

Mapewrap C QUADRI-AX

Balanced high strength quadri-directional carbon fibre fabric

WHERE TO USE

This system is suitable to repair and for the static upgrade of reinforced concrete structures damaged by environmental or accidental aggression, where the distribution of isostatic lines of tension are unknown.

Some application examples

- Repair of bidimensional structures such as slabs, plates, small vaults and tanks without needing to know where the distribution of the isostatic lines of tension are.
- 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.
- Plating beam-column joints for seismic strengthening.
- Reinforcement of load bearing elements in buildings that have been restructured for architectural reasons or change of use.

TECHNICAL CHARACTERISTICS

Mapewrap C QUADRI-AX is a quadri-directional 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 QUADRI-AX** is manufactured in two different weights, each with different widths (30 and 48.5 cm):

- **Mapewrap C QUADRI-AX 380** (380 g/m²);
- **Mapewrap C QUADRI-AX 760** (760 g/m²).

ADVANTAGES

Because of their extreme light weight, the fabrics from the **Mapewrap C QUADRI-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

MapeWrap C QUADRI-AX



Preparing the substrate



Applying
Mapewrap Primer 1



Smoothing with
Mapewrap 11 or
Mapewrap 12

plaqu e method), the use of **Mapewrap C QUADRI-AX** fabrics 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 QUADRI-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 is 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 QUADRI-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 QUADRI-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 QUADRI-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 QUADRI-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 QUADRI-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.

TECHNICAL DATA (typical values)

PRODUCT IDENTIFICATION:

Type of fibre:	high strength carbon
Consistency:	balanced quadri-directional fabric
Specific gravity (g/cm ³):	1.79
Customs class:	6815 10 10

MAPEWRAP C QUADRI-AX 380/30 AND MAPEWRAP C QUADRI-AX 380/48

Weight (g/m ²):	380
Fabric equivalent thickness:	0.053
Fabric cross area per unit width (mm ² /m):	53.1
Tensile strength (MPa):	> 4800
Maximum load per unit width (kN/m):	> 254
Tensile modulus of elasticity (GPa):	230
Elongation at breaking point (%):	2.1

MAPEWRAP C QUADRI-AX 760/30 AND MAPEWRAP C QUADRI-AX 760/48

Weight (g/m ²):	760
Fabric equivalent thickness:	0.106
Fabric cross area per unit width (mm ² /m):	106.1
Tensile strength (MPa):	> 4800
Maximum load per unit width (kN/m):	> 500
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

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 QUADRI-AX

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

QUADRI-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.

Overlapping is not necessary for the width of the fabric. The different strips of fabric need to be applied one next to the other. After applying and passing the roller over the fabric, **Mapewrap C QUADRI-AX** must not be disturbed.

Installing the Mapewrap C QUADRI-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 QUADRI-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 QUADRI-AX

Place the **Mapewrap C QUADRI-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 QUADRI-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 QUADRI-AX** must not be disturbed.

Installing several layers of Mapewrap C QUADRI-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 QUADRI-AX** fabric.

With the "dry system":

- Apply a first coat of **Mapewrap 31**, place the **Mapewrap C QUADRI-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 paint. 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.



Application phase



Wrapping columns and beams



Wrapping a hitch

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.

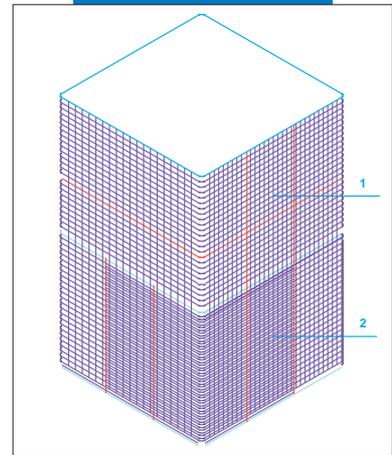


Applying a second coat of Mapewrap 31

PACKAGING

Mapewrap C QUADRI-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)
Mapewrap C QUADRI-AX 380/30	380	30	0.3	15
Mapewrap C QUADRI-AX 380/48	380	48.5	0.485	24.25
Mapewrap C QUADRI-AX 760/30	760	30	0.3	15
Mapewrap C QUADRI-AX 760/48	760	48.5	0.485	24.25



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 ²)
Mapewrap Primer 1	250-300
Mapewrap 11 or Mapewrap 12	1500-1600

Impregnating Mapewrap C QUADRI-AX fabric

	Type (QUADRI-AX)	Consumption (g/m ²)	Height (cm)	Consumption (g/m)
Mapewrap 21	380	1800-2000	30	540-600
			48.5	870-970
	760	3150-3500	30	950-1050
			48.5	1530-1700
Mapewrap 31	380	2000-2100	30	600-700
			48.5	970-1020
	760	3500-3700	30	1050-1100
			48.5	1700-1800



Coating with Elastocolor

MapeWrap C QUADRI-AX



Acc.V Spot Magn Det WD | b μm
15.0 kV 3.0 5000x SE 9.9

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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