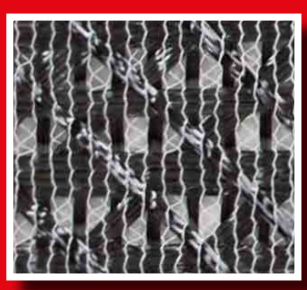
DRIZORO®
Construction Products

PRODUCTS AND SYSTEMS

40 ANNIVERSARY 1977-2017
INNOVATING IN CONSTRUCTION CHEMICALS

Carbon Fiber Strengthening System

595R/18



Repair & Strengthening System with Carbon Fiber Composite Materials

COMPANY

DRIZORO S.A.U. is a Spanish company founded in 1977, starting its activity as a manufacturer of chemical products for construction. It is now a benchmark for the sector in solutions for civil engineering and building, in the fields of waterproofing, restoration, protection and finishing of concrete structures.

From our **Headquarters** and Production Center in **Torrejón de Ardoz** (Madrid) all the operations of the different departments are directed; production, R & D, laboratory, technical, sales, marketing and administration.

COMMITMENT TO QUALITY AND THE ENVIRONMENT
Our strong commitment to Quality and the Environment policies, drive us to the implementation of an Integrated Management System based on ISO 9001: 2008 and ISO 14001: 2004 standards, and certified by Bureau Veritas Quality International.

COMMITMENT TO RESEARCH, DEVELOPMENT AND INNOVATION
Our continuous commitment to research and development policies, investing both in human resources and in technical means, allows us to offer the market solutions based on the high quality and latest technology systems, and provide innovative solutions supported also by a proven and tested experience under the most adverse conditions throughout the entire world geography.

TECHNICAL SUPPORT
Our Technical and Commercial Department and Sales Department, consisting of technical professionals with extensive experience in the sector, offers advice in a personalized manner both in the design phase and in the execution phase, with the aim of reaching an optimal prescription and implementation of our proposed products and systems.

DRIZORO TECHNICAL SOLUTIONS


WATERPROOFING


STRENGTHENING


DECORATION


REPAIR


PROTECTION


OTHER USES

ADVANTAGES FOR CARBON FIBER STRENGTHENING SYSTEM

- HIGH TENSILE STRENGTH
- LIGHTNESS
- VERSATILE
- FAST AND EASY APPLICATION
- FLEXURAL, SHEAR AND COMPRESSIVE STRESS STRENGTHENING OF STRUCTURES
- STRAIN COMPATIBILITY
- LONG LASTING WITHOUT MAINTENANCE
- EASY CALCULUS SYSTEM BY DRIZORO SOFTWARE

TECHNICAL APPROVAL (DIT)

595R/18

DRIZORO S.A.U. provides strengthening systems supported by **TECHNICAL APPROVAL (DIT)** from Institute of Building Sciences Eduardo Torroja, which implies a favourable technical assessment of the suitability of its use in construction of non-traditional materials, systems and procedures for a specific and specific use.
The ***DRIZORO® COMPOSITE*** System is designed for flexural strengthening of concrete elements.
The ***DRIZORO® WRAP***, System is designed for both flexural and shear strengthening of concrete elements, and axial compressive strengthening of pillars.
DRIZORO, S.A.U., provides technical assistance to enable the Project Management to perform the calculation and correctly define the execution of the project, which includes providing all the necessary information of each one of the components of the system.

REHABILITATION OF STRUCTURES

CHANGES IN USES

DAMAGE REPAIR

RECTIFICATION OF DESIGN

ADAPTATION TO NEW REGULATIONS

STRENGTHENING DUE TO EARTHQUAKE

Flexural strengthening of beams

Axial compressive strengthening of pillars

Shear and torque strengthening of beams


BRIDGES


CHIMMEYS


PILLARS


TUNNELS


BEAMS


HISTORICAL BUILDING


CANTILEVERS


SLABS

CARBON FIBER FABRICS

Based on the technology of carbon fiber, different products have been developed using this material either in its pure form, that is, carbon fiber fabric, or as a raw material together with high-performance polymer resins for the production of preformed elements, namely: laminates or bars.

