



MapeWrap S Fabric 650

High-strength unidirectional galvanized steel fibre fabric for structural strengthening

WHERE TO USE

This system is recommended for structural strengthening of reinforced concrete members, stone, brick and tuff masonry buildings and structures damaged by physical-mechanical stresses, for increasing shear and flexural strength of reinforced concrete and masonry members and for seismic upgrading of structures in high-risk areas.

Some application examples

- Anchoring and static upgrading of damaged or deteriorated structures where the shear-bearing section of members needs to be integrated.
- Flexural strengthening of beams.
- Repairs to structures damaged by fire.
- Strengthening load-bearing member in buildings whose structural system has been modified due to new architectural requirements or change in use.
- Strengthening reinforcement for more even distribution of stresses induced by seismic activity.
- Structural strengthening of arches and vaulted roofs through application to both the external and internal faces.

TECHNICAL CHARACTERISTICS

MapeWrap S Fabric 650 is a unidirectional fabric made from metal fibres called SRP (*Steel Reinforced Polymer*), consisting of galvanized steel filaments characterised by their extremely high strength, and is applied using

epoxy resin (*FRP System*) or resin with an inorganic matrix (*FRG System*).

The fabric is applied by using a complete range of epoxy resins such as:

- **MapeWrap Primer 1** consolidator used to treat the substrate.
- **MapeWrap 11** and **MapeWrap 12** smoothing and levelling compounds used to even out uneven surfaces and seal porosity (the workable time of **MapeWrap 12** is higher than that of **MapeWrap 11**).

An alternative solution is to apply the fabric using high ductile, fibre-reinforced mortar such as **Planitop HDM Maxi** or **Planitop HDM Restauro**, **Mape-Antique Strutturale NHL** or a lime-based product such as **MapeWall Render & Strengthen**.

ADVANTAGES

Due to the low weight of **MapeWrap S Fabric 650**, it may be installed by a lower number of workers compared with installations carried out using conventional methods. The product can be applied extremely quickly and often without interrupting the use of the structure.

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 S Fabric 650** is to be applied must be perfectly clean, dry and strong.

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

If the concrete is deteriorated, remove all damaged parts using a hammer, a pneumatic hammer or by hydro-scarifying. Remove all traces of rust from the reinforcement rods and protect them with **Mapefer**, two-component anti-corrosion cementitious mortar or **Mapefer 1K**, one-component cementitious mortar (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 applying **MapeWrap S Fabric 650**.

If strengthening work needs to be carried out immediately, use **Adesilex PG1**, **Adesilex PG2** or **Mapefloor EP19** to carry out repair work. Seal all cracks in the structure by injecting **Epojet** (suitable only for dry or slightly damp cracks) or **Foamjet T** or **Foamjet F** (suitable for damp cracks or if water is seeping in). Round off all sharp corners on members to be strengthened with **MapeWrap S Fabric 650** in combination with fabrics from the **MAPEI FRP System** range (such as beams and pillars) with a pneumatic hammer or other suitable tools. We recommend forming a bending radius of at least 30 mm.

When used to strengthen bay walls or the internal face of arched or vaulted members and elements, the render must be completely removed either manually or with suitable power tools, along with any deteriorated or detached areas until the substrate is sound, compact and strong so that the strengthening package itself does not detach. This operation must be carried out until the underlying masonry is exposed. While the render is being removed, if new stones, bricks and/or tuff are required to fill large gaps in the wall, use material with characteristics as similar as possible to the material originally used to build the structure. When used to strengthen the external face of masonry vaulted members and elements, remove all the flooring and spandrels and any deteriorated or detached areas until the substrate is sound, compact and strong so that the strengthening package itself does not detach.

Application of MapeWrap S Fabric 650 with an organic matrix (FRP)

Application phases

1. Preparation of **MapeWrap S Fabric 650**.
2. Preparation of **MapeWrap Primer 1**.
3. Application of **MapeWrap Primer 1**.
4. Preparation of **MapeWrap 11** or **MapeWrap 12**.
5. Application of **MapeWrap 11** or **MapeWrap 12**.
6. Application of **MapeWrap S Fabric 650**.

