

MapeWrap C UNI-AX HM

High strength uni-directional carbon fibre fabric with very high modulus of elasticity

WHERE TO USE

This system is suitable to repair reinforced concrete and masonry elements damaged by physical-mechanical action, for the confinement of compressed or compressed flexed members and for seismic strengthening of structures in earthquake zones.

Some application examples

- Repair, static and seismic upgrade of deteriorated structures, where it is absolutely necessary to reinforce the tensile strength of the section.
- Confinement of axially loaded or damaged concrete elements (columns, bridge piers, chimneys) in order to improve ductility and load bearing capacity.
- Seismic strengthening and restoration of vaulted structures without the increase of seismic mass and without the danger of liquid percolation towards the internal surface of an archway.
- Repair of structures damaged by fire.
- Reinforcement of load bearing elements in buildings that have been restructured for architectural reasons or change of use.
- Seismic strengthening of industrial buildings in reinforced concrete.

TECHNICAL CHARACTERISTICS

MapeWrap C UNI-AX HM is mono-directional carbon fibre fabrics characterised by a extremely high ($390,000 \text{ N/mm}^2$) modulus of elasticity respectively, and high tensile strength. They may be laid using two different techniques:

- wet system;
- dry system

by using the following range of epoxy resins:

- **MapeWrap Primer 1**, strengthening for the treatment of the substrate.
- **MapeWrap 11** and **MapeWrap 12**, smoothing compounds to smooth any rough areas or to seal porous surfaces (**MapeWrap 12** has a longer workability).
- **MapeWrap 21**, impregnating agent for fabrics by “wet system”.
- **MapeWrap 31**, impregnating agent for fabrics by “dry system”.

Using the “wet system”, the **MapeWrap** fabric is manually dipped into **MapeWrap 21** immediately before placing on the surface. When using the “dry system”, the dry fabric is placed directly on a layer of **MapeWrap 31** which has been applied to the concrete element that needs reinforcement.

Bonding products from **MapeWrap System** range respond to the principles defined in EN 1504-9 (*“Products and systems for protecting and repairing concrete structures: definitions, requirements, quality control and conformity evaluation. General principles for the use and application of systems”*), and the minimum requirements for EN 1504-4 (*“Structural bonding”*).

To meet a wide range of design requirements, **MapeWrap C UNI-AX HM** are produced in two different weights (300 and 600 g/m^2), and each weight is available in different widths (10 cm , 20 cm and 40 cm), indicated respectively as follows:

- **MapeWrap C UNI-AX HM 300**: M.E. = $390,000 \text{ N/mm}^2$;

MapeWrap C UNI-AX HM



Confinement of a column with MapeWrap C UNI-AX HM



Impregnation with "wet system" of MapeWrap C UNI-AX HM with MapeWrap 31

– MapeWrap C UNI-AX HM 600: M.E. = 390,000 N/mm².

ADVANTAGES

Because of their extreme light weight, the fabrics from the **MapeWrap C UNI-AX HM** range, are less labour intensive than conventional technologies (beton plaqué). With the "wet system" (and with the aid of a machine that helps the impregnation process) or the "dry system", the application is carried out in an extremely short time and often without downtime of the structure. Unlike the plating method using steel plates (beton plaqué method), the use of **MapeWrap C UNI-AX HM** fabric will adapt to any contours of the element that needs repair. It does not need temporary reinforcement during placing and removes all risks of corrosion of the applied reinforcement.

RECOMMENDATIONS

All workers must wear gloves, masks for solvents and protective goggles.

DIRECTIONS FOR USE

Preparing the substrate

The surface onto which **MapeWrap C UNI-AX HM** fabrics will be applied must be perfectly clean, dry and be mechanically strong.

In the case of masonry structures, remove all crumbling or loose parts and any parts at risk of becoming detached before applying the fabric and, where required, level off the surfaces by applying a layer of **Planitop HDM** or **Planitop HDM Maxi**.

Remove traces of form release oils, varnishes or paints and cement laitance from sound structures, by sandblasting.

If the concrete is deteriorated, remove damaged parts by manual or pneumatic bushhammering or by hydro-scarifying. Clean metal reinforcement and remove any traces of rust. Remove all traces of rust from the reinforcement rods and protect them using **Mapefer** two-component anti-corrosion cementitious mortar or **Mapefer 1K** single component cementitious mortar (please refer to the respective Technical Data Sheet for each product for application procedures). Repair concrete surfaces using products from the **Mapegrout** range.

Wait at least three weeks before laying **MapeWrap C UNI-AX HM**.

