

# MapeWrap C UNI-AX

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

## WHERE TO USE

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

## Some application examples

- Repair, maintenance and static 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 made of reinforced concrete.

## TECHNICAL CHARACTERISTICS

**MapeWrap C UNI-AX** is mono-directional carbon fibre fabrics characterised by a high ( $252,000 \pm 2\%$  N/mm<sup>2</sup>) 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”.

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”*).

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.

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

- **MapeWrap C UNI-AX 300**: M.E. =  $252,000 \pm 2\%$  N/mm<sup>2</sup>;
- **MapeWrap C UNI-AX 600**: M.E. =  $252,000 \pm 2\%$  N/mm<sup>2</sup>.

# MapeWrap C UNI-AX



Preparing the substrate



Applying  
MapeWrap Primer 1



Smoothing with  
MapeWrap 11 or  
MapeWrap 12

## ADVANTAGES

The mechanical performance characteristics and durability of the **MapeWrap C UNI-AX** carbon fibre composite system has been certified by the American institute ICC-ES (International Code Council Evaluation Service) under various environmental conditions and achieved the report ESR-3499. Because of their extreme lightweight, the fabrics from the **MapeWrap C UNI-AX** range, is 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** 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.

## APPLICATION PROCEDURE

### Preparing the substrate

The surface onto which **MapeWrap C UNI-AX** fabrics will be applied must be perfectly clean, dry and mechanically strong. For masonry structures, remove all crumbling or loose parts and any parts at risk of becoming detached before bonding the fabrics and, where required, level off the surface by applying a layer of **Planitop HDM** or **Planitop HDM Maxi**.

If applied on sound concrete structures, sandblast the surface to remove all traces of stripping compound, varnish, paint and cement laitance.

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**, one-component cementitious mortar (please refer to the relevant 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**.

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**, 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 MapeWrap C UNI-AX with the “wet system”

### Operational steps

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

### 1. Prepare MapeWrap Primer 1

Mix together the two components for **MapeWrap Primer 1**. 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 component A and 1 part by weight of component B. If only partial quantities are used, weigh out each component with high precision electronic scales (this procedure must also be used for the products applied afterwards). 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 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 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 component A and 1 part by weight of component 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 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



## TECHNICAL DATA (typical values)

### PRODUCT IDENTITY

Type of fibre:	high-strength carbon fibre	
Appearance:	mono-directional fabric	
Weight (g/m <sup>2</sup> ):	300	600
Density (kg/m <sup>3</sup> ):	1,800	1,800
Equivalent thickness of dry fabric (mm):	0.164	0.331
Load-resistant area per unit of width (mm <sup>2</sup> /m):	164.3	331.3
Tensile strength (N/mm <sup>2</sup> ):	≥ 4,900	≥ 4,900
Maximum load per unit of width (kN/m):	> 800	> 1,600
Tensile modulus of elasticity (N/mm <sup>2</sup> ):	252,000 ± 2%	252,000 ± 2%
Elongation at breakage (%):	≥ 2	≥ 2

### FINAL PERFORMANCE

Bond strength to concrete (N/mm <sup>2</sup> ):	> 3 (failure of support)
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### CURED LAMINATE PROPERTIES WITH MAPEWRAP 31

PROPERTIES	MAPEWRAP C UNI-AX 300		MAPEWRAP C UNI-AX 600		Test method
	Average value	Design value <sup>1</sup>	Average value	Design value <sup>1</sup>	
Tensile strength* (MPa)	1,637	1,492	1,630	1,450	D-3039
Tensile modulus* (MPa)	83,848	83,848	81,876	81,876	D-3039
Elongation at breakage* (%)	2	1.7	2	1.76	D-3039
Nominal layer thickness* (mm)	0.500	0.500	1	1	-



Manually impregnating MapeWrap C



Impregnating MapeWrap C with a machine



Application phase

\* 20 sample coupons per test series according to ACI 440. Testing in accordance with ASTM D3039.

<sup>1</sup> average value minus 3 standard deviation according to ACI 440.2R (point 4.3.1).

of component A and 1 part by weight of component B. The product 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** 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 fabric

Make sure that the coat of **MapeWrap 11** or **MapeWrap 12** is still “fresh”, and immediately apply **MapeWrap C UNI-AX** 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** 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 approximately 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** must not be moved.

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

### Operational steps

1. Prepare **MapeWrap Primer 1**.
2. Apply **MapeWrap Primer 1**.
3. Prepare **MapeWrap 11** or **MapeWrap 12**.
4. Apply **MapeWrap 11** or **MapeWrap 12**.
5. Prepare **MapeWrap 31**.

6. Impregnate the fabric with **MapeWrap 31**.
7. Place the **MapeWrap C UNI-AX** fabric.

### 1. Prepare MapeWrap Primer 1

Mix together the two components of **MapeWrap Primer 1**. 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 component A and 1 part by weight of component B. Use the whole amount in the packaging to eliminate dosage errors. If only partial quantities are used, weigh out each component with high precision electronic scales (this procedure must also be used for the products applied afterwards).

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

### 2. Apply 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 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 component A and 1 part by weight of component 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 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**



Application phase



Wrapping columns and beams



Wrapping a hitch

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

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

**EPOXY SYSTEM CONSUMPTIONS**

**Surface priming, levelling and smoothing**

	Consumption (g/m <sup>2</sup> )
<b>MapeWrap Primer 1</b>	250-300
<b>MapeWrap 11 or MapeWrap 12</b>	1500-1600

**Impregnating MapeWrap C UNI-AX**

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

approximately 0.5 mm with a brush or short haired roller over the still "fresh" **MapeWrap 11** or **MapeWrap 12**.

**7. Place MapeWrap C UNI-AX**

Immediately place **MapeWrap C UNI-AX** 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 **MapeWrap C UNI-AX**. 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** 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 approximately 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** 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:**

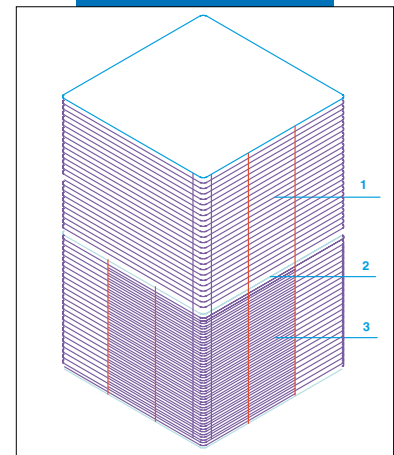
- Impregnate the fabric with **MapeWrap 21**.
- Place the **MapeWrap C UNI-AX** fabric.

**With the "dry system":**

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



Applying a second coat of MapeWrap 31



An example of a joint:  
1. Overlapping the top part 20 cm;  
2. Placing the two strips next to each other;  
3. Overlapping longitudinally 20 cm



Coating with Elastocolor Paint



**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 (approximately 1-2 days at +23°C) by the use of **Mapelastic**, 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 sunlight.

## PRECAUTIONS TO BE TAKEN 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 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](http://www.mapei.com)

**All relevant references for the product are available upon request and from [www.mapei.com](http://www.mapei.com)**



A microscope photograph of a polymeric matrix structural composite from the Mapei R&D Laboratories



BUILDING THE FUTURE