DRIZORO® WRAP

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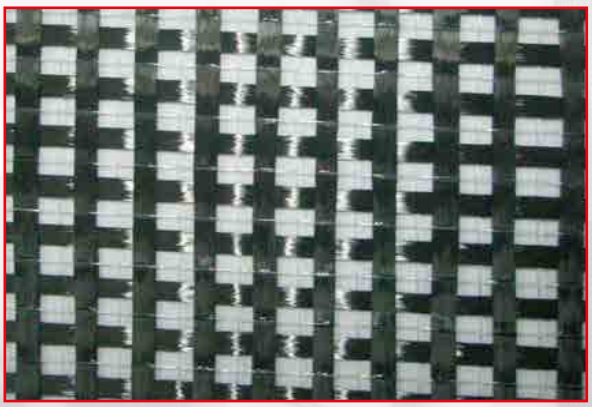
DRIZORO® WRAP system is made up of unidirectional fabric of pure carbon fiber in different widths, thickness and elastic modulus which are bonded to the surface with epoxy resins creating an in situ laminate providing a in situ composite, namey: ***MAXPRIMER® C*** as epoxy priming, ***MAXEPOX® CP*** as epoxy repair/ levelling putty, and ***MAXEPOX® CS*** as bonding agent for fibers.

PHYSICAL PROPERTIES OF UNIDIRECTIONAL FABRIC OF C.F				
Product name	***DRIZORO® WRAP 200***	***DRIZORO® WRAP 300***	***DRIZORO® WRAP 600***	***DRIZORO® WRAP HM***
Thickness (mm)	0,111	0,167	0,333	0,163
Elasticity modulus (MPa)	$2,3 \cdot 10^5$	$2,3 \cdot 10^5$	$2,3 \cdot 10^5$	$4,4 \cdot 10^5$

DRIZORO® CARBOMESH

DRIZORO® CARBOMESH is a composite system based on a flat mesh of high strength carbon fiber, arranged in two orthogonal directions, for repairing and strengthening of concrete structures, timber, brickworks and masonry. System is bonded to element surface by the ***MAXEPOX® CARBOFIX*** epoxy mortar, or the ***CONCRESEAL® CARBOMESH*** cement mortar.



PHYSICAL PROPERTIES OF BIDIRECTIONAL FABRIC OF C.F			
Product name	***DRIZORO® CARBOMESH 160***	***DRIZORO® CARBOMESH 210***	***DRIZORO® CARBOMESH 300***
Grammage (g/m^2)	160 ± 5%	210 ± 5%	300 ± 5%
Elasticity modulus (MPa)	$2,3 \cdot 10^5$		

DRIZORO® WRAP QUADRIAXIAL

DRIZORO® WRAP QUADRIAXIAL is a composite system based in a flat fabric of carbon fiber, arranged in four directions, bonded with epoxy resins for repairing and strengthening of concrete structures, steel structures, timber and brickworks and masonry.

PHYSICAL PROPERTIES OF QUADRAXIAL FABRIC OF C.F.		
Product name	***DRIZORO® WRAP QUADRIAXIAL 380***	***DRIZORO® WRAP QUADRIAXIAL 760***
Grammage (g/m^2)	380 ± 5%	760 ± 5%
Elasticity modulus (MPa)	$2,2 \cdot 10^5$	

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DRIZORO® COMPOSITE

Carbon Fiber Laminates

PHYSICAL PROPERTIES OF C.F. LAMINATE				
Product name	DRIZORO® COMPOSITE 1405	DRIZORO® COMPOSITE 1408	DRIZORO® COMPOSITE 1410	DRIZORO® COMPOSITE 1412
Width (mm)	50	80	100	120
Thickness (mm)	1,4			
Elasticity modulus (MPa)	$1{,}65 \cdot 10^5$			
Tensile stress failure (MPa)	2.600			
Elongation at break (%)	1,60			

DRIZORO® COMPOSITE is a pre-formed laminate composed of unidirectional carbon fibers, embedded in an epoxy resin matrix and conformed by continuous and automatic pultrusion process, becoming an effective strengthening system for concrete, steel and wood elements under tensile stress due to flexion.
DRIZORO® COMPOSITE is bonded to the element surface with the ***MAXEPOX® CARBOFIX*** epoxy mortar.

