



# DRIZORO<sup>®</sup> COMPOSITE

## PRE-FORMED CARBON FIBRE LAMINATE FOR STRUCTURAL STRENGTHENING OF CONCRETE, STEEL AND WOOD STRUCTURES

### DESCRIPTION

**DRIZORO<sup>®</sup> COMPOSITE** is a pre-formed laminate composed of unidirectional carbon fibres, embedded in an epoxy resin matrix and conformed by pultrusion process. Its high tensile strength, lightness and easy of use, provides an efficient system for strengthening concrete, steel and wood structures subject to tensile stress due to flexural loads.

**DRIZORO<sup>®</sup> COMPOSITE** is bonded on the structure surface with **MAXEPOX<sup>®</sup> CARBOFIX** (Technical Bulletin No. 290) as the epoxy-based structural adhesive.

**DRIZORO<sup>®</sup> COMPOSITE** has Technical Approval (DIT) n° 595R/18 issued by the Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)

### APPLICATION FIELDS

- Structural strengthening in restoration of civil works and buildings.
- Strengthening bearing elements due to requirements for increasing live loads, installation of heavy machinery, and improvement of service capacity or change of final use.
- Repair of concrete elements due to damage on structural parts, pathologies, project design defects, construction faults, etc.
- Adaptation to updated regulations.
- Restoration of bearing elements, changes in structural systems or rehabilitation of historical buildings.
- Strengthening of concrete, steel or wood elements subject to tensile stress: beams, small beams, girders, slabs.

### ADVANTAGES

- High mechanical properties without overload the structure.
- Low weight, 5 times less than standard steel.
- High tensile strength, 3.5 times stronger than steel reinforcement.
- High fatigue resistance.

- Improves highly the flexural strength of bearing elements.
- Stress reduction in steel reinforcements, reducing the fissuring process under load.
- Reduces deflection of beams and other elements.
- Low thickness system with minimum increase of the cross-section, keeping the original geometry and appearance of the strengthened elements.
- Long lasting. It is not affected by corrosion process, withstands marine environments and freeze-thaw cycles.
- Economical system with no maintenance. Very easy and quick to use, saving labour costs and reducing use of auxiliary tools.
- According with European Regulations. Fib (International Federation for Structural Concrete) CED-FIP, Technical Report, Bulletin 14: Externally bonded FRP reinforcement for RC structures. July 2001.

### APPLICATION INSTRUCTIONS

#### Substrate preparation

It is essential the proper treatment of concrete surface in order to ensure the optimum adhesion of the system on the structure.

**Concrete:** it must be solid, with no loose particles and free of dirt, paint, efflorescence, plaster, grout surface, fats, oils, concrete release, as well as de-moulding agents, curing agents or any coating, which could affect the adhesion. Recommended dry methods for preparation are blasting, abrasive disc or sanding. Optimal surface texture is a rough surface with open pore. Substrate must be perfectly dry and with a surface moisture content less than 4%.

Concrete must be cured for at least 28 days and surface mechanical properties should be verified by tests. Thus, minimum pull-off strength should be greater than 1.5 MPa, according to EN 1542 standard. If pull-off strength is higher than 2,0 MPa, previous primer coating is not required.

In case of corroded rebars, remove all concrete around the affected reinforcements, clean up of rust and scale (St-2 grade) and then, treat with the oxide

converter and anti-corrosive protection **MAXREST® PASSIVE** (Technical Bulletin n° 12).

In order to repair the area, use a structural repair mortar such as **MAXREST®** (n° 4) or **MAXRITE® -500/-700/-S/-F** (Technical Bulletin n° 50, 51, 57 and 240, respectively).

Before applying **DRIZORO® COMPOSITE**, all surface damages such as defects, cavities, honeycombs, peelings should be filled with a suitable structural repair mortar, and any sharp edge must be ground smooth and flush.

Cracks wider than 0,3 mm must be treated by injecting a suitable low viscosity epoxy-based resin such as **MAXEPOX® INJECTION** (Technical Bulletin No. 78) or **MAXEPOX® INJECTION -R** (Technical Bulletin No. 79) depending on temperature.

