

MapeWrap C UNI-AX 240

High-strength unidirectional carbon fibre fabric with high modulus of elasticity

WHERE TO USE

This system is recommended for repairing reinforced concrete members and masonry damaged by physical-mechanical stresses, for compressive confinement and combined compressive/bending strengthening of concrete members and masonry and for seismic upgrading of structures in high-risk zones.

Some application examples

- Repairs and static and seismic upgrading of unstable or weak structures where the shear and tensile strength need to be supplemented.
- Confining compressed and pre-compressed members (pillars, bridge piles, chimneys, etc.) to improve their load-bearing capacity or ductility.
- Renovation work and seismic upgrading of arched and vaulted structures without increasing their seismic mass and without the risk of liquids percolating towards the internal surface.
- Repairs to structures damaged by fire.
- Strengthening load-bearing members in buildings whose structural system has been modified due to new architectural requirements or change in use.
- Seismic upgrading of reinforced concrete industrial buildings.

TECHNICAL CHARACTERISTICS

MapeWrap C UNI-AX 240 is a unidirectional carbon

fibre fabric characterised by its high modulus of elasticity ($252,000 \pm 2\%$ N/mm²) and high tensile strength. It may be applied using two different techniques:

- “wet” application method;
- “dry” application method using a complete range of epoxy resins comprising:
 - **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 (the workability time of **MapeWrap 12** is higher than **MapeWrap 11**);
 - **MapeWrap 21** impregnator for “wet” system fabrics;
 - **MapeWrap 31** impregnator for “dry” system fabrics.

The bonding products in the **MapeWrap System** line meet the requirements defined in EN 1504-9 (“*Products and systems for the repair and protection of concrete structures: definitions, requirements, quality control and conformity assessment. General principles for the use of products and systems*”), and the minimum requirements for EN 1504-4 (“*Anchoring of reinforcing steel bar*”).

With the “wet” system the fabric is pre-impregnated with **MapeWrap 21** and then applied, while with the “dry” system the dry fabric is positioned directly on a layer of **MapeWrap 31** applied previously on the surface of the concrete member to be strengthened.

ADVANTAGES

Unlike work carried out using conventional techniques,

thanks to their extremely low weight, fabrics from the **MapeWrap C UNI-AX 240** line may be put in place by a smaller team of workers. With both the “dry” system and the “wet” system (which only requires tools to make impregnation easier), application is carried out extremely quickly and often without having to interrupt the normal activities of the structure.

Compared with the cladding technique with metal plates (beton plaqué), **MapeWrap C UNI-AX 240** fabric may be adapted to suit any shape of member requiring repair, it does not require temporary supports during application and any risk of corrosion to the reinforcement is completely eliminated.

RECOMMENDATIONS

All workers must use protective gloves and goggles and anti-solvent safety masks.

APPLICATION PROCEDURE

Preparation of the substrate

The surface on which **MapeWrap C UNI-AX 240** fabric is to be applied must be perfectly clean, dry and strong.

For 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 surface by applying a layer of **Planitop HDM Maxi**. When applied on sound concrete structures, sandblast the surface to remove all traces of form-release oil, varnish, paint and cement laitance.

If the concrete is deteriorated, remove all damaged parts using a hammer, a jack-hammer or by hydro-scarifying.

Remove all traces of rust from the exposed rebar and protect it with **Mapefer** two-component anti-corrosion cementitious mortar or **Mapefer 1K** one component cementitious mortar (refer to the respective Technical Data Sheet of each product for application procedures).

Repair concrete surfaces using products from the **Mapegrout** line.

Wait at least three weeks before applying **MapeWrap C UNI-AX 240**.

If strengthening work needs to be carried out immediately, use **Adesilex PG1** or **Adesilex PG2** to carry out repairs.

Seal all cracks in the structure by injecting **Epojet** or **Epojet LV** (suitable only for dry or slightly damp cracks) or with **Foamjet T** or **Foamjet F** (suitable for damp cracks or if water is seeping in).

Round off all sharp edges and corners on members which are to be strengthened with **MapeWrap C UNI-AX 240** (such as beams and pillars) with a jack-hammer or other suitable tools. We recommend rounding them off to a radius of at least 2 cm (in compliance with CNR-DT 200 R1/2013).

“Wet system” application method for MapeWrap C UNI-AX 240

Application phases

1. Preparation of **MapeWrap Primer 1**.
2. Application of **MapeWrap Primer 1**.

3. Preparation of **MapeWrap 11** or **MapeWrap 12**.
4. Application of **MapeWrap 11** or **MapeWrap 12**.
5. Preparation of **MapeWrap 21**.
6. Impregnation of the fabric with **MapeWrap 21**.
7. Application of **MapeWrap C UNI-AX 240** fabric.

1. Preparation of MapeWrap Primer 1

The two components which make up **MapeWrap Primer 1** must be mixed together. Pour component B into component A and mix with a drill at low-speed with a mixing attachment until the resin is completely blended. Mixing ratio: 3 parts in weight of component A with 1 part in weight of component B. To avoid dosage errors use the entire contents of the two components. If only partial quantities are required, use high-precision electronic scales to weigh out the components (this procedure must also be adopted for the other products).