DRIZORO® CARBOROD

Carbon Fiber Rods

DRIZORO® CARBOROD is a high mechanical strength rod for repairing and strengthening of concrete structures and masonry, composed of unidirectional carbon fibers, embedded in an epoxy resin matrix and conformed by pultrusion process.
DRIZORO® CARBOROD is set in the interior of the element by grooves or drill holes, bonded and embedded with the ***MAXEPOX® CARBOFIX*** structural epoxy mortar.

PHYSICAL PROPERTIES OF C.F. RODS			
Product name	DRIZORO® CARBOROD 308	DRIZORO® CARBOROD 310	DRIZORO® CARBOROD 312
Diameter (mm)	8	10	12
Length (m)	3,0		
Elasticity modulus (MPa)	$1{,}5 \cdot 10^5$		

DRIZORO® WRAP CONNECT

Carbon Fiber Connectors

DRIZORO® WRAP CONNECT is a set of carbon fiber yarns of high mechanical strength wrapped in a protective mesh for the anchoring and structural connection of the ***DRIZORO® WRAP*** and ***DRIZORO® CARBOMESH*** strengthening systems placed on reinforced concrete.
DRIZORO® WRAP CONNECT is impregnated in the ***MAXEPOX® CS*** bonding epoxy resin to achieve its hardening and its subsequent anchoring to the structure with the ***MAXFIX® –ER***, epoxy anchoring resin, leaving a part of the set unhardened for its overlap with the ***DRIZORO® WRAP*** strengthening fabric sheets.