Steel: Prepare surface by dry shot or sand blasting to Sa 2½ grade (near to white metal) according to Swedish Standard SIS 055900 or equivalent, in order to remove fats, oils, paints and other pollutants that may affect the adhesion of the system. Then, surface must be degreased with a suitable solvent and dry before application.

Wood: it must be solid and free of any biological attack. It should be protected in accordance with Wood Structures Code CTE-DB-SE-M. Sand the surface, vacuum the dust and repair any damage with the epoxy-based mortar **MAXEPOX® -W** (Technical Bulletin No. 207) if necessary. Generated dust or other residue must be removed by pressurized air or clean wiping rags. Before placing **DRIZORO® COMPOSITE**, prime surface sealing all pores with **MAXEPOX® -W**, with at least an estimated consumption of 0,25 kg/m<sup>2</sup> per layer, depending on surface absorption.

The maximum difference allowed for any surface unevenness is about 10 mm measured with a ruler of 2,0 meter length, or about 4,0 mm measured with a ruler of 0,3 meter length. For levelling this unevenness, use **MAXEPOX® CARBOFIX**.

### Preparation of laminates

Clean thoroughly the laminate surfaces with **MAXEPOX® SOLVENT** before use. Allow to dry and cut the laminate according to the lengths specified in the design drawings, with a suitable grinder using a duct tape in the cutting zone.

### Application

Apply on **DRIZORO® COMPOSITE** a layer of **MAXEPOX® CARBOFIX** with a thickness of about 1 to 3 mm and spread it with curved spatula achieving greater thickness on the middle and decreasing on the edges. Apply a similar layer on the structure surface wherein laminate will be bonded.

Place **DRIZORO® COMPOSITE** on the substrate within the open time of the adhesive and press the laminate using a hard rubber roller to force the adhesive overflow on both sides, ensuring total

saturation between surfaces of the laminate and the substrate and avoiding entrapped air voids. Finally, remove any excess of adhesive with a spatula.

## Application conditions

The ideal working temperature for surface and ambient is between 10 °C and 35 °C. Do not apply with temperature below 10 °C or if lower temperature is expected within the first 24 hours.

Temperatures above 35 °C increase the reaction speed and production of heat, and reduce greatly the workability time for application. In this case, before applying the system, store products at temperatures between 15 °C to 20 °C and plan previously the works.

Surface and ambient temperature must be at least 3 °C higher than dew point. Do not apply with R.H. higher than 85%. With low temperatures, high humidity levels or both, use dry and warm air in order to get the suitable conditions, such as with an electric powered air blower system.

Do not apply if rain, condensation, dew or water contact is expected 24 hours after application and protect the application against contact with water until the total curing of the material.

## Curing

Complete cure of **MAXEPOX® CARBOFIX** is achieved at 7 days at 20 °C and 50% R.H. Minimum temperature during the full curing time must be higher than 10°C. Do not allow to bear loads before full curing time. Applications carried out at lower temperatures, with high humidity or with poor ventilation require longer drying and curing time.

## Cleaning

All tools and equipments can be cleaned with **MAXEPOX® SOLVENT** immediately after use. Once the product cures, it can only be removed by mechanical methods.

## CONSUMPTION

Estimated consumption of **MAXEPOX® CARBOFIX** is 1,8 kg/m<sup>2</sup> per mm thickness.

For **DRIZORO® COMPOSITE 1405**, estimated consumption of **MAXEPOX® CARBOFIX** is about 0,35-0,4 kg per lineal meter.

For **DRIZORO® COMPOSITE 1410**, estimated consumption of **MAXEPOX® CARBOFIX** is about 0,7-0,8 kg per lineal meter.

These figures may vary depending on roughness, surface conditions and application method. A preliminary test on-site will determine the consumption exactly.

