

# Mapewrap C BI-AX

## Balanced high strength bidirectional carbon fibre fabric

### WHERE TO USE

This system is suitable to repair and improve the flexural and shear strength of reinforced concrete elements damaged by physical-mechanical actions.

### Some application examples

- Repair, maintenance and static upgrade of deteriorated structures, where it is absolutely necessary to reinforce the flexural and shear strength of the cross section.
- Confinement of axially loaded or damaged concrete elements (columns, bridge piers, chimneys) in order to improve ductility and load bearing capacity where at the same time it is necessary to compensate the reduction of the area that needs reinforcement.
- 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 bidimensional structures such as slabs, plates, small vaults and tanks.
- Repair of structures damaged by fire.
- Reinforcement of load bearing elements in buildings that have been restructured for architectural reasons or change of use.

### TECHNICAL CHARACTERISTICS

Mapewrap C BI-AX is a bidirectional continuous carbon fibre fabric with balanced weight characterized

by high modulus of elasticity (comparable to steel) and very high tensile strength that can be placed using two different methods:

- 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 **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.

In order to satisfy the most diverse needs, **Mapewrap C BI-AX** is manufactured in two different weights, each with different widths (20 and 40 cm):

- **Mapewrap C BI-AX 230** (238 g/m<sup>2</sup>);
- **Mapewrap C BI-AX 360** (360 g/m<sup>2</sup>).

# Mapewrap C BI-AX



Preparing the substrate



Applying Mapewrap Primer 1



Smoothing with Mapewrap 11 or Mapewrap 12

## ADVANTAGES

Because of their extreme light weight, the fabrics from the **Mapewrap C BI-AX** 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 BI-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.

## DIRECTIONS FOR USE

### Preparing the substrate

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

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

If the concrete has deteriorated, remove damaged parts by manual or pneumatic bushhammering or by hydro-scarifying. Clean metal reinforcement and remove any traces of rust. Protect them with **Mapefer**, a corrosion-inhibiting cement mortar (follow application methods described in the product's technical data sheet). Repair the concrete surfaces with products from the **Mapegrout** line.

**Mapewrap C BI-AX** should be used only on fully cured substrates.

If reinforcement must be carried out immediately, repair with **Adesilex PG1** 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 BI-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.

### Installing the Mapewrap C BI-AX 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 BI-AX** 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. Smooth with **Mapewrap 11** or **Mapewrap 12**.

### 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 Part B into Part 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

Apply an approximately 1 mm thick coat of **Mapewrap 11** or **Mapewrap 12**, depending on the temperature, with a notched trowel, over the concrete surface pre-treated with **Mapewrap Primer 1**. Use a flat trowel to completely level uneven parts of the substrate 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 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: 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. Impregnate the fabric with Mapewrap 21

#### Manually

Cut the fabric beforehand with a pair of scissors to the desired size and manually impregnate the **Mapewrap C BI-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

## TECHNICAL DATA (typical values)

### PRODUCT IDENTIFICATION:

Type of fibre:	high strength carbon
Consistency:	balanced bidirectional fabric
Specific gravity (g/cm <sup>3</sup> ):	1.79
Customs class:	6815 10 10

### MAPEWRAP C BI-AX 230/20 AND MAPEWRAP C BI-AX 230/40

Weight (g/m <sup>2</sup> ):	238
Fabric equivalent thickness:	0.064
Fabric cross area per unit width (mm <sup>2</sup> /m):	64.2
Tensile strength (MPa):	> 4800
Maximum load per unit width (kN/m):	> 305
Tensile modulus of elasticity (GPa):	230
Elongation at breaking point (%):	2.1

### MAPEWRAP C BI-AX 360/20 AND MAPEWRAP C BI-AX 360/40

Weight (g/m <sup>2</sup> ):	360
Fabric equivalent thickness:	0.10
Fabric cross area per unit width (mm <sup>2</sup> /m):	105
Tensile strength (MPa):	> 4800
Maximum load per unit width (kN/m):	> 450
Tensile modulus of elasticity (GPa):	230
Elongation at breaking point (%):	2.1

### FINAL PERFORMANCE

Adhesion to concrete (MPa):	> 3 (concrete breaking point)
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Manually impregnating Mapewrap C



Impregnating Mapewrap C with a machine



Application phase

resin is removed completely, but without wringing the fabric in order not to damage the carbon fibres.