1. Preparation of MapeWrap S Fabric 650

Cut the metal fibre fabric to the length required with a hand grinder.

2. 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 by weight of component A with 1 part by weight of component B. To avoid dosage mistakes, use the whole amount of the two components. If only partial quantities are required, use a high-precision electronic scales to weigh out the components (this procedure may also be adopted for the other products).

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

3. 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.

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.

4. 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 for **MapeWrap 11**). Pour component B into component A and mix with a drill at low-speed with a mixing attachment until a uniform, grey blend is obtained.

Mixing ratio for both products: 3 parts by weight of component A with 1 part by 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.

5. Application of MapeWrap 11 or MapeWrap 12

For concrete surfaces treated with **MapeWrap Primer 1**, apply a 1 mm-thick layer of **MapeWrap 11** or **MapeWrap 12** while the primer is still fresh using a notched trowel, then smooth over the surface using a flat trowel to completely remove any imperfections on the surface.

6. Application of MapeWrap S Fabric 650

Check that the first layer of **MapeWrap 11** or **MapeWrap 12** is still wet, then immediately apply **MapeWrap S Fabric 650** with a flat trowel to lightly press the fabric down; work the fabric in a longitudinal direction to the fibres to make sure it adheres perfectly to the first layer of **MapeWrap 11** or **MapeWrap 12**. If the span to be strengthened is more than the length of the roll (> 25.00 m), overlap the ends of each length of fabric by at least 30 cm. After laying

TECHNICAL DATA (typical values)

PRODUCT IDENTITY

Type of fibre:	galvanized steel fibres
Appearance:	unidirectional fabric
Density (kg/m ³):	7,850
Weight (metal fibres only) (g/m ²):	650
N° threads per unit of width (n°/m):	144
Resistant area per unit of width (mm ² /m):	97.405
Equivalent thickness of dry fabric (mm):	0.097
Tensile strength (N/mm ²):	> 2,580
Tensile strength per unit of width (kN/cm):	2.5
Tensile modulus of elasticity (N/mm ²):	200,000
Maximum load per unit of width (kN/m):	> 251
Elongation at failure (%):	> 1.29

and pressing the fabric with the flat trowel, use plastic or metal studs to temporarily fix it to the structure. Apply a second layer of **MapeWrap 11** or **MapeWrap 12** making sure that it completely covers the fibres of **MapeWrap S Fabric 650**.

Application of MapeWrap S Fabric 650 bows to increase shear strength around the base of reinforced concrete and to make localised strengtheners

Application phases

1. Preparation of **MapeWrap S Fabric 650**.
2. Preparation of **MapeWrap Primer 1**.
3. Application of **MapeWrap Primer 1**.
4. Preparation of **MapeWrap 11** or **MapeWrap 12**, **Mapefix EP 470 Seismic**, **Mapefix EP 385-585**, **Mapefix VE SF** and **Mapefix PE Wall**.
5. Application of **MapeWrap 11** or **MapeWrap 12**, **Mapefix EP 470 Seismic**,

Mapefix EP 385-585, **Mapefix VE SF** and **Mapefix PE Wall**.

6. Application of **MapeWrap S Fabric 650** bows.

1. Preparation of MapeWrap S Fabric 650

Cut the fabric to the length required with a hand grinder and then roll it up to form an "anchor bow". Drill holes around the base of the pillar for shear strengthening, or in the area where the strengtheners are to be applied. The diameter of the holes should be larger than the bow so that it forms a good, solid anchor point with the adhesive selected. Make sure the holes are perfectly clean and dry.

2. 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 by weight of component A with 1 part by weight of component B. To avoid dosage mistakes, use the whole amount of the two components. If only partial quantities are required, use a 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.

