

PBO-MESH 44

FRCM strengthening system for masonry consisting of unidirectional PBO mesh weighing 44 g/m² and MX-PBO Masonry inorganic matrix.



FIELDS OF APPLICATION

- Retrofitting and upgrading the static and seismic behaviour of masonry buildings.
- Structural strengthening of load-bearing walls (piers) and perimeter strips (spandrels) in masonry buildings.
- Structural strengthening of masonry corners and floor edge beams.
- Structural strengthening of eaves edge beams in masonry walls.
- Structural strengthening of masonry arches, vaults, and domes.
- Structural strengthening of masonry infrastructure.
- Increased ductility of masonry buildings.
- Anti-overturn protection and structural strengthening for external infill walls in r.c. frame buildings.

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:

- Ensure the substrate is clean, consistent and free of loose parts, dust, or mould.
- If necessary, clean the surfaces by sand-blasting or using low pressure water jets.
- Ensure the substrate is sufficiently moist and has been correctly prepared for the first layer of **MX-PBO Masonry** mortar and the subsequent FRCM system application phases.

If the support is deteriorated, irregular, and/or damaged, proceed as follows, subject to prior approval of the Works Manager:

- Remove any inconsistent residual bedding mortar between the various stone elements, and any previous work that could compromise adhesion to the support - such as structural repairs on the masonry element, e.g. unstitching/restitching work and/or deep repointing of mortar joints.
- Remove any existing residual mortar, either mechanically or simply by raking out manually.
- Regularise the substrate and/or mortar joints as necessary using structural repair mortars such as **MX-RW High Performance**, **MX-CP Lime**, **MX-15 Plaster** and **MX-PVA Fibre-reinforced** (consult the technical data sheets available on the website Ruregold.com).
- Ensure the substrate is sufficiently moist and has been correctly prepared for the first layer of **MX-PBO Masonry** mortar and the subsequent FRCM system application phases.

Preparing the inorganic matrix

MX-PBO Masonry 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 Masonry** and add approx 5.5-6.5 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 44** to the required dimensions using an **angle grinder** or **Ruregold SCISSORS**.
- Apply an initial layer of **MX-PBO Masonry** matrix, between 3 mm and 5 mm thick.
- Apply the **PBO-MESH 44**, 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 Masonry** matrix, between 3 mm and 5 mm thick, 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.
- In the case of rubble-core masonry and/or unconnected cavity walls, use the appropriate **PBO-JOINT** face-to-face connectors, together with **MX-JOINT** inorganic matrix (consult the **PBO-JOINT + MX-JOINT** technical data sheets available on the web site Ruregold.com).
- When applying the strengthening system to one face of the load-bearing wall only, use the appropriate **PBO-JOINT** together with the **MX-JOINT** inorganic matrix. The connectors should be long enough to penetrate into the outermost layer of the unstrengthened wall (consult the **PBO-JOINT + MX-JOINT** connection system technical data sheets, available on the web site www.ruregold.it).

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 44

PBO fibre mesh weight	44 g/m ²
Mesh total weight	approx. 84 g/m ²
Equivalent thickness of the mesh in warp	0.028 mm ² /mm
Equivalent thickness of the mesh in weft	0.000 mm ² /mm
Strand pitch distance (yarn)	approx. 7 mm
Area single thread (yarn)	approx. 0.21 mm ²
Dry mesh modulus of elasticity E _f	280 GPa
Width of mesh on the reel	25 cm
Length of mesh on the reel	50 m
Storage conditions	In the original packaging, indoors, in a cool, dry, unventilated place away from sources of heat.
Packaging	50 metre rolls, h 25 cm

PROPERTIES OF MX-PBO MASONRY INORGANIC MATRIX

Density of fresh mortar (EN 1015-6)	Approx. 1750 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	≥ 20 MPa
Coverage	approx. 11.4 kg/m ² per strengthening layer (4+4 mm) approx. 17.1 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.
Compliant	EN 998-2 / FRCM Guidelines 03/22

PROPERTIES OF THE MX-JOINT INORGANIC MATRIX

Density of fresh mortar (EN 1015-6)	approx. 2000 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	≥ 25 MPa
Coverage	approx. 0.8 - 1 kg/m
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.
Compliant	EN 998-2

PROPERTIES OF THE PBO-MESH 44 + MX-PBO MASONRY FRCM 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)	$\sigma_{lim,conv}$	Brickwork	1880 MPa
		Tufa	1836 MPa
Conventional limit strain (characteristic value)	$\epsilon_{lim,conv}$	Brickwork	0.67 %
		Tufa	0.66 %
Ultimate tensile strength of the FRCM composite (Tensile failure) (characteristic value)	σ_u	2435 MPa	
Ultimate tensile strength of the dry fabric (Tensile failure) (characteristic value)	$\sigma_{u,f}$	2810 MPa	
Dry fabric modulus of elasticity (mean value)	E_f	280 GPa	
Matrix compressive strength (characteristic value)	$f_{c,mat}$	20 MPa	
Equivalent thickness of the mesh in warp	t_f	0.028 mm	
System failure mechanism	-	Type F	
Serviceability temperature range	$T_{min} - T_{max}$	From -18°C to +100°C	
Application thickness of MX-PBO Masonry matrix	-	3-5 mm per layer	
Reaction to fire (EN 13501-1)	-	B-s1, d0	
Certification		Technical Evaluation Certificate No. CVT 285, issued on 28/06/2023	

PROPERTIES OF THE PBO-JOINT FIBRE CONNECTOR

Nominal diameter	3 mm	6 mm
Hole diameter	≥ 14 mm	≥ 16 mm
Resistant transverse cross-section of the connector	8.80 mm ²	17.61 mm ²
Tensile strength (mean value)	2789 MPa	2983 MPa
Tensile strength (characteristic value)	2413 MPa	1860 MPa
Fracture strain (characteristic value)	2.14 %	1.95 %
Modulus of elasticity (mean value)	198 GPa	238 GPa
Extraction force from brickwork and tufa substrate (mean value)	12.7 kN	-
Minimum anchorage length	150 mm	-
Packaging	10 m dispenser	
Storage conditions	In original packaging, indoors, in a cool, dry, unventilated place.	
Compliant	ETA 19/0361 issued on 16/10/2019	

SPECIFICATION ITEM

Supply and implementation of an FRCM structural strengthening system, consisting of a unidirectional PBO fibre mesh, e.g. Ruregold **PBO-MESH 44** and **MX-PBO Masonry** inorganic matrix. The PBO fibre has a density of 1.56 g/cm³, toughness/tensile strength of approx. 5.8 GPa, maximum modulus of elasticity of 270 GPa, and fracture strain 2.5%. The dry mesh has a grammage of 44 g/m² and an equivalent thickness of 0.028 mm. The compressive strength of the inorganic matrix, which is specifically designed for masonry substrates, is ≥ 20 MPa. The FRCM systems in PBO fibre may be used to strengthen load-bearing walls (piers), spandrels and reinforce masonry corners, floor and ceiling edge beams, and the intrados and extrados of arch and vault structures. 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.

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This Technical Data Sheet cancels and replaces previous editions, which are no longer in force.