DRIZORO® CARBO CONNECT

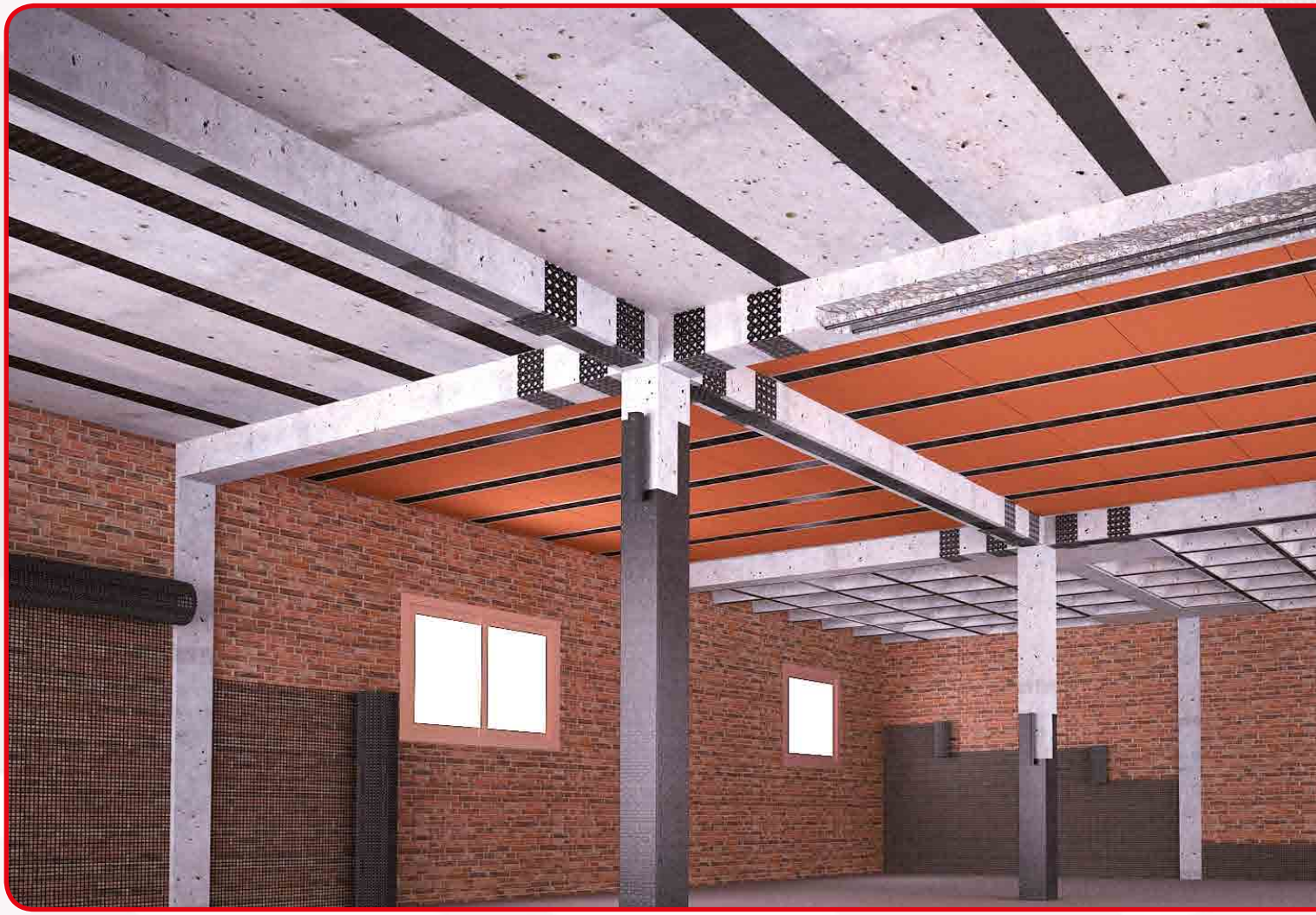
Carbon Fiber Connectors

DRIZORO® CARBO CONNECT is a carbon fiber rod of high mechanical strength for the anchoring and structural connection of the ***DRIZORO® WRAP*** and ***DRIZORO® CARBOMESH*** strengthening systems placed on reinforced concrete. Available in different diameters.
DRIZORO® CARBO CONNECT is placed into concrete structure to be reinforced with the ***MAXFIX® -ER*** epoxy anchoring resin, leaving a part of the set unhardened for its overlap with the ***DRIZORO® WRAP*** strengthening fabric sheets.

APPLICATION FIELDS FOR CARBON FIBER COMPOSITE

Replacement of steel rebars affected by corrosion processes.

Repair of concrete structures damaged by accident, pathologies, design or project mistakes or runtime errors.



Rehabilitation of historical buildings and monuments.

Rehabilitation of bridges, chimneys, silos and singular structures.

Construc
structu

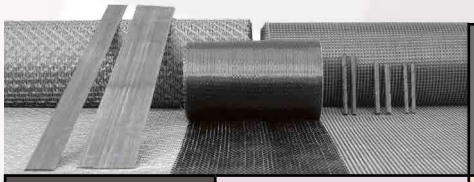
DRIZORO® WRAP and ***DRIZORO® CARBOMESH*** are systems of structural strengthening with allow the performance of any type or reinforcement due its flexibility and adaptability to the element geometry, suitable to reinforce beams under flexural and shear strains or pillars and columns under compression by confinement.

DRIZORO® COMPOSITE laminate allows strengthening in beams, girders, cantilevers, joists, and other structural elements under tensile stresses due flexion, reducing the deflection of the in service element and improving the cracking state.

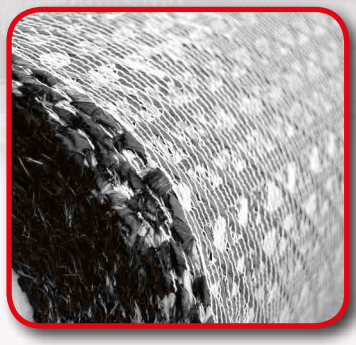
DRIZORO® CARBOROD rods, behave as steel rebars, fulfilling the same laws, requiring smaller diameters to assume the same loads, lightening the structure and without corrosion problems.

