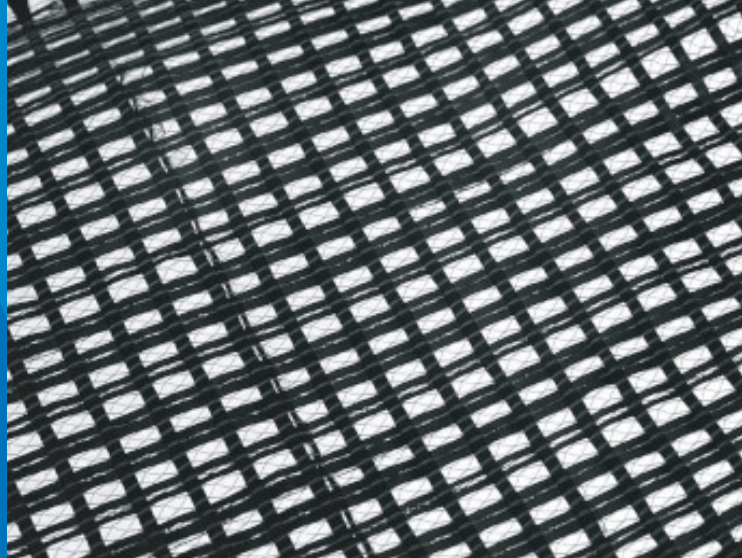


MapeWrap C Bi-Ax

High-Strength, Bi-Directional Carbon Fiber Fabric



FOR PROFESSIONAL USE ONLY

DESCRIPTION

MapeWrap C Bi-Ax is a high-strength, bi-directional carbon fiber fabric in which the primary fibers are oriented in the 0°/90° directions. When used with the *MapeWrap* family of two-component epoxy adhesives, *MapeWrap C Bi-Ax* forms an externally bonded fiber-reinforced polymer (FRP) reinforcement system engineered to increase the strength of existing structural elements. When applied to the surface of structural members in buildings, parking garages, bridges, marine piles and other structures, *MapeWrap C Bi-Ax* contributes significant strength with minimal increase to the dead load supported by the structure.

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 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*, suggested for the strengthening of the substrate.
- *MapeWrap 11* and *MapeWrap 12*, recommended for the levelling of surfaces with a roughness equal or greater than ± 2 mm. Application is also recommended to improve the adhesion (*MapeWrap 12* has a longer workability time than *MapeWrap 11*).
- *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* (230 g/m²);
- *MapeWrap C Bi-Ax 360* (360 g/m²).

ADVANTAGES

Thanks to their extreme light weight, the fabrics from the *MapeWrap C Bi-Ax* range require a smaller team of workers than conventional technologies to be applied. 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.

APPLICATION PROCEDURE

Preparation of 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* two-component corrosion inhibiting cementitious mortar or *Mapefer 1K* one-component corrosion inhibiting cementitious mortar (for application procedures please refer to the products' respective Technical Data Sheets). Repair the concrete surfaces with products from the *Mapegrout* range.

Wait at least three weeks before applying the *MapeWrap C Bi-Ax System*.

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

Seal any surface cracks by injecting *Epojet* or *Epojet LV* (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 to maintain a bending radius of no less than 2 cm.

Installing *MapeWrap C Bi-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 Bi-Ax* fabric.

1. Prepare *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. Mixing ratio: 3 parts by weight of A and 1 part by weight of B. Use the whole amount in the packaging to avoid dosage mistakes.

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. Smooth with *MapeWrap 11* or *MapeWrap 12*.

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 time than *MapeWrap 11*). Pour Part B into Part A and mix with a low speed drill fitted with a stirrer until an even grey paste is obtained. Mixing ratio for both products: 3 parts by weight of part A and 1 part by weight of part B. Once *MapeWrap 11* has been prepared, it remains workable for approximately 35 minutes at +23°C while *MapeWrap 12* remains workable for approximately 50 minutes.

MapeWrap 11 is especially recommended for application at a temperature between +5°C and +23°C, while *MapeWrap 12* is recommended for higher surrounding temperatures.

4. Apply *MapeWrap 11* or *MapeWrap 12*

Apply an approximately 1 mm thick coat of *MapeWrap 11* or *MapeWrap 12*, 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 *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. Mixing ratio: 4 parts by weight of part A and 1 part by weight of part 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 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 saturate and drip 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 *MapeWrap C Bi-Ax*

Make sure that the coat of *MapeWrap 11* or *MapeWrap 12* is still fresh, and immediately apply *MapeWrap C Bi-Ax* making sure it is laid without wrinkles. Flatten the fabric by hand (always wear protective rubber gloves) and press using the *Roller for MapeWrap* so that the adhesive perfectly penetrates into the fabric, then apply on *MapeWrap C Bi-Ax* a second coat of *MapeWrap 21*. Pass again over the fabric the *Roller for MapeWrap* in order to completely eliminate any air bubbles formed during the application.

