C-JOINT

Carbon fibre anchor for FRCM system.

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FIELDS OF APPLICATION

Connection system used with Ruregold **MX-JOINT** inorganic matrix for anchoring FRCM strengthening systems and enhancing their adhesion to the existing substrate, in the following cases (see Section 6 CNR DT215/2018):

- Strengthening on one face of a masonry wall (for all types of masonry).
- Strengthening on two sides of unconnected cavity walls.
- In strengthening reinforced concrete columns against combined axial and flexural forces to ensure that the action of the strengthening system is transferred to the structure continuously.
- Shear strengthening reinforced concrete beams when it is not possible to guarantee an anchoring length of at least 300 mm (11.81 in).
  In absence of experimental evidence, you provide adequate development length determined per ICC-ES AC 434.
- Structural strengthening of reinforced concrete walls.
- Connecting non-structural elements to structural support elements in reinforced concrete, such as beams and columns, etc.

METHOD OF USE

Preparing the substrate

- After preparing the substrate, as indicated in the Ruregold concrete and masonry PBO FRCM structural strengthening system technical data sheets, drill the holes in the substrate, having a diameter of 16 mm (0.63 in) or greater in the case of **C-JOINT 6 mm (0.24 in)** and 20 mm (0.79 in) in the case of **C-JOINT 10 mm (0.39 in)**.
  The depth, inclination, and pitch of the anchoring systems must conform to the design requirements and be approved by the Works Manager.
- Eliminate any dust and loose parts caused by drilling using compressed air or an equivalent method.
- Protect the hole using pipes or similar elements and then apply the Ruregold FRCM carbon system (consult the technical data sheet available on the web site www.ruregold.com).
- Wait until the FRCM strengthening system inorganic matrix has set completely before installing the connection system.

Preparing the inorganic matrix

MX–JOINT does not require any additional materials and may be prepared using a low-speed paddle mixer.

Preparing the inorganic matrix for anchoring the anchor in the hole.

- Open the pack of **MX–JOINT** and add approx. 1.0 litre (0.26 gal) of clean water for every 5 kg (11 lb) of powder used (approx. 5.0 litres (1.32 gal) of clean water for every 25 kg (55 lb) of powder).
- Mix continuously for about 3 minutes, without interrupting, to obtain a smooth, homogeneous mix.
- Transfer the entire contents to the Ruregold **Applicator GUN**, complete with rigid nozzle extension and flexible coupling.

Preparing the inorganic matrix for impregnating the fibre anchor

- Open the pack of **MX–JOINT** and add approx. 1.0 litre (0.26 gal) of clean water for every 5 kg (11 lb) of powder used (approx. 5.0 litres (1.32 gal) of clean water for every 25 kg (55 lb) of powder).
- Mix continuously for about 3 minutes, without interrupting, to obtain a smooth, homogeneous mix.
- Add another 1.75 litres (0.46 gal) of clean water for every 5 kg (11 lb) of powder used and mix to obtain a “fluid consistency” (approx. 8.75 litres (2.31 gal) of clean water for every 25 kg (55 lb) of powder). Impregnate the part of the fibre anchor that was prepared earlier.

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APPLICATION

- Carefully wet the hole, ensuring that no excess water remains inside it.
- Cut the **C-JOINT** fibre anchor to the required length using an **angle grinder** or **Ruregold SCISSORS**.
- In the case of wall tie connections, the length of each individual anchor is equivalent to the thickness of the wall, plus approximately 30 cm (11.81 in) (to permit the **C-JOINT** to spread out onto the FRCM strengthening system by a radius of approx. 15 cm (5.90 in) on either face).
- In the case of one side only connections, the length of each individual anchor is equivalent to about 3/5 of the depth of the hole, plus approximately 15 cm (5.90 in) (to permit the **C-JOINT** to spread out onto the FRCM strengthening system).
- Slide the tubular elastic net off the portion of the **C-JOINT** anchor to be inserted into the masonry.
- Having removed the fibre bundle from the tubular elastic net, spread it out so that the fibre anchor is ready to be impregnated.
- Impregnate the exposed portion with **MX-JOINT** matrix in a semi-fluid state.
- Allow the impregnated portion of the fibre anchor to harden (approx. 5-7 hours).
- Fill the hole with **MX-JOINT** inorganic matrix in a dense state using the Ruregold **Application GUN**.
- Insert the section of the **C-JOINT** fibre anchor that was impregnated earlier into the hole, taking care to insert it to the correct depth (approx. 3/5 of the depth of the hole in the case of one side only connections).
- Remove the tubular elastic net from the portion of the **C-JOINT** fibre anchor protruding from the hole.
- Once the FRCM system has been installed and allowed to harden, apply an initial layer (thickness approx. 3-5 mm (0.12-0.20 in)) of **MX-JOINT** matrix around the hole.
- Spread out the bundle of fibres of the portion of the **C-JOINT** fibre anchor protruding from the hole, and then, use a smooth metal spatula, apply light pressure and press it into the first layer of **MX-JOINT** matrix.
- Then apply a second layer of **MX-JOINT** inorganic matrix (approx. thickness 3-5 mm (0.12-0.20 in)) on to the spread-out fibres to completely cover the previously spread-out portion of the fibre anchor.
- The operations described above should be carried out wet on wet.