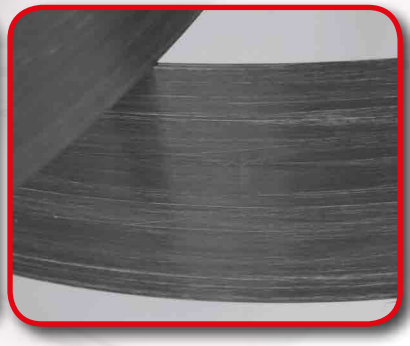
Concrete, steel and wood elements under tensile strain: beams, joists, slabs, girders, cantilevers, etc.

Suitability to current legislation or adaptation to new building regulations.



		Fabrics	Laminates	Rods
Beams Joist Cantilevers Slabs	Flexion	✓	✓	✓
	Shear	✓		
Pillars	Flexion	✓		✓
	Shear	✓		
	Compression	✓		
Walls	Flexion	✓	✓	✓
	Crack Stitching	✓		✓





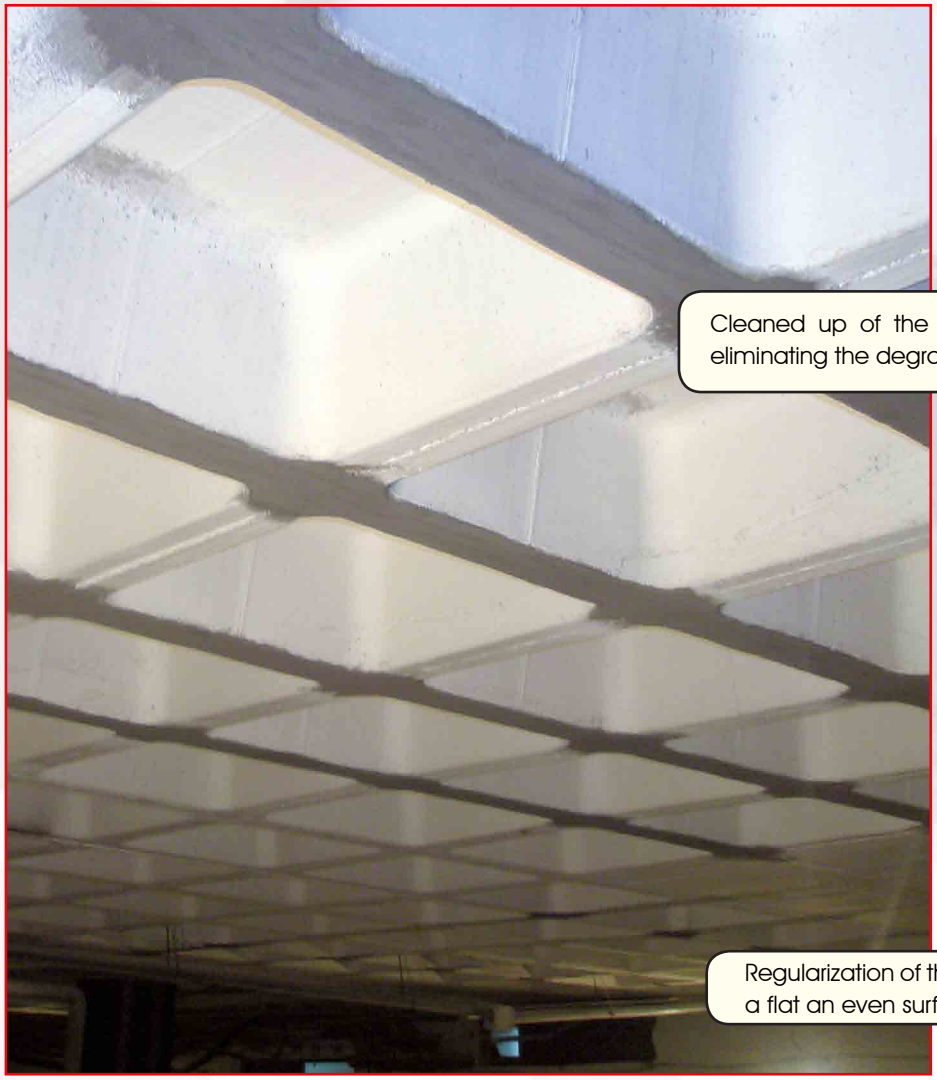
tion of light and slender reinforced concrete ures or with reduced protection covering.

