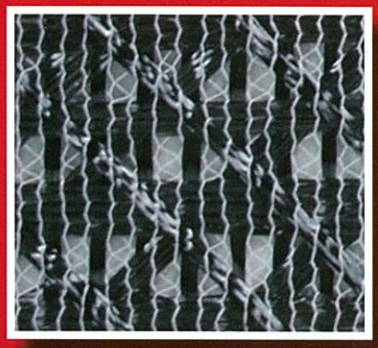
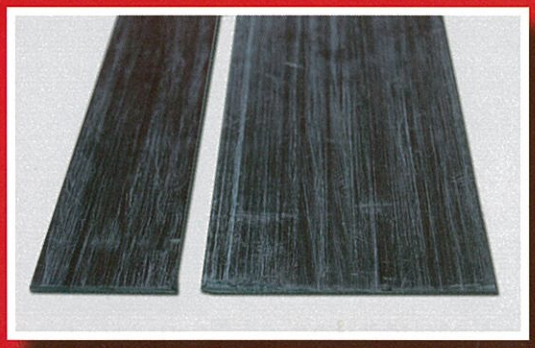
DRIZORO®
Construction Products

PRODUCTS AND SYSTEMS

Carbon Fiber Strengthening System





Repair and Strengthening

System with Carbon Fiber Composite Materials

DRIZORO, S.A.U.

DRIZORO S.A.U. is a Spanish company with more than thirty years of experience in the chemical industry for construction. DRIZORO S.A.U belongs to the corporate group DRIZORO HOLDING, business structure which allows organizing its different national and international enterprise management units within the construction products sector.

Obtain optimal product, tailored to actual need, makes our business vocation constantly working to overcome the challenges of a globalized and highly competitive industry.

The commitment of improving constantly products and internal procedures, incorporating the newest technologies, lead us to follow a clear and direct address, stimulating all company personnel, facing the present and future with enthusiasm and professionalism.

Our strong commitment with quality and environment policies, drive us to implant a integrated quality management and environment system, based on ISO standards ***ISO 9001:2008 e ISO 14001:2004.***

The certification of both standards, issued by ***Bureau Veritas Quality International*** on November, the 27th of 2003, reflects our ongoing commitment for search and development of new systems and products, to provide market solutions of high quality and newest technology, friendly with environment, supported by the other hand, for a proven and tested experience under more adverse conditions throughout the entire world geography.

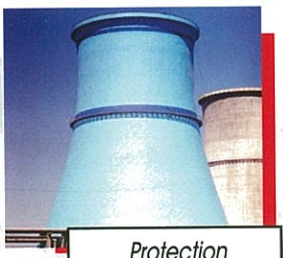
Technical Solutions DRIZORO

Waterproofing

Strengthtening

Cosmetic

Repair

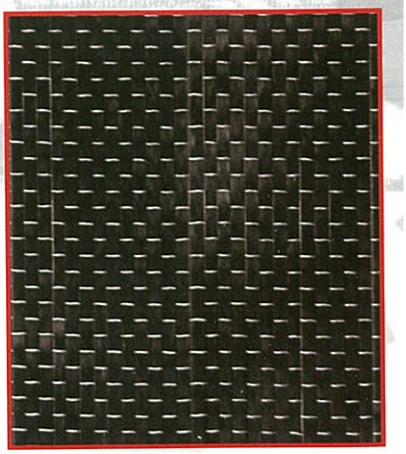


Protection

Anchorage

Advantages of CARBON FIBER

- ***High tensile strength***
- ***Lightness***
- ***Versatile***
- ***Strain compatibility***
- ***Strengthening of structures at flexural, shear and compressive stress***
- ***Fast and easy application***
- ***High durability without maintenance***
- ***Simple calculus system by DRIZORO software***

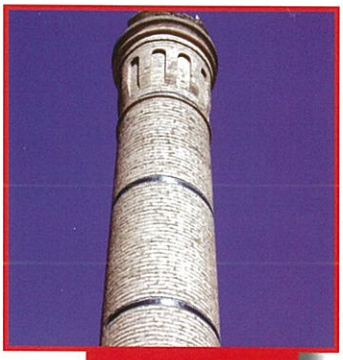


CARBON FIBER AS STRUCTURAL STRENGTHENING MATERIAL

SLABS

PILLARS

CHIMNEYS



BRIDGES

Rehabilitation of Structures
Changes in construction uses
Rectification of design or job constructions defects
Damage repair
Adaptation to new regulations
Structure strengthening
Earthquake reinforcement