#### With impregnate 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 machine is particularly recommended for the repair of large surface areas. 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 BI-AX

Make sure that the coat of **Mapewrap 11** or **Mapewrap 12** is still fresh, and immediately

apply the **Mapewrap C BI-AX** making sure it is laid without wrinkles. Flatten the fabric, always wear protective rubber gloves, and pass a stiff rubber roller 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 an aluminium roller with a worm screw in order to completely eliminate any air bubbles formed during the application.

#### Joining

When wrapping columns, the **Mapewrap C BI-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.

After applying and passing the roller over the fabric, **Mapewrap C BI-AX** must not be disturbed.

## Installing the Mapewrap C BI-AX 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 BI-AX** 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. Smooth with **Mapewrap 11** or **Mapewrap 12**.

### 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 Part B into Part 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

Apply with a notched trowel, an approximately 1 mm thick coat of **Mapewrap 11** or **Mapewrap 12**, depending on the temperature, over the concrete surface pre-treated with **Mapewrap Primer 1**. Use a flat trowel to completely level uneven parts of the substrate 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 Part B into Part 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 BI-AX

Place the **Mapewrap C BI-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**. Pass over the fabric a stiff rubber roller 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 BI-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.

After applying and passing the roller over the fabric, **Mapewrap C BI-AX** must not be disturbed.

### Installing several layers of Mapewrap C BI-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 BI-AX** fabric.

With the “dry system”:

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

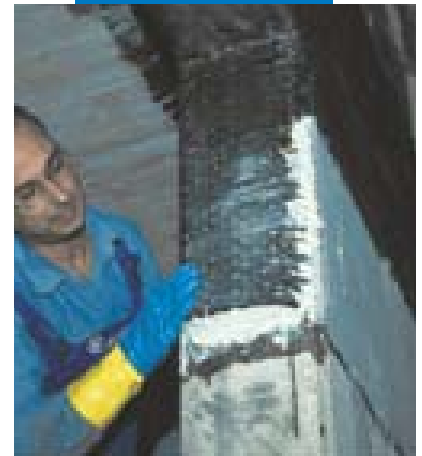
**Note:** If more layers of fabric are applied after 24 hours, the last hardened coat must be sanded.

### PROTECTIVE COVERING

The protective covering can be carried out once the epoxy system has cured by the use of **Mapelastic**, flexible cement mortar, or **Elastocolor**, 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.



Application phase



Wrapping columns and beams



Wrapping a hitch



**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.

**RECOMMENDATIONS FOR HANDLING THE PRODUCTS**

It is absolutely necessary that the workers wear rubber waterproof gloves, protective goggles and masks for solvents when preparing and placing the above described epoxy systems. Avoid contact with skin and eyes and if necessary wash with plenty of running water and soap and contact a doctor. If application is carried out in closed spaces, provide for good ventilation in order to ensure a continuous change of air. For

further information, carefully read the product safety data sheet.

**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.

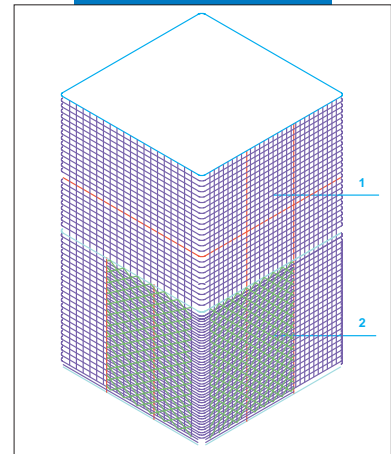
**WARNING**

*N.B. - Although the technical details and recommendations contained in this product report 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 applications: 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.*



Applying a second coat of Mapewrap 31

PACKAGING				
Mapewrap C BI-X 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)
Mapewrap C BI-AX 230/20	238	20	0.2	10
Mapewrap C BI-AX 230/40	238	40	0.4	20
Mapewrap C BI-AX 360/20	360	20	0.2	10
Mapewrap C BI-AX 360/40	360	40	0.4	20



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

**EPOXY SYSTEM CONSUMPTIONS**

**Surface priming, levelling and smoothing**

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

**Impregnating Mapewrap C BI-AX fabric**

	Type (BI-AX)	Consumption (g/m <sup>2</sup> )	Height (cm)	Consumption (g/m)
Mapewrap 21	230	1200-1300	20	240-260
			40	480-520
	360	1500-1650	20	300-330
			40	600-660
Mapewrap 31	230	1000-1100	20	200-220
			40	400-440
	360	1250-1400	20	250-280
			40	500-560



Coating with Elastocolor

# MapeWrap C BI-AX



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

**All relevant references of the product are available upon request.**



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