If reinforcement must be carried out immediately, repair with **Adesilex PG1** or **Adesilex PG2** or **Mapefloor EP19**.

Seal any surface cracks by injecting **Epojet** (suitable if the cracks are dry or slightly moist) or with **Foamjet T** or **Foamjet F** (suitable if the cracks are wet or with water infiltrations). All sharp edges in the concrete elements (for example beams or columns) that need to be wrapped with **MapeWrap C UNI-AX HM**, must be smoothed with a demolition hammer or any other suitable means. It is recommended that the bending radius be not less than 2 cm in compliance with Italian Guidelines CNR-DT 200 R1/2013.

Installing the MapeWrap C UNI-AX HM with the "wet system"

Operational steps

1. Prepare the **MapeWrap Primer 1**.
2. Apply the **MapeWrap Primer 1**.
3. Prepare the **MapeWrap 11** or **MapeWrap 12**.
4. Apply the **MapeWrap 11** or **MapeWrap 12**.
5. Prepare the **MapeWrap 21**.
6. Impregnate the fabric with **MapeWrap 21**.
7. Place the **MapeWrap C UNI-AX HM** fabric.

1. Prepare the MapeWrap Primer 1

Mix together the two **MapeWrap Primer 1** components. Pour component B into component A and mix with a low speed drill fitted with a stirrer until a completely homogeneous fluid resin is obtained. Mix ratio: 3 parts by weight of A and 1 part by weight of B. Use the whole amount in the packaging to eliminate dosage errors.

Once **MapeWrap Primer 1** has been prepared, it remains workable for approximately 90 minutes at +23°C.

2. Apply the MapeWrap Primer 1

Apply an even coat of **MapeWrap Primer 1** onto the clean and dry concrete surface with a roller or a brush.

If the substrate is very porous, apply a second coat of **MapeWrap Primer 1** after the first coat has been completely absorbed. Then smooth over the surface using **MapeWrap 11** or **MapeWrap 12** while the mortar underneath is still fresh.

3. Prepare the MapeWrap 11 or MapeWrap 12

Depending on the temperature and working times, choose either **MapeWrap 11** or **MapeWrap 12** (**MapeWrap 12** has a longer workability). Pour component B into component A and mix with a low speed drill fitted with a stirrer until an even grey paste is obtained. Mix ratio for both products: 3 parts by weight of A and 1 part by weight of B. Once **MapeWrap 11** has been prepared, it remains workable for approximately 40 minutes at +23°C while **MapeWrap 12** remains workable for approximately 60 minutes.

4. Apply MapeWrap 11 or MapeWrap 12

On concrete surfaces which have been previously treated with **MapeWrap Primer 1**, and while it is still "fresh", apply a 1 mm-thick layer of **MapeWrap 11** or **MapeWrap 12** using a notched trowel, then smooth over the surface using a flat trowel to completely remove light imperfections on the surface. Use the same product to fill and round the corners in order to create a profile with a bending radius not less than 2 cm.

5. Prepare the MapeWrap 21

Pour component B into component A and mix with a low speed drill fitted with a stirrer until a completely homogeneous fluid resin is obtained. Mix ratio: 4 parts by weight of A and 1 part by weight of B. The product

| TECHNICAL DATA (typical values) | | |
|---|---|---------|
| PRODUCT IDENTITY | | |
| Type of fibre: | high-strength and extremely high elastic modulus carbon fibre | |
| Appearance: | mono-directional fabric | |
| Weight (g/m ²): | 300 | 600 |
| Density (kg/m ³): | 1,820 | 1,820 |
| Equivalent thickness of dry fabric (mm): | 0.164 | 0.329 |
| Load-resistant area per unit of width (mm ² /m): | 164.8 | 329.6 |
| Tensile strength (N/mm ²): | 4,410 | 4,410 |
| Maximum load per unit of width (kN/m): | > 700 | > 1,400 |
| Tensile modulus of elasticity (N/mm ²): | 390,000 | 390,000 |
| Elongation at breakage (%): | 1.1 | 1.1 |
| FINAL PERFORMANCE | | |
| Bond strength to concrete (N/mm ²): | > 3 (failure of support) | |

remains workable for approximately 40 minutes at +23°C.

6. Impregnate the fabric with MapeWrap 21 Manually

Cut fabric with a pair of scissors to the desired size beforehand and manually impregnate the **MapeWrap C UNI-AX HM** fabric by plunging it into a plastic trough filled 1/3 of the total volume with **MapeWrap 21**. Remove the fabric from the trough, let it drip and then press it between the hands protected with rubber waterproof gloves until the excess resin is removed completely, but without wringing the fabric in order not to damage the carbon fibres.

