

Carboplate

Pultruded carbon fibre plate with a double plastic protective film



WHERE TO USE

This system is used for repairing and strengthening reinforced cement elements damaged by physical and mechanical stresses, strengthening concrete and wooden members to withstand flexural loads and for the seismic upgrading of structures in high-risk areas.

Some application examples

- Repairs and static upgrading on reinforced concrete beams, floor joists and floor slabs to increase the bending moment.
- Flexural strengthening of wooden beams and joists.
- Repair of structures damaged by fire.
- Repair of structures damaged by earthquakes.
- Renovating two-dimensional structures such as plates, sheets and storage tanks with a large bending radius.
- Reinforce viaduct slabs after an increase of static and/or dynamic loads.
- Reinforce industrial and/or commercial structures as a consequence of an increase of static loads brought on by equipment, machinery, etc.
- Reinforce car park decks in residential and industrial buildings.

- Reinforce structures subject to vibration.
- Strengthening load-bearing members in buildings whose structural system has been modified due to new architectural requirements or change in use.

TECHNICAL CHARACTERISTICS

Carboplate is a range of pultruded carbon fibre plates, with high resistance and flexibility, for plating prestressed reinforced concrete and steel and wood structures.

Carboplate can replace conventional steel sheets that are used for plating.

Carboplate is available in different widths (50, 100 and 150 mm) and with three modules of elasticity (170, 200 and 250 GPa):

- **Carboplate E 170**
- **Carboplate E 200**
- **Carboplate E 250**

Because of its composition and manufacturing procedure, which ensures constant properties to all parts of the material, **Carboplate** has the following properties:

- high tensile strength;
- light weight;
- reduced thickness;
- excellent endurance strength.

Carboplate



A view of the bridge during repair work



Fixing Carboplate in especially created areas on the substrate



A bridge-deck reinforced with Carboplate

TECHNICAL DATA (typical values)

PRODUCT IDENTITY

Matrix:	epoxy resin
Reinforcement:	high resistance carbon fibres
Colour:	black

PRODUCT PROPERTIES

	Carboplate E 170			Carboplate E 200			Carboplate E 250		
Density (g/cm ³):	1.61			1.56			1.61		
Fibre content (%):	68			68			65		
Thickness (mm):	1.4			1.4			1.4		
Width (mm):	50	100	150	50	100	150	50	100	150
Resistant section (mm ²):	70	140	210	70	140	210	70	140	210
Weight (g/m):	113	225	338	109	218	328	113	225	338

FINAL PERFORMANCE

Tensile strength (MPa):	≥ 3,100	3,300	2,500
Modulus of elasticity (GPa):	170	200	250
Ultimate elongation (%):	2	1.4	0.9
Shearing strength (MPa):	77	70	79
Coefficient of expansion (m/m/°C):	0.6 x 10 ⁻⁶	0.8 x 10 ⁻⁶	0.4 x 10 ⁻⁶

ADVANTAGES

Unlike work based on conventional methods, the **Carboplate** range of products, due to their extreme light weight, can be used without the need of special machinery or equipment and in a very short time, often without downtime of the structure.

Unlike the plating method using metal plates (*béton plaqué* method), **Carboplate** does not need temporary reinforcements during placing and removes all risks of corrosion of the applied reinforcement.

Unlike the plating method using impregnated fabric on the job-site, **Carboplate** can be applied quickly and the full success of the operation depends less on the operator's ability.

Because of its degree of flexibility, **Carboplate** can be used to line cylindrical structures (basins, storage bins, holding tanks, etc.) with a bending radius greater than 3 m.

RECOMMENDATIONS

- Before bonding, make sure that the concrete substrate has a tensile strength > 1.5 MPa.
- Do not use **Carboplate** on un-cured concrete.

- On particularly porous surfaces or on concrete placed in environments with a high R.H. (underpasses, basements, etc.), apply **MapeWrap Primer 1** to prime these surfaces before bonding **Carboplate** (refer to the relevant technical data sheet for the preparation and application of the product). The following application of epoxy adhesives **MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** or **Adesilex PG2** must be carried out while **MapeWrap Primer 1** is still "fresh".

APPLICATION PROCEDURE

Preparation of the concrete substrate

The surface on which **Carboplate** has to be bonded must be perfectly clean, dry, mechanically strong and smooth (the roughness must not be higher than 1 mm). All traces of form-release agents, varnishes, paints and cement laitance must be removed from the substrate by sandblasting.

If the concrete has deteriorated in depth, remove the damaged parts manually or mechanically or by hydro-scarifying pneumatic bush hammering. Remove all traces of rust from metal reinforcement rods and protect with

Mapefer, a two-component corrosion-inhibiting cement mortar or **Mapefer 1K**, one-component, corrosion-inhibiting cement mortar (follow application methods described in the relevant technical data sheet).

Repair the concrete surfaces with products from the **Mapegrout** range.

Wait at least three weeks before applying **Carboplate**.

If reinforcement must be carried out immediately, use epoxy mortars such as **Adesilex PG1** or **Adesilex PG2** to repair the deteriorated concrete.

Products to use for bonding

In temperatures between +5°C and +20°C, use **MapeWrap 11** or **Adesilex PG1**.