BEAMS

CANTILEVERS

TUNNELS

HISTORICAL BUILDINGS

Strengthening of beams subject to flexural stress
Strengthening of pillars subject to compressive stress
Strengthening of beams subject to shear and torque stress

CARBON FIBER FABRICS

Based on carbon fiber, different products has been developed, which uses this material in pure form, fabric of carbon fiber, or as a raw material besides polymeric resins to elaborate composite laminate or prefabricated rods.

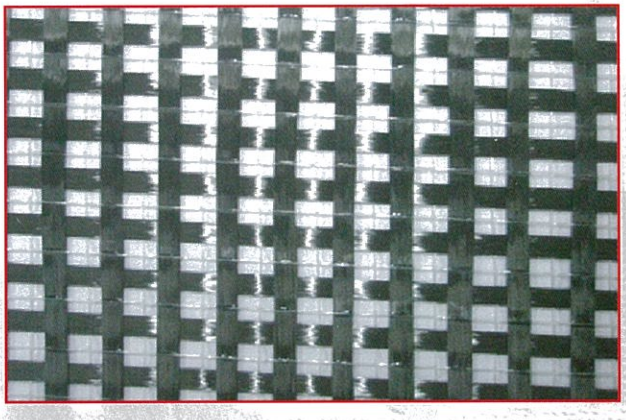
DRIZORO® WRAP

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.

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

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.

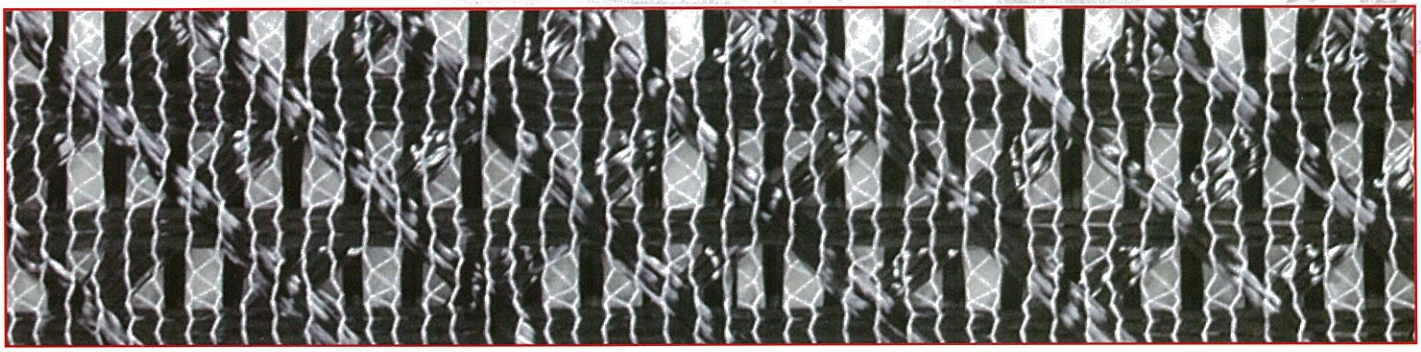


PHYSICAL PROPERTIES OF BIDIRECTIONAL FABRIC OF C.F			
Product name	***DRIZORO® CARBOMESH 160***	***DRIZORO® CARBOMESH 210***	***DRIZORO® CARBOMESH 300***
Grammage (g/m^2)	160 ± 5%	210 ± 5%	300 ± 5%
Elasticity modulus (MPa)	$2,3 \cdot 10^5$		

