minutes (4-5 minutes when using a concrete mixer) so as to obtain a smooth, homogeneous mix.
3. Leave the mix to stand for about 1-2 minutes before use.

APPLICATION

To apply the FRCM system, proceed as follows:

- Cut the **PBO-MESH 105** to the required dimensions using an **angle grinder** or **Ruregold SCISSORS**.
- Apply an initial layer of **MX-PBO Concrete** matrix, between 3 mm and 5 mm thickness.
- Apply the **PBO-MESH 105**, embedding it manually in the initial layer of matrix while still fresh using a **smooth metal float and/or spatula with rounded edges** to create a see-through effect.

- Apply a second layer of **MX-PBO Concrete** matrix, between 3 mm and 5 mm thickness, over the initial layer while it is still fresh, exerting sufficient pressure to guarantee optimal adhesion between the two layers.
- When applying two or more layers of PBO mesh, apply each layer on the previous one while still fresh as described above.
- Where they meet longitudinally, ensure the mesh strips overlap by approx. 300 mm in the direction of the stress.
- When using the system for strengthening columns against combined axial and flexural forces and in all those cases where it is not possible to guarantee an anchoring depth of at least 300 mm (see Section 6, CNR DT215/2018), install **PBO-JOINT** connectors as necessary, using **MX-JOINT** inorganic matrix (consult the technical data sheet on the web site Ruregold.com).

PROPERTIES OF PBO (polyparaphenylene benzobisoxazole) FIBRE

Toughness	5.8 GPa
Modulus of elasticity	270 GPa
Maximum strain at rupture	2.5 %
Density	1.56 g/cm ³
Decomposition temperature	+ 650 °C
Compliant	ISO 16120 – 1/4

PROPERTIES OF PBO-MESH 105

PBO fibre mesh weight	105 g/m ² in warp
Mesh total weight	approx. 152 g/m ²
Equivalent thickness of the mesh in warp	0.067 mm ² /mm
Equivalent thickness of the mesh in weft	0.000 mm ² /mm
Strand pitch distance (yarn)	approx. 9 mm
Area single thread (yarn)	approx. 0.63 mm ²
Dry mesh modulus of elasticity E_f	228 GPa
Width of mesh on the reel	10 cm / 25 cm
Length of mesh on the reel	30 metres/15 metres
Storage conditions	In the original packaging, indoors, in a cool, dry, unventilated place away from sources of heat.
Packaging	30-metre rolls, h 10 cm 15-metre rolls, h 25 cm

PROPERTIES OF MX-PBO CONCRETE INORGANIC MATRIX

Density of fresh mortar (EN 1015-6)	Approx. 1900 kg/m ³
Application time at 20°C	Densification begins after approx. 10-15 minutes. Mix again and use within a maximum of about 45 minutes
Application temperature	From +5°C up to +35°C
Compressive strength after 28 days	≥ 40 MPa
Modulus of elasticity in compression after 28 days	≥ 15 GPa
Coverage	approx. 12.4 kg/m ² per strengthening layer (4+4 mm) approx. 18.5 kg/m ² per double strengthening layer (4+4+4 mm)
Packaging	Disposable wooden pallet laden with 60 x 25 kg bags - total weight 1500 kg
Storage conditions (Italian Ministerial Decree 10/05/2004)	In original packaging, indoors, in a cool, dry, unventilated place.
Durability (Italian Ministerial Decree 10/05/2004)	Not more than 12 months from packing date.
Compliance	EN 1504-3 / FRCM Guidelines 03/22

PROPERTIES OF THE PBO-MESH 105 + MX-PBO CONCRETE STRENGTHENING SYSTEM

Certified in accordance with the “FRCM Guidelines 03/2022” - Designed in accordance with “CNR-DT215/2018” (National Research Council Technical Guidelines)

Conventional limit stress (characteristic value)	$\sigma_{lim,conv}$	Concrete single layer	1770 MPa
		Concrete double layer	1738 MPa
Conventional limit strain (characteristic value)	$\varepsilon_{lim,conv}$	Concrete single layer	0.78 %
		Concrete double layer	0.76 %
Ultimate tensile strength of the FRCM composite (Tensile failure) (characteristic value)	σ_u	Single layer	2270 MPa
		Double layer	2135 MPa
Ultimate tensile strength of the dry fabric (Tensile failure) (characteristic value)	$\sigma_{u,f}$	3317 MPa	
Dry fabric modulus of elasticity (mean value)	E_f	228 GPa	
Matrix compressive strength (characteristic value)	$f_{c,mat}$	40 MPa	
Equivalent thickness of the mesh in warp	t_f	0.067 mm	
System failure mechanism	-	Type D	
Serviceability temperature range	$T_{min} - T_{max}$	From -18°C to +100°C	
Application thickness of the MX-PBO Concrete matrix	-	3-5 mm per layer	
Reaction to fire (EN 13501-1)	-	NPD	
Certification	-	Technical Evaluation Certificate No. CVT 285, issued on 28/06/2023	

SPECIFICATION ITEM

Supply and implementation of a CVT certified FRCM structural strengthening system, consisting of a unidirectional PBO fibre mesh, e.g. Ruregold **PBO-MESH 105** and **MX-PBO Concrete** inorganic matrix. The carbon fibre has a density of 1.56 g/cm³, toughness/tensile strength of approx. 5.8 GPa, modulus of elasticity of 270 GPa, and fracture strain 2.5%. The dry mesh has a grammage of 105 g/m² and an equivalent thickness of 0.067 mm. The compressive strength of the inorganic matrix, which is specifically designed for concrete substrates, is ≥ 40 Mpa, while the modulus of elasticity is ≥ 15 GPa. The PBO fibre FRCM system may be used to increase the resistance to combined axial and flexural forces, and confinement in columns, to bending in beams and slab joists and shear in beams; in addition, it may also be used for localised strengthening at beam - column nodes. The system is resistant to high temperatures and freeze/thaw cycles and may be applied directly to moist substrates. The system meets the requirements of the FRCM Guidelines issued in March 2022. The substrate must be prepared and the system applied in accordance with the manufacturer's instructions.

Edition 04/2025 Revision 02

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