PROPERTIES OF CARBON FIBRE

Toughness	4.9 GPa (710.7 ksi)
Modulus of elasticity	250 GPa (3.62 x 10^4 ksi)
Maximum strain at rupture	1.9 %
Density	1.81 g/cm^3 (0.065 lb/in^3)
Compliant	EN 13002/ISO 13002

PROPERTIES OF THE C-JOINT FIBRE ANCHOR

Nominal diameter	6 mm (0.24 in)	10 mm (0.40 in)
Hole diameter	≥ 16 mm (0.63 in)	≥ 20 mm (0.79 in)
Resistant transverse cross-section of the anchor	15.43 mm^2 (0.024 in2)	25.77 mm^2 (0.04 in^2)
Tensile strength (mean value)	1494 MPa (216686 psi)	1380 MPa (200152 psi)
Tensile strength (characteristic value)	1225 MPa (177671 psi)	1221 MPa (177091 psi)
Fracture strain (characteristic value)	0.68 %	0.49 %
Modulus of elasticity (mean value)	234 GPa (33939 ksi)	232 GPa (33649 ksi)
Extraction force from brickwork and tufa substrate (mean value)	5.1 kN (1147 lb)	-
Extraction force from concrete substrate (mean value)	11.8 kN (2652.7 lb)	14.15 kN (3181.1 lb)
Minimum anchorage length	150 mm (5.9 in)	-
Packaging	10 m (32.8 ft) dispenser	
Storage conditions	In the original packaging, indoors, in a cool, dry, unventilated place away from sources of heat.	
Compliant	ETA 19/0361 issued on 16/10/2019	

PROPERTIES OF THE MX-JOINT INORGANIC MATRIX

Density of fresh mortar (EN 1015-6)	approx. 2000 kg/m³ (125 lb/ft3)
Mixing water per 5 kg of powder	approx. 1.0 litres (0.26 gal) for anchoring the anchor in the hole
	approx. 2.75 litres (0.73 gal) for impregnating the fibre anchor
Mixing water per 25 kg of powder	approx. 5.0 litres (1.32 gal) for anchoring the anchor in the hole
	approx. 13.75 litres (3.63 gal) for impregnating the fibre anchor
Mix consistency	Dense when anchoring in the hole
	Fluid when impregnating the fibre anchor
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 (41°F) up to +35°C (95°F)
Compressive strength after 28 days	≥ 25 MPa (3625.9 psi)
Coverage	approx. 0.8 - 1 kg/m (0.54 – 0.67 lb/ft)
Packaging	Disposable wooden pallet laden with 60 x 25 kg (55 lb) bags - total weight 1500 kg (3300 lb)
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

SPECIFICATION ITEM

Supply and application of an anchoring system for FRCM structural strengthening solutions, consisting of unidirectional carbon fibre, e.g. Ruregold **C-JOINT**, having a nominal diameter of 6 (0.24 in) or 10 mm (0.40 in). The carbon fibre has a density of 1.81 g/cm³ (0.065 lb/in³), toughness/tensile strength of approx. 4.9 GPa (710.7 ksi), modulus of elasticity of 250 GPa (3.62 x 10^4 ksi), and fracture strain 1.9%. The system is coupled to an inorganic matrix, e.g. Ruregold **MX-JOINT** specific for connections, having compressive strength ≥ 25 MPa (3625.9 psi). The anchoring system in unidirectional carbon fibres enables connections to be created between the existing structures and the structural strengthening, and to achieve the necessary continuity of the reinforcement, where necessary. 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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