## IMPORTANT INDICATIONS

- **DRIZORO® COMPOSITE** is used to increase the concrete bearing capacity according to a determinate mechanical stress request; hence it

is not suitable for related structural durability problems.

- Concrete must be sound and provide a minimum compressive strength at 28 days of at least 15 N/mm<sup>2</sup>, measured with a 15 x 30 cm cylinder.
- Ensure the perfect adhesion of the laminate on the substrate through a proper surface preparation.
- Design and specifications must be made by qualified engineer.
- Workers on job-site must be skilled for this type of structural strengthening.
- For further information and other uses not specified in this Technical Bulletin consult our Technical Department.

## PACKAGING

**DRIZORO® COMPOSITE** is supplied in rolls of 25 lineal meters length with the following widths:

**DRIZORO® COMPOSITE 1405**: 50 mm width.

**DRIZORO® COMPOSITE 1408**: 80 mm width.

**DRIZORO® COMPOSITE 1410**: 100 mm width.

## STORAGE

**DRIZORO® COMPOSITE** has an indefinitely shelf life when is stored in its original packaging, in a dry and covered place with temperatures between 5 °C and 40 °C, protected from direct sunlight, heat and frost.

## SAFETY AND HEALTH

**DRIZORO® COMPOSITE** is not a toxic product but skin and eye contact must be avoided. When mixing and applying the structural adhesive, do not work without protection of rubber gloves and safety goggles. In case of eye contact, rinse immediately with clean water but do not rub. In case of skin contact, wash affected area with abundant water and soap. If irritation persists, seek medical assistance.

Observe the usual precautions for the handling and application of this type of products.

**DRIZORO® COMPOSITE** is a conductive material so it must be kept away from electrical cables and devices in order to avoid risk of electric shocks or short-circuiting.

For further information, Safety Data Sheet of **DRIZORO® COMPOSITE** is available by request.

Disposal of the product and its empty packaging must be made by the final user and according to official regulations.

## TECHNICAL DATA

<b>DRIZORO® COMPOSITE</b>	
Technical Approval (DIT) nº 595R/18 issued by the Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)	
Appearance and colour	Black carbon fibre laminate
Carbon-fibre content, (% by volume)	68
Elasticity modulus, (MPa)	165.000
Tensile strength at break, (MPa)	2.600
Elongation at break, (%)	1,60
Design tensile strength, (MPa)	1.320
Recommended design elongation, (%)	0,80

Type	Thickness (mm)	Width (mm)	Cross-section area (mm <sup>2</sup> )	Design load (kN)
<b>DRIZORO® COMPOSITE 1405</b>	1,4	50	70	92,40
<b>DRIZORO® COMPOSITE 1408</b>	1,4	80	112	143,70
<b>DRIZORO® COMPOSITE 1410</b>	1,4	100	140	184,80

Anchoring length (m)	Characteristic concrete compressive strength (MPa)					
	f <sub>ck</sub> = 15	f <sub>ck</sub> = 17,5	f <sub>ck</sub> = 20	f <sub>ck</sub> = 25	f <sub>ck</sub> = 30	f <sub>ck</sub> = 35
<b>DRIZORO® COMPOSITE 1405 / 1408 / 1410</b>	1,50	1,38	1,20	1,00	0,90	0,82

## GUARANTEE

The information contained in this leaflet is based on our experience and technical knowledge, obtained through laboratory testing and from bibliographic material. **DRIZORO®**, **S.A.U.** reserves the right to introduce changes without prior notice. Any use of this data beyond the purposes expressly specified in the leaflet will not be the Company's responsibility unless authorised by us. We shall not accept responsibility exceeding the value of the purchased product. The data shown on consumptions, measurement and yields are for guidance only and based on our experience. The data is subject to variation due to the specific atmospheric and jobsite conditions so reasonable variations from the data may be experienced. In order to know the real data, a test on the jobsite must be done, and to be carried out under the client responsibility. We shall not accept responsibility exceeding the value of the purchased product. For any other doubt, consult our Technical Department. This version of bulletin replaces the previous one.



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