3. Application of MaPeWrap Primer 1

Prime the holes by applying **MaPeWrap Primer 1** with a pipe-cleaner. If the substrate is particularly absorbent, apply a second coat of **MaPeWrap Primer 1** once the first coat has been completely absorbed. Then apply **MaPeWrap 11** or **MaPeWrap 12**, **MaPeFix EP 470 Seismic**, **MaPeFix EP 385-585**, **MaPeFix VE SF** or **MaPeFix PE Wall** while the product underneath is still fresh.

4. Preparation of MaPeWrap 11 or MaPeWrap 12, MaPeFix EP 470 Seismic, MaPeFix EP 385-585, MaPeFix VE SF and MaPeFix PE Wall

Which product to use depends on the type of hole to be filled and the type of substrate on which it has to be applied. For horizontal holes, holes in ceilings or holes in particularly porous substrates, use **MaPeWrap 11** or **MaPeWrap 12** epoxy grout. Chemical anchors may also be used to anchor **MaPeWrap Fiocco**, depending on the type of substrate. Anchor the bows to concrete structures using **MaPeFix EP 470 Seismic** (ETA Seismic performance C2) or **MaPeFix EP 385-585** (ETA Seismic performance C1) pure epoxy chemical anchors for structural loads, and to masonry using **MaPeFix VE SF** (ETA Seismic performance C1) vinylester resin chemical anchors or **MaPeFix PE Wall** polyester resin-based chemical anchors.

MaPeWrap 11 or MaPeWrap 12

MaPeWrap 11 or **MaPeWrap 12** must be chosen according to the surrounding temperature and workability time (**MaPeWrap 12** has a higher workability time than **MaPeWrap 11**).

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

Mixing ratio for both products: 3 parts by weight of component A with 1 part by weight of component B. At +23°C, **MaPeWrap 11** remains workable for around 35 minutes after mixing, while **MaPeWrap 12** remains workable for approximately 50 minutes.

MaPeFix EP 470 Seismic

MaPeFix EP 470 Seismic is a two-component chemical anchor supplied in 470 ml bi-axial cartridges containing two separate components, A (resin) and B (catalyser). The two components are mixed together when they are extruded through a static mixer supplied with the cartridge. This product may be applied at +5°C to +40°C.

MaPeFix EP 385-585

MaPeFix EP 385-585 is a two-component product supplied in 385 ml bi-axial cartridges containing two separate components, A (resin) and B (catalyser). The two components are mixed together when they are extruded through a static mixer supplied with the cartridge. This product may be applied at +5°C to +40°C.

MaPeFix VE SF

MaPeFix VE SF is a two-component chemical anchor supplied in 300 and 380 ml cartridges containing two components, A (resin) and B (catalyser), at the correct mixing ratio in volume. The two components are mixed together when they are extruded through a static mixer supplied with the cartridge. This product may be applied at temperatures down to -10°C.

MaPeFix PE Wall

MaPeFix PE Wall is a two-component product supplied in 300 and 380 ml bi-axial cartridges containing two separate components, A (resin) and B (catalyser). The two components are mixed together when they are extruded through a static mixer supplied with the cartridge.

5. Application of MaPeWrap 11 or MaPeWrap 12, MaPeFix EP 470 Seismic, MaPeFix EP 385-585, MaPeFix VE SF and MaPeFix PE Wall

Completely fill the holes previously treated with **MaPeWrap Primer 1** while it is still fresh. Apply **MaPeWrap 11** or **MaPeWrap 12** in the holes using an empty sealant cartridge filled with the product and an extrusion gun; otherwise apply **MaPeFix EP 470 Seismic**, **MaPeFix EP 385-585**, **MaPeFix VE SF** and **MaPeFix PE Wall** using the static mixer supplied with the product attached to an extrusion gun.

6. Application of

MaPeWrap S Fabric 650 bows

Carefully and slowly insert the **MaPeWrap S Fabric 650** bows into the holes so that the excess product comes out of the holes. Remove the excess resin with a metal trowel. To avoid the transversal section of the pillar becoming too large and to improve adhesion with the first layer of wet epoxy grout, splay out the parts of the bows protruding from the holes. After laying and pressing them down with a flat trowel, apply a second coat of **MaPeWrap 11** or **MaPeWrap 12**

making sure it completely covers the fibres of **MapeWrap S Fabric 650**.