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)	$2,2 \cdot 10^5$	



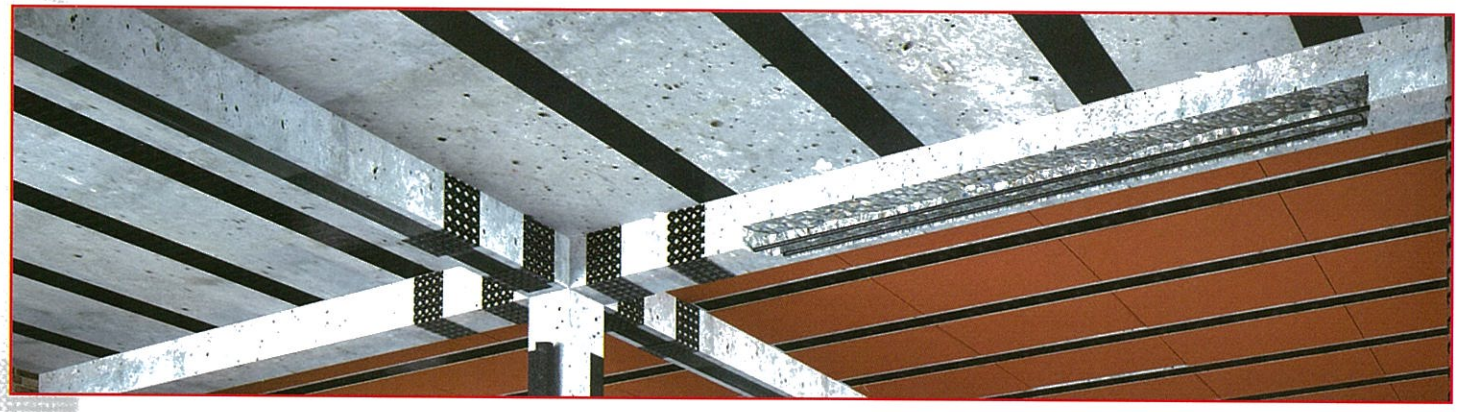
CARBON FIBER COMPOSITE

DRIZORO® CARBOROD
Carbon Fiber Rods

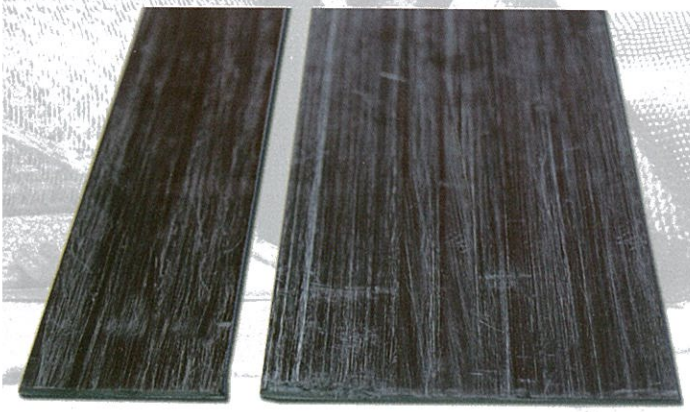
DRIZORO® CARBOROD is a high mechanical strength rod for repairing and strengthening of concrete structures and masonry, composed of unidirectional carbon fibers, embedded in an epoxy resin matrix and conformed by pultrusion process.

DRIZORO® CARBOROD is set in the interior of the element by grooves or drill holes, bonded and embedded with the structural epoxy mortar ***MAXEPOX® CARBOFIX***.

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® COMPOSITE
Carbon Fiber Laminate



PHYSICAL PROPERTIES OF C.F. LAMINATE		
Product name	***DRIZORO® COMPOSITE 1405***	***DRIZORO® COMPOSITE 1410***
Width (mm)	50	100
Thickness (mm)	1,4	
Elasticity modulus (MPa)	$1,65 \cdot 10^5$	
Tensile stress failure (MPa)	>2.200	
Elongation at break (%)	1,30	

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 epoxy mortar ***MAXEPOX® CARBOFIX***.

APPLICATION SCOPE OF CARBO

Replacement of steel rebars affected by corrosion processes.

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

Rehabilitation of historical buildings and monuments.

Rehabilitation of bridges, chimneys, silos and singular structures.