MapeWrap 12 or **Adesilex PG2** should be used in temperatures higher than +20°C because of the longer pot life.

Preparing MapeWrap 11 or MapeWrap 12 or Adesilex PG1 and Adesilex PG2

Mix together the two components that make up **MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** and **Adesilex PG2**.

Pour component B into component A and mix with a drill fitted with a stirrer until the mix is perfectly smooth and even (the same colour grey throughout).

Each component is supplied in pre-dosed quantities. Do not use partial quantities otherwise mixing errors may occur and the system may not harden correctly.

Bonding Carboplate

- **Carboplate** is supplied in rolls that must be cut on site according to the desired length with an electric saw fitted with a diamond blade.

- Furthermore, during its manufacturing, the sides of **Carboplate** are protected by a plastic sheet. This material protects the plate from dirt while cutting.

- Before bonding, this sheet must be removed from **Carboplate**, that will be placed in contact with the chosen epoxy adhesive.

- Prime the surface that needs to be reinforced with **MapeWrap Primer 1** (particularly porous surfaces or on concrete placed in environments with a high R.H.).

- Apply a uniform 1-1.5 mm thick layer of **Adesilex PG1** or **Adesilex PG2** (in relation to the temperature) with a flat trowel over **Carboplate** on the side where the protective sheet has been removed.

- Apply a layer of **MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** or **Adesilex PG2** also on the substrate (that must be clean and dry) that will receive the plate. The application of the adhesive layer must be carried out while **MapeWrap Primer 1** is still "fresh".

- Install **Carboplate** applying a constant pressure over the whole surface. Use a stiff rubber roller and remove the excess resin with a trowel paying attention not to move the plate.

- For plating curved structures, it is necessary to use clamps or supports to hold the plates in place until the resin has completely hardened (usually 24 hours before removing the temporary supports).

- If more layers of **Carboplate** are necessary, remove the second plastic film from the already installed plate once **MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** or **Adesilex PG2** has set, before installing the next plate.

The surface plated with **Carboplate** can be protected with **Mapelastic**, **Elastocolor** or with a fire resistant paint.

The protection coat can be applied 24 hours after the installation of the plates.

PRECAUTIONS TO TAKE DURING AND AFTER APPLICATION

- During application the temperature must not be below +5°C and the structure must be protected from rain and dust brought by wind.

- Maintain the treated surfaces at a temperature higher than +5°C after work has been carried.

- Protect the surface from rain for at least 24 hours. If the minimum temperature does not go below +15°C, or for at least 3 days if the temperature should be lower.

SAFETY INSTRUCTIONS FOR PREPARATION AND INSTALLATION

It is absolutely essential that users wear waterproof rubber gloves, protective goggles and clothing while preparing and installing the carbo-plate and epoxy systems (**MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** or **Adesilex PG2**).

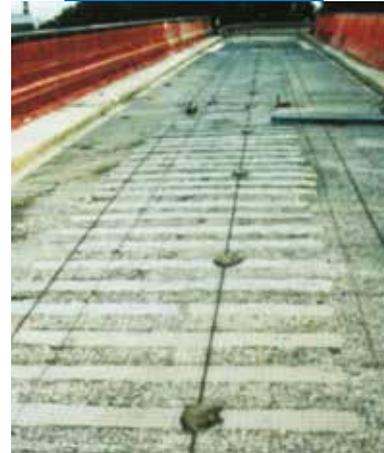
Avoid contact with the eyes and skin. In case of contact with the skin, wash with water and soap. If the product comes in contact with the eyes, wash with plenty of water and seek medical attention. When the product is applied in a closed environment, provide good ventilation. For further information carefully read the safety data sheets of the products.

Cleaning

Due to the high bonding strength of **MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** and **Adesilex PG2** on metal, it is recommended to clean tools with solvents (ethyl alcohol, toluene etc.) before the product dries.

PACKAGING

Carton boxes each containing a 25 m roll.



Carboplate covered with Mapegrout BM



Applying the epoxy primer



The repaired bridge-deck

Carboplate



Carboplate is available in 3 modules of elasticity (170, 200 and 250 GPa), each one in 3 widths (50, 100 and 150 mm):

- **Carboplate E 170/50/1.4**
- **Carboplate E 170/100/1.4**
- **Carboplate E 170/150/1.4**
- **Carboplate E 200/50/1.4**
- **Carboplate E 200/100/1.4**
- **Carboplate E 200/150/1.4**
- **Carboplate E 250/50/1.4**
- **Carboplate E 250/100/1.4**
- **Carboplate E 250/150/1.4**

CONSUMPTION OF ADHESIVE

The consumption of **MapeWrap 11** or **MapeWrap 12** or **Adesilex PG1** or **Adesilex PG2** depends on the width of the **Carboplate** plates; approximately following:

- 50 mm plate: 160-200 g/m;
- 100 mm plate: 320-400 g/m;
- 150 mm plate: 480-600 g/m.

STORAGE

Store in a sheltered dry place.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Carboplate is an article and referring to the current European regulations (Reg. 1906/2007/CE - REACH) does not require the preparation of the material safety data sheet. During use

it is recommended to wear protective 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

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