Even though epoxy resin is an insulating material, if the element needs to be wrapped with carbon fibre, we recommend applying a further "insulating" layer of glass fibre fabric between the carbon fibre and the **MapeWrap S Fabric 650**.

If this precaution is not taken, the different electro-chemical potential between the metal fibres and the carbon fibres may generate galvanic currents, thereby causing corrosion. Apply a first, even 0.5 mm thick layer of **MapeWrap 31** (refer to the product's Technical Data Sheet for preparation instructions) on the mortar while it is still wet with a roller or short-piled brush. Then immediately apply the **Mapewrap G UNI-AX** fabric on the still wet layer of **Mapewrap 31**, flattening it out by hand while wearing waterproof rubber gloves. Press the fabric with a roller to make sure there are no creases or folds and let the adhesive penetrate completely into the fibres of the fabric. Then apply a second coat of **Mapewrap 31** and press it again with a roller to eliminate any air bubbles entrapped during application. The extra carbon strengthening material may now be applied.

Note: *if a finishing coat has to be applied, broadcast the final layer of epoxy resin with fine sand while it is still wet to guarantee a good bond with the finishing coat.*

Application of MapeWrap S Fabric 650 with an inorganic matrix (FRCM)

1. Prepare **Planitop HDM Maxi**, **Planitop HDM Restauro**, **Mape-Antique Strutturale NHL** or **MapeWall Render & Strengthen** (refer to the relevant Technical Data Sheet).
2. Apply an even layer around 5-6 mm thick of **Planitop HDM Maxi**, **Planitop HDM Restauro**, **Mape-Antique Strutturale NHL** or **MapeWall Render & Strengthen** with a flat metal trowel or by spray.
3. After applying the first layer of mortar and while it is still wet, place **MapeWrap S Fabric 650** metal fabric over the surface and press down lightly with a flat trowel so that it adheres perfectly to the mortar.
4. Apply a second even layer of **Planitop HDM Maxi**, **Planitop HDM Restauro**, **Mape-Antique Strutturale NHL** or **MapeWall Render & Strengthen** around 5-6 mm thick so that it completely covers the fabric.

PROTECTIVE COATING

A protective coating may be applied over structural strengthening on concrete once the epoxy system has completely hardened (approximately 1-2 days at +23°C), such as **Mapelastix** two-component, elastic cementitious mortar or **Elastocolor Paint** elastic acrylic paint (refer to the Technical

Data Sheet for each product for application instructions).

These products 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 and the structure must also be dry and protected from rain and dust carried by the wind.
- After completing the application operations, make sure treated surfaces are kept at a temperature of at least +5°C.
- 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.

PRECAUTIONS TO BE TAKEN WHEN HANDLING THE PRODUCTS

Workers must wear protective, waterproof rubber gloves, goggles and anti-solvent safety masks when preparing and applying epoxy systems. Do not allow the products to come into contact with the skin or eyes. If they come into contact, wash off with plenty of soap and water and seek medical attention.

If the products are applied in closed environments, make sure they are well ventilated to guarantee a continuous circulation of fresh air. Never use naked flames and do not smoke while using or handling these products.

For further information please refer to the Safety Data Sheet for each product.

Cleaning

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

PACKAGING

MapeWrap S Fabric 650 is supplied in 30 cm wide by 50 m long rolls packed in cardboard boxes.

STORAGE

Store in a covered dry area.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

MapeWrap S Fabric 650 is an article and referring to the current European regulations (Reg. 1906/2007/CE - REACH) does not require the preparation of the 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

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The contents of this Technical Data Sheet ("TDS") may be copied into another

project-related document, but the resulting document shall not supplement or replace requirements per the TDS in force at the time of the MAPEI product installation.

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All relevant references for the product are available upon request and from www.mapei.com