



Carboplate

Pultruded carbon fibre plate pre-impregnated in epoxy based resin, protected by a double plastic film



WHERE TO USE

Repairing and reinforcing reinforced concrete structures damaged by time and natural causes. Anti-seismic strengthening of structures built on earthquake zones.

Some application examples

- Repair and upgrade of beams for flexural strengthening.
- Repair of structures damaged by fire.
- Repair of structures damaged by earthquakes.
- Restore bi-dimensional structures such as plates, slabs, small vaults and tanks with high 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.
- Anti-seismic strengthening of vaulted structures without having to increase the seismic masses and without danger of liquid percolation towards the internal surface of an archway.

- Reinforcement of load bearing elements in buildings that have been restructured for architectural reasons or change of use.

TECHNICAL CHARACTERISTICS

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

ADVANTAGES

Unlike work based on conventional methods, the **Carboplate** range of products, thanks to their

Carboplate



A view of the bridge during repair work



Fixing Carboplate in especially created areas on the substrate



A bridge-deck reinforced with Carboplate

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.), it is recommended to apply **MapeWrap Primer 1** to prime these surfaces before bonding the **Carboplate** (refer to the relevant technical data sheet for the preparation and application of the product). The following application of **Adesilex PG1** or **Adesilex PG2** must be carried out while **MapeWrap Primer 1** is still "fresh".

APPLICATION PROCEDURE

Preparing 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 hidro-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 3 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 **Adesilex PG1**.

Adesilex PG2 should be used in temperatures higher than +20°C because it has a longer pot life.

Preparing Adesilex PG1 and Adesilex PG2

Mix together the two components that make up **Adesilex PG1** and **Adesilex PG2**.

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

The components are already in correct proportions. Do not use partial quantities.

Bonding the 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.
- 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 the **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 the **Carboplate** on the side where the protective sheet has been removed.
- Apply a layer of **Adesilex PG1** or **Adesilex PG2** also on the substrate (that must be clean and dry) that will receive the plate. If the surface has been primed with **MapeWrap Primer 1**, the application of the adhesive layer must be carried out while the primer is still "fresh".
- Install the **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.

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/cm³):				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 (mm²):				70 140 210			70 140 210			70 140 210		
Weight (g/m):				113 225 338			109 218 328			113 225 338		
FINAL PERFORMANCES												
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		



Carboplate covered with Mapegrout BM



Applying the epoxy primer



The repaired bridge-deck

- 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 **Adesilex PG1** or **Adesilex PG2** has set, before installing the next plate.

The surface plated with **Carboplate** can be protected with **Mapelastix**, **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 (**Adesilex PG1** or **Adesilex PG2**). Avoid contact with the eyes and skin.

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In case of contact with the skin, wash with water and soap. If in contact with the eyes, wash with plenty of water and consult a doctor.

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 **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 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 **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.

WARNING

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.

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