Strengthening of concrete structures by requirements of load increases, improvement of in service capability and/or specification changes of use.

Substrate Preparation

Before application of structural strengthening systems, substrate must be prepared according to the technical bulletins of each product to ensure the right application and the correct adherence to the elements to be strengthened.

Elimination of sharp edges such as the concrete burrs.



Cleaned up of the damaged concrete, eliminating the degraded surface.

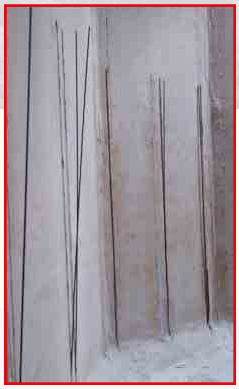
Regularization of the surface planimetry until achieve a flat an even surface.

DRIZORO® COMPOSITE Application

Apply on the laminate ***DRIZORO® COMPOSITE*** and on the substrate a homogeneous and continuous layer of ***MAXEPOX® CARBOFIX*** epoxy mortar of 1 to 3 mm of thickness. Place ***DRIZORO® COMPOSITE*** within the open time of the mortar and press the laminate with a solid roller until the adhesive mortar overflow the sides, following remove the leftover mortar with spatula.

DRIZORO® CARBOROD Application

Perform a groove or drill hole with a depth or diameter 1,5 times the diameter of the rod to be placed. Apply the structural epoxy mortar ***MAXEPOX® CARBOFIX*** inside the groove or the structural adhesive ***MAXFIX® ER*** inside of the drill hole, without air bubbles. Place the rod ***DRIZORO® CARBOROD***, pressing while the mortar or adhesive is still fresh, assuring the rod is completely embedded. Finally cover the installed rod with the mortar or adhesive and clean the overflow before it hardens.



Preparation of the strengthening with ***DRIZORO® CARBOROD***.

Placing of rods inside of the groove.

Anchoring of the rod into the slab using ***MAXFIX® -ER***.

Covering of the rods with ***MAXEPOX® CARBOFIX***.

DRIZORO® WRAP Application

1.- Once prepared the surface, apply the priming ***MAXPRIMER® -C***. This primer penetrates into the substrate, increasing its strength and improving the adherence of the ***DRIZORO® WRAP*** system.

5.- Use the metallic roller to improve the contact between the carbon fiber sheets and the element surface, pressing firmly, eliminating all possible air bubbles and wrinkles.

2.- Honeycombs and small imperfections must be repaired using epoxy putty ***MAXEPOX® -CP***.

3.- Prepare the different pieces of the carbon fiber sheets according to the reinforcement project.

4.- Bond the different pieces of carbon fiber sheets using the ***MAXEPOX® -CS*** epoxy resin. The resin is intended to provide a matrix, strongly attached to the reinforced element that supports the carbon fibers sheets, and also serve as a means of transmission of stress from concrete to the carbon fibers.

6.- Finish the application with an over coat-ing layer of resin ***MAXEPOX® -CS***, verifying there are no air bubbles.

DRIZORO® CARBOMESH Application

The adhesion of the carbon fiber mesh may be applied by epoxy mortar ***MAXEPOX® CARBOFIX***, on concrete, wood and steel or with cement based mortar ***CONCRESEAL® CARBOFIX*** on concrete, masonry, brickworks and blocks.

Apply ***MAXEPOX® CARBOFIX*** or ***CONCRESEAL® CARBOFIX*** by notched trowel and place the ***DRIZORO® CARBOMESH*** carbon fiber mesh while the resin/mortar is still fresh, smoothing against the surface, to achieve fully embedded mesh and a right adherence.