Then fully broadcast the still fresh resin with dry quartz sand, with a grain size between 1.2 and 1.9 mm (for further details regarding the technical characteristics of each epoxy resin employed in *MapeWrap C Bi-Ax* strengthening system, please refer to the respective Technical Data Sheets).

Joints

When wrapping columns, the *MapeWrap C Bi-Ax* strip must be overlapped at least 30 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 moved anymore.

Installing *MapeWrap C Bi-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. Apply the first coat of *MapeWrap 31*.
7. Place the *MapeWrap C Bi-Ax* fabric.

1. Prepare *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. Mixing ratio: 3 parts by weight of part A and 1 part by weight of part B. Use the whole amount in the packaging to avoid dosage mistakes.

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. Smooth with *MapeWrap 11* or *MapeWrap 12*.

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 time than *MapeWrap 11*). Pour Part B into Part A and mix with a low speed drill fitted with a stirrer until an even grey paste is obtained. Mixing ratio for both products: 3 parts by weight of part A and 1 part by weight of part B. Once *MapeWrap 11* has been prepared, it remains workable for approximately 35 minutes at +23°C while *MapeWrap 12* remains workable for approximately 50 minutes.

MapeWrap 11 is especially recommended for application at a temperature between +5°C and +23°C, while *MapeWrap 12* is recommended for higher surrounding temperatures.

4. Apply *MapeWrap 11* or *MapeWrap 12*

Apply an approximately 1 mm thick coat of *MapeWrap 11* or *MapeWrap 12*, 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 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. Mixing ratio: 4 parts by weight of part A and 1 part by weight of part 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 thick with a brush or roller over the still fresh *MapeWrap 11* or *MapeWrap 12*.

7. Place MapeWrap C Bi-Ax

Place the *MapeWrap C Bi-Ax* fabric over the still fresh *MapeWrap 31*, ensuring no wrinkles are present and pressing it using the *Roller for MapeWrap*, so that the adhesive penetrates deeply in the fibres of the fabric. Apply a second coat of *MapeWrap 31*. Pass over the *Roller for MapeWrap* in order to completely eliminate any air bubbles formed during application.

Then fully broadcast the still fresh resin with dry quartz sand, with a grain size between 1.2 and 1.9 mm (for further details regarding the technical characteristics of each epoxy resin employed in *MapeWrap C Bi-Ax* strengthening system, please refer to the respective Technical Data Sheets).

Joints

When wrapping columns, the *MapeWrap C Bi-Ax* strip must be overlapped at least 30 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 moved anymore.