With impregnating machine

As an alternative, the impregnation can be carried out with a simple machine fitted with a bucket and a series of rollers that automatically saturates and drips the fabric easily and safely. This equipment is particularly recommended when a large number of interventions on large surface areas need to be carried out. This system ensures the uniform distribution

of the resin over every part of the fabric. Immediately place the fabric after it has been impregnated.

7. Place the MapeWrap C UNI-AX HM

Make sure that the coat of **MapeWrap 11** or **MapeWrap 12** is still fresh, and immediately apply the **MapeWrap C UNI-AX HM** making sure it is laid without wrinkles. Flatten the fabric, always wear protective rubber gloves, and pass a **Roller for MapeWrap** vertically to the fibres several times over the surface so it perfectly penetrates into the **MapeWrap 11** or **MapeWrap 12** epoxy putty. Pass over the fabric **Roller for MapeWrap** in order to completely eliminate any air bubbles formed during the application.

Joining

When wrapping columns, the **MapeWrap C UNI-AX HM** strip must be overlapped at least 20 cm with the same fabric.

The same procedure must be followed when several strips need to be joined longitudinally. Overlap the joints in the fabric by 5 cm in the

direction of the width of the fabric to make alignment easier.
After laying and pressing using the special roller, **MapeWrap C UNI-AX HM** must not be moved.

Installing the MapeWrap C UNI-AX HM with the “dry system”

Operational steps

1. Prepare the **MapeWrap Primer 1**.
2. Apply the **MapeWrap Primer 1**.
3. Prepare the **MapeWrap 11** or **MapeWrap 12**.
4. Apply the **MapeWrap 11** or **MapeWrap 12**.
5. Prepare the **MapeWrap 31**.
6. Impregnate the fabric with **MapeWrap 31**.
7. Place the **MapeWrap C UNI-AX HM** fabric.

1. Prepare the MapeWrap Primer 1

Mix together the two **MapeWrap Primer 1** components. Pour Part B into Part A and mix with a low speed drill fitted with a stirrer until a completely homogeneous fluid resin is obtained. Mix ratio: 3 parts by weight of A and 1 part by weight of B. Use the whole amount in the packaging to eliminate dosage errors.

Once **MapeWrap Primer 1** has been prepared, it remains workable for approximately 90 minutes at +23°C.

2. Apply the MapeWrap Primer 1

Apply an even coat of **MapeWrap Primer 1** onto the clean and dry concrete surface with a roller or a brush. If the substrate is very porous, apply a second coat of **MapeWrap Primer 1** after the first coat has been completely absorbed. Then smooth over the surface using **MapeWrap 11** or **MapeWrap 12** while the mortar underneath is still fresh.

3. Prepare the MapeWrap 11 or MapeWrap 12

Depending on the temperature and working times, choose either **MapeWrap 11** or **MapeWrap 12** (**MapeWrap 12** has a longer workability). Pour component B into component A and mix with a low speed drill fitted with a stirrer until an even grey paste is obtained. Mix ratio for both products: 3 parts by weight of A and 1 part by weight of B. Once **MapeWrap 11** has been prepared, it remains workable for approximately 40 minutes at +23°C while **MapeWrap 12** remains workable for approximately 60 minutes.

4. Apply MapeWrap 11 or MapeWrap 12

On concrete surfaces which have been previously treated with **MapeWrap Primer 1**, and while it is still “fresh”, apply a 1 cm-thick layer of **MapeWrap 11** or **MapeWrap 12** using a notched trowel, then smooth over the surface using a flat trowel to completely remove light imperfections on the surface.

Use the same product to fill and round the corners in order to create a profile with a bending radius not less than 2 cm.

5. Prepare the MapeWrap 31

Pour component B into component A and mix with a low speed drill fitted with a stirrer until an even yellow paste is obtained. Mix ratio: 4 parts by weight of A and 1 part by weight of B. The product remains workable for approximately 40 minutes at +23°C.

6. Apply a first coat of MapeWrap 31

Spread an even first coat of **MapeWrap 31** approximately 0.5 mm with a brush or short haired roller over the still fresh **MapeWrap 11** or **MapeWrap 12**.

7. Place the MapeWrap C UNI-AX HM

Immediately place the **MapeWrap C UNI-AX HM** fabric over the still fresh **MapeWrap 31**, ensuring no wrinkles are present.