Once prepared, the workability time of **MapeWrap Primer 1** is around 90 minutes at +23°C.

2. Application of MapeWrap Primer 1

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

If the surface is particularly absorbent, apply a second coat of **MapeWrap Primer 1** once the first coat has been completely absorbed. Smooth over the surface using **MapeWrap 11** or **MapeWrap 12** while the product underneath is still wet.

3. Preparation of MapeWrap 11 or MapeWrap 12

Choose whether to use **MapeWrap 11** or **MapeWrap 12** according to the surrounding temperature and workability times (the workability time of **MapeWrap 12** is higher than **MapeWrap 11**). Pour component B into component A and mix with a drill at low-speed with a mixing attachment until an even grey paste is obtained. Mixing ratio for both products: 3 parts in weight of component A with 1 part in weight of component B. At +23°C **MapeWrap 11** remains workable for approximately 35 minutes after mixing, 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 temperature.

4. Application of MapeWrap 11 or MapeWrap 12

On concrete or masonry surfaces which have been previously treated with **MapeWrap Primer 1**, and while it is still “wet”, apply a layer around 1 mm thick of **MapeWrap 11** or **MapeWrap 12** with a notched spreader then smooth over the surface using a flat spreader to completely remove all imperfections on the surface.

TECHNICAL DATA (typical values)

PRODUCT IDENTITY

Type of fibre:	high strength carbon with high modulus of elasticity
Appearance:	unidirectional fabric
Weight (g/m ²):	240
Density (kg/m ³):	1,800
Equivalent thickness of dry fabric (mm):	0.133
Resistant area per unit of width (mm ² /m):	132.8
Tensile strength (N/mm ²):	4,830
Maximum load per unit of width (kN/m):	640
Tensile modulus of elasticity (N/mm ²):	252,000 ± 2%
Elongation at failure (%):	≥ 2

FINAL PERFORMANCE

Adhesion to concrete (N/mm ²):	> 3 (failure of substrate)
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CONSUMPTION OF EPOXY SYSTEMS

Priming, evening out and skimming surfaces

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

Impregnation of MapeWrap C UNI-AX 240

	Weight (g/m ²)	Consumption (g/m ²)
MapeWrap 21	240	1000-1100
MapeWrap 31	240	900-1000

Using the same product, fill and round off the corners to form an edge with a radius of at least 2 cm.

5. Preparation of MapeWrap 21

Pour component B into component A and mix with a drill at low-speed with a mixing attachment until the resin is completely blended. Mixing ratio: 4 parts in weight of component A with 1 part in weight of component B. The product remains workable for approximately 40 minutes at +23°C.

6. Impregnating the fabric with MapeWrap 21

Manual impregnation

Cut the **MapeWrap C UNI-AX 240** fabric to the sizes required using a pair of scissors and impregnate the fabric by soaking it for a few minutes in a rectangular plastic bowl approximately 1/3 full with **MapeWrap 21**. Take the fabric from the bowl, leave it to drip for a few seconds and then remove all the excess resin by squeezing it gently with your hands; do not wring the fabric, it may damage the carbon fibres. Wear rubber gloves when carrying out this operation.

Mechanical impregnation

As an alternative to manual impregnation, simple equipment with a bowl and a series of rollers may be used. This makes it easier and safer for the operator to saturate the fabric and remove the excess resin.

This equipment is particularly recommended when a large number of interventions on large surface areas need to be carried out. This system will guarantee that the resin is distributed evenly in every part of the fabric. Apply the fabric immediately after impregnation.

7. Application of MapeWrap C UNI-AX 240 fabric

Make sure the layer of **MapeWrap 11** or **MapeWrap 12** is still "wet", then immediately apply the **MapeWrap C**

UNI-AX 240, making sure there are no folds or creases. After flattening the fabric out by hand (always wear protective rubber gloves), go over the surface several times with a **MapeWrap Roller** in a lengthways direction with respect to the fibres, so that it penetrates perfectly into the **MapeWrap 11** or **MapeWrap 12** epoxy grout. Then go over the surface again with the **MapeWrap Roller** to completely remove all air bubbles.

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 UNI-AX 240** strengthening system, please refer to the respective Technical Data Sheets).

Joints

There must be an overlap of at least a 20 cm between the ends of two strips of **MapeWrap C UNI-AX 240** fabric. This is not necessary, however, across the width of the fabric. In

this case, adjacent strips of fabric only need to be butted tightly against each other. After laying and pressing the **MapeWrap C UNI-AX 240** fabric with the special roller it must not be moved.

"Dry system" application method for MapeWrap C UNI-AX 240

Application phases

1. Preparation of **MapeWrap Primer 1**.
2. Application of **MapeWrap Primer 1**.
3. Preparation of **MapeWrap 11** or **MapeWrap 12**.
4. Application of **MapeWrap 11** or **MapeWrap 12**.
5. Preparation of **MapeWrap 31**.
6. Application of the first coat of **MapeWrap 31**.
7. Application of **MapeWrap C UNI-AX 240** Fabric.