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.*



Preparing the substrate



Applying MapeWrap Primer 1



Smoothing with MapeWrap 11 or MapeWrap 12



Manually impregnating MapeWrap C



Impregnating MapeWrap C with a machine



Application phase



Application phase



Wrapping columns and beams



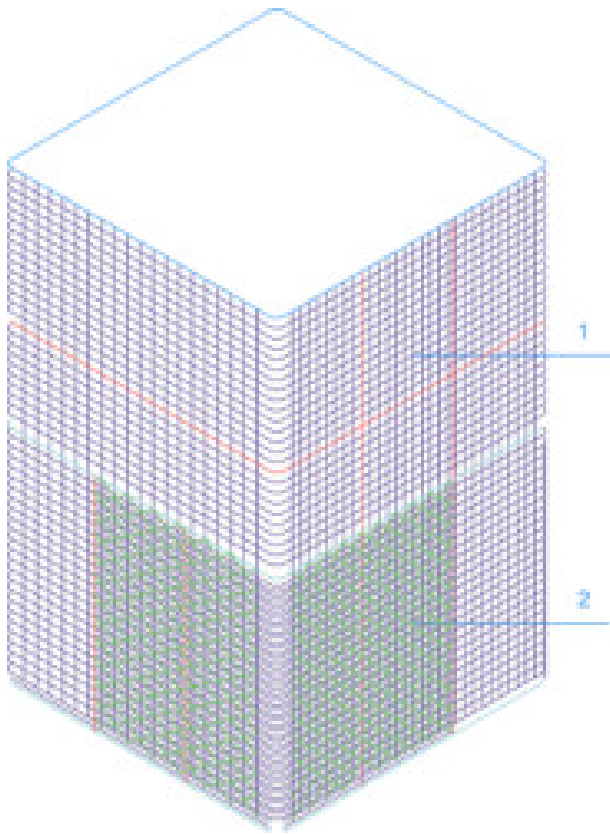
Wrapping a hitch



Applying a second coat of MapeWrap 31

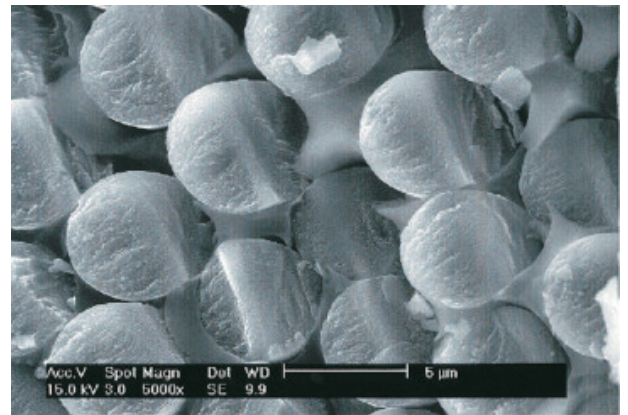


Coating with Elastocolor



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



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

PROTECTIVE COVERING

The protective covering can be carried out once the epoxy system has cured by the use of *Mapelast* 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 is especially recommended when the structures are exposed to direct sunlight.

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- Application temperature must not be below +5°C (or +10°C in case *MapeWrap Primer 1* is employed) and the structure must be protected from rain and dust.
- After application, the temperature of the treated surfaces must be kept above +5°C (or +10°C in case *MapeWrap Primer 1* is employed).
- Protect from rain for at least 24 hours if the minimum temperature does not drop 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 water and soap and seek medical attention.

If application is carried out in closed environments, provide 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.

EPOXY SYSTEM CONSUMPTION

Surface priming, levelling and smoothing

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

Impregnating *MapeWrap C Bi-Ax* fabric

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

PACKAGING

MapeWrap C Bi-Ax 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)
<i>MapeWrap C Bi-Ax 230/20</i>	230	20	0.2	10
<i>MapeWrap C Bi-Ax 230/40</i>	230	40	0.4	20
<i>MapeWrap C Bi-Ax 360/20</i>	360	20	0.2	10
<i>MapeWrap C Bi-Ax 360/40</i>	360	40	0.4	20

STORAGE

Store in a sheltered dry place.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

MapeWrap C Bi-Ax is an article and referring to the current regulations does not require the preparation of the Safety Data Sheet. During use it is recommended wearing gloves and goggles and following the safety requirements of the workplace.

Technical Data

PRODUCT IDENTITY	
Type of fibre:	high strength carbon fibres
Appearance:	balanced bidirectional fabric
Specific gravity (g/cm ³):	1.79
<i>MapeWrap C Bi-Ax 230/20 and MapeWrap C Bi-Ax 230/40</i>	
Weight (g/m ²):	230
Fabric equivalent thickness (mm):	0.064
Fabric cross area per unit of width (mm ² /m):	64.2
Tensile strength (MPa):	> 4800
Maximum load per unit width (kN/m):	> 305
Tensile modulus of elasticity (GPa):	230
Elongation at failure (%):	2.1
<i>MapeWrap C Bi-Ax 360/20 and MapeWrap C Bi-Ax 360/40</i>	
Weight (g/m ²):	360
Fabric equivalent thickness (mm):	0.10
Fabric cross area per unit of width (mm ² /m):	105
Tensile strength (MPa):	> 4800
Maximum load per unit of width (kN/m):	> 450
Tensile modulus of elasticity (GPa):	230
Elongation at failure (%):	2.1
FINAL PERFORMANCE	
Adhesion to concrete (MPa):	> 3 (concrete failure)

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.

ADDITIONAL INFORMATION

For information on MAPEI's commitment to sustainability and transparency, as well as how MAPEI products may contribute to green building standards and certification systems, contact sustainability_USA@mapei.com (USA) or sustainability-durabilite@mapei.com (Canada).

LEGAL NOTICE

The contents of this Technical Data Sheet ("TDS") may be copied into another project-related document, but the resulting document shall not supplement nor replace requirements per the TDS in effect at the time of the MAPEI product installation. For the most up-to-date TDS and warranty information, please visit our website at www.mapei.com. **ANY ALTERATIONS TO THE WORDING OR REQUIREMENTS CONTAINED IN OR DERIVED FROM THIS TDS SHALL VOID ALL RELATED MAPEI WARRANTIES.**

Before using, the user must determine the suitability of our products for the intended use, and the user alone assumes all risks and liability. **ANY CLAIM SHALL BE DEEMED WAIVED UNLESS MADE IN WRITING TO US WITHIN FIFTEEN (15) DAYS FROM DATE IT WAS, OR REASONABLY SHOULD HAVE BEEN, DISCOVERED.**

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Edition Date: June 8, 2023 MK 3001003 (23-1909)

For the most current product data and BEST-BACKEDSM warranty information,
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