Finish the application with a last layer of ***MAXEPOX® CARBOFIX*** or ***CONCRESEAL® CARBOFIX*** verifying there are no air bubbles.

Protection and Finishing

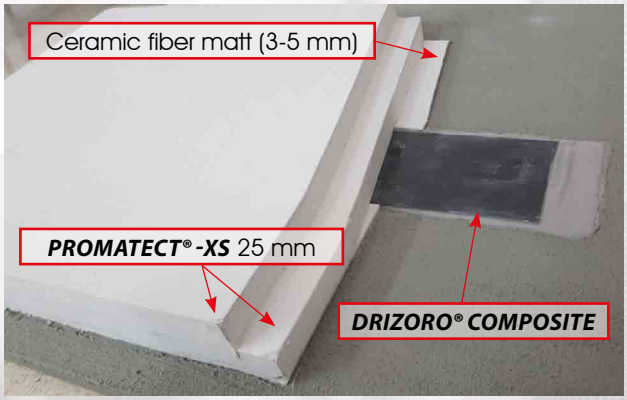
DRIZORO® system for structural reinforcement with carbon fiber is extremely resistant to weathering (hot/cold weather, humidity, thaw-freeze cycles, and marine environment), chemical agents (gasoline, acids) and to the U.V. radiation. From the standpoint of architectural and aesthetic may be advisable to apply a coating or protection mortar in those areas subjected to impact. For all this the ***DRIZORO®*** mortars and coatings may be used.

SYSTEM OF PASSIVE FIRE PROTECTION: 120 minutes

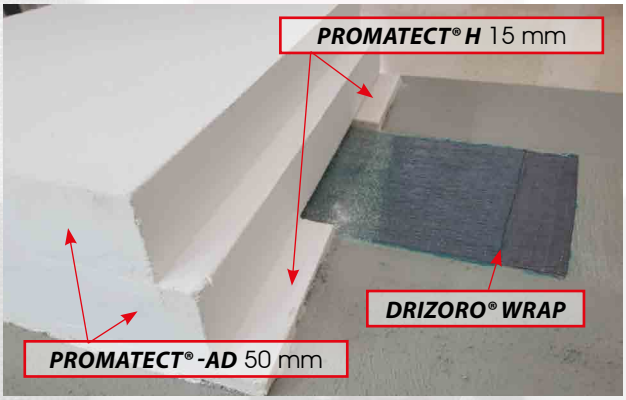
DRIZORO® S.A.U. and ***PROMAT IBÉRICA S.A.*** have collaborated in the development of an exclusive system of passive fire protection for carbon fiber strengthening systems; ***DRIZORO® WRAP*** and ***DRIZORO® COMPOSITE***. System has been approved by Affiti Licof (officially approved laboratory for Fire Resistance) obtaining a ***fire resistance of about 120 minutes*** without exceeding the glass temperatures for both the ***MAXEPOX® CS*** epoxy bonding resin and the ***MAXEPOX® CARBOFIX*** epoxy bonding mortar using summer (-S) or winter(-W) compositions.

RESISTANCE TO FIRE:
120 Minutes
Licof - Classification Report No.: 9397/17-2

DRIZORO® COMPOSITE SYSTEM
Fire protection System:
- Ceramic fiber matt (3-5 mm)
- Silicate Board (x2) ***PROMATECT® -XS*** (25 mm)



DRIZORO® WRAP SYSTEM
Fire protection System:
- Silicate Board (x1) ***PROMATECT® H*** (15 mm)
- Silicate Board (x2) ***PROMATECT® -AD*** (50 mm)



After carrying out the fire resistance test, and in order to perform pull-off strength tests, the protection system is removed. Thus, results show the adequate performance for both strengthening systems ***(DRIZORO® WRAP*** and ***DRIZORO® COMPOSITE)*** after the fire test using the proposed passive protection systems.

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ISO 9001
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