1. Preparation of MapeWrap Primer 1

The two components which make up **MapeWrap Primer 1** must be mixed together. Pour component B into component A and mix with a drill at low-speed with a mixing attachment until the resin is completely blended. Mixing ratio: 3 parts in weight of component A with 1 part in weight of component B. To avoid dosage errors use the entire contents of the two components. If only partial quantities are required, use high-precision electronic scales to weigh out the components (this procedure must also be adopted for the other products). Once prepared the workability time of **MapeWrap Primer 1** is around 90 minutes at +23°C.

2. Application of MapeWrap Primer 1

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

If the surface is particularly absorbent, apply a second coat of **MapeWrap Primer 1** once the first coat has been completely absorbed. Skim the surface with **MapeWrap 11** or **MapeWrap 12** while the product underneath is still "wet".

3. Preparation of MapeWrap 11 or MapeWrap 12

Choose whether to use **MapeWrap 11** or **MapeWrap 12** according to the surrounding temperature and workability times (the workability time of **MapeWrap 12** is higher than **MapeWrap 11**). Pour component B into component A and mix with a drill at low-speed with a mixing attachment until an even grey paste is obtained. Mixing ratio for both products: 3 parts in weight of component A with 1 part in weight of component B. At +23°C **MapeWrap 11** remains workable for approximately 35 minutes after mixing, 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 temperature.

4. Application of MapeWrap 11 or MapeWrap 12

On concrete or masonry surfaces which have been previously treated with **MapeWrap Primer 1**, and while it is still “wet”, apply a layer around 1 mm thick of **MapeWrap 11** or **MapeWrap 12** with a notched spreader then smooth over the surface using a flat spreader to completely remove all imperfections on the surface. Using the same product, fill and round off the corners to form an edge with a radius of at least 2 cm.

5. Preparation of MapeWrap 31

Pour component B into component A and mix with a drill at low-speed with a mixing attachment until they form an even yellow paste.

Mixing ratio: 4 parts in weight of component A with 1 part in weight of component B. After mixing, the product remains workable for approximately 40 minutes at +23°C.

6. Application of the first coat of MapeWrap 31

Apply a first, even layer around 0.5 mm thick of **MapeWrap 31** on the **MapeWrap 11** or **MapeWrap 12** while they are still “wet” with a brush or roller.

7. Application of MapeWrap C UNI-AX 240 fabric

Place **MapeWrap C UNI-AX 240** 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 UNI-AX 240** strengthening system, please refer to the respective Technical Data Sheets).

Joints

There must be an overlap of at least a 20 cm between the ends of two strips of **MapeWrap C UNI-AX 240** fabric. This is not necessary, however, across the width of the fabric. In this case, adjacent strips of fabric only need to be butted tightly against each other.

After laying and pressing the **MapeWrap C UNI-AX 240** fabric with the special roller it must not be moved.

Procedure for the “wet” application method (within 24 hours) of additional layers of MapeWrap C UNI-AX 240

Using the “wet” application method, repeat the following operations:

- impregnate the fabric with **MapeWrap 21**;
- apply the **MapeWrap C UNI-AX 240** fabric.

Using the “dry” application method:

- apply a first coat of **MapeWrap 31** and apply the **MapeWrap C UNI-AX 240** fabric;
- apply another coat of **MapeWrap 31**.

Note: if additional layers of fabric are applied after more than 24 hours the previous layer must be roughened up by sanding.

PROTECTIVE COATING

A protective coating may be applied once the epoxy system has completely hardened (approximately 1-2 days at +23°C), such as **Mapelastic** two-component elastic cementitious mortar or **Elastocolor Paint** elastic acrylic paint (please refer to the Technical Data Sheet of each product for application instructions). The products mentioned above form an efficient barrier against UV rays, which makes them particularly recommended for structures exposed to direct sunlight.

PRECAUTIONS TO BE TAKEN DURING AND AFTER APPLICATION

- The temperature during application must be at least +5°C (or +10°C in case **MapeWrap Primer 1** is used) and the structure must be dry and protected from rain and dust carried by the wind.
- After completing the application operations, make sure the treated surfaces are kept at a temperature of at least +5°C (or +10°C in case **MapeWrap Primer 1** is used).
- Protect surfaces from rain for at least 24 hours if the temperature does not drop below +15°C and for at least 3 days if the temperature is lower.

Cleaning

Epoxy systems form an extremely strong bond and we recommend cleaning all work tools with solvent (such as ethanol, toluene, etc.) before the products harden.

STORAGE

Store in a dry, covered area.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

MapeWrap C UNI-AX 240 is an article, and to current European Regulations (Reg. 1906/2007/CE - REACH), does not require a Safety Data Sheet. When using this product we recommend wearing gloves and safety goggles and to adhere to the safety guidelines for the area in which work is carried out.

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 upon request and from www.mapei.com