After having accurately flattened it (hands must be protected by rubber waterproof gloves), apply a second coat of **MapeWrap 31** over the **MapeWrap C UNI-AX HM**. Pass over the **Roller for MapeWrap** so the adhesive can completely penetrate through the fibres of the fabric. Pass over an aluminium roller with a worm screw in order to completely eliminate any air bubbles formed during application.

Joining

When wrapping columns, the **MapeWrap C UNI-AX HM** strip must be overlapped at least 20 cm with the same fabric.

The same procedure must be followed when several strips need to be joined longitudinally.

Overlap the joints in the fabric by 5 cm in the direction of the width of the fabric to make alignment easier.

After laying and pressing using the special roller, **MapeWrap C UNI-AX HM** must not be moved.

Installing several layers of MapeWrap C UNI-AX while still fresh (within 24 hours)

With the “wet system” repeat the following steps:

- Impregnate the fabric with **MapeWrap 21**.
- Place the **MapeWrap C UNI-AX HM** fabric.

With the “dry system”:

- Apply a first coat of **MapeWrap 31**, place the **MapeWrap C UNI-AX HM** fabric.
- Apply another coat of **MapeWrap 31**.

Note: *If more layers of fabric are applied after 24 hours, the last hardened coat must be sanded.*

PROTECTIVE COVERING

The protective covering can be carried out once the epoxy system has cured by the

PACKAGING
MapeWrap C UNI-AX HM fabrics are available
in 50 m rolls packed in carton boxes with the following names:

| | Weight (g/m ²) | Height (cm) | Surface (m ² /m) | Surface (m ² /roll) |
|---------------------------------|-------------------------------|----------------|--------------------------------|-----------------------------------|
| MapeWrap C UNI-AX 300/10 | 300 | 10 | 0.1 | 5 |
| MapeWrap C UNI-AX 300/20 | 300 | 20 | 0.2 | 10 |
| MapeWrap C UNI-AX 300/40 | 300 | 40 | 0.4 | 20 |
| MapeWrap C UNI-AX 600/10 | 600 | 10 | 0.1 | 5 |
| MapeWrap C UNI-AX 600/20 | 600 | 20 | 0.2 | 10 |
| MapeWrap C UNI-AX 600/40 | 600 | 40 | 0.4 | 20 |

EPOXY SYSTEM CONSUMPTIONS

Surface priming, levelling and smoothing

| | Consumption (g/m ²) |
|-----------------------------------|---------------------------------|
| MapeWrap Primer 1 | 250-300 |
| MapeWrap 11 or Mapewrap 12 | 1500-1600 |

Impregnating MapeWrap C UNI-AX HM

| | Weight (g/m ²) | Consumption (g/m ²) | Height (cm) | Consumption (g/m) |
|--------------------|-------------------------------|------------------------------------|----------------|----------------------|
| MapeWrap 21 | 300 | 1200-1300 | 10 | 120-130 |
| | | | 20 | 240-260 |
| | | | 40 | 480-520 |
| | 600 | 1800-1950 | 10 | 180-195 |
| | | | 20 | 360-390 |
| | | | 40 | 720-780 |
| MapeWrap 31 | 300 | 1000-1100 | 10 | 100-110 |
| | | | 20 | 200-220 |
| | | | 40 | 400-440 |
| | 600 | 1500-1550 | 10 | 150-155 |
| | | | 20 | 300-310 |
| | | | 40 | 600-620 |

use of **Mapelastick**, two-component flexible cement mortar, or with **Elastocolor Paint**, flexible acrylic. For the application of these products, refer to the relative technical data sheets. The above mentioned products create an effective barrier against U.V rays. The use of these products are especially recommended when the structures are exposed to direct sun light.

Precautions to be observed before and after application

- Application temperature must not be below +5°C and the structure must be protected from rain and dust.
- After application, the temperature of the treated surfaces should be kept above +5°C.
- Protect from rain for at least 24 hours if the minimum temperature does not go

below +15°C and for at least 3 days if the temperature is lower.

Cleaning

Due to the strong adhesion of the described epoxy systems, it is recommended to wash the working tools with solvents (ethyl alcohol, toluol, etc.) before the products dry.

STORAGE

Store in a sheltered dry place.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

MapeWrap C UNI-AX HM is an article and referring to the current European regulations (Reg. 1906/2007/CE - REACH) does not require the preparation of the material safety data sheet. During use it is recommended to wear gloves and goggles

and follow the safety requirements of the workplace.

PRODUCT FOR PROFESSIONAL USE.

WARNING

Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

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**All relevant references
for the product are available
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