Construction of light a
structures or with r

FIBER COMPOSITE MATERIALS

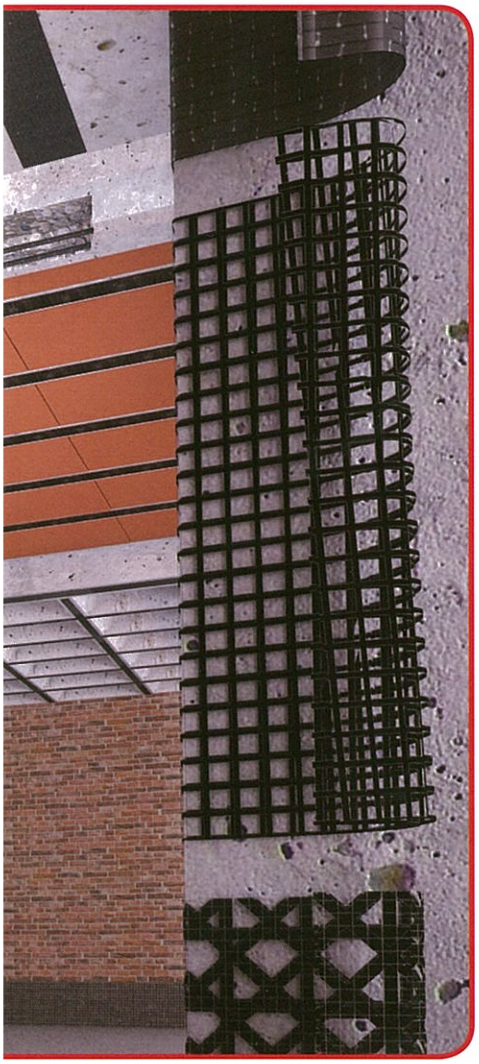
DRIZORO® WRAP and ***DRIZORO® CARBOMESH*** are systems of structural strengthening with allow the performance of any type or reinforcement due its flexibility and adaptability to the element geometry, suitable to reinforce beams under flexural and shear strains or pillars and columns under compression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

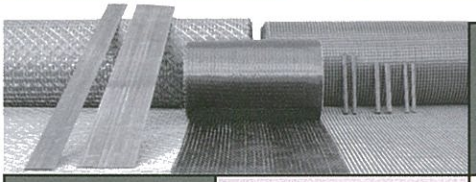
DRIZORO® COMPOSITE laminate allows strengthening in beams, girders, cantilevers, joists, and other structural elements under tensile stresses due flexion, reducing the deflection of the in service element and improving the cracking state.

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.

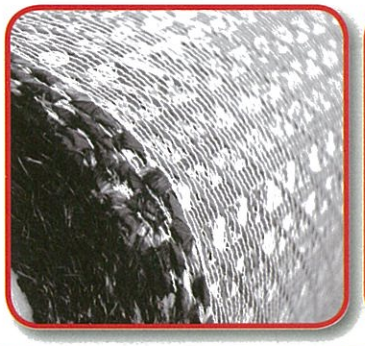
Concrete, steel and wood elements under tensile strain: beams, joists, slabs, girders, cantilevers, etc.

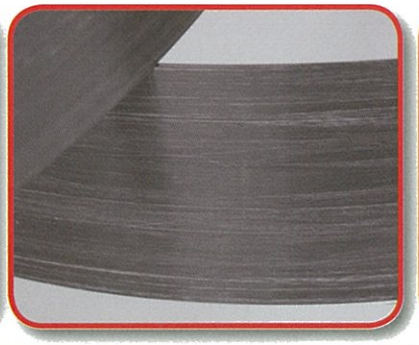
Suitability to current legislation or adaptation to new building regulations.

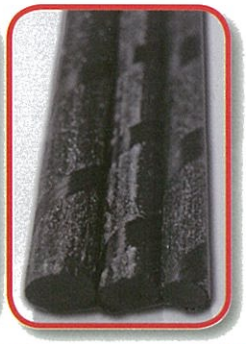




		Carbon Fiber	Laminate	Rods
Beams Joist Cantilevers Slabs	Flexion	✓	✓	✓
	Shear	✓		
Pillars	Flexion	✓		✓
	Shear	✓		
	Compression	✓		
Walls	Flexion	✓	✓	✓
	Crack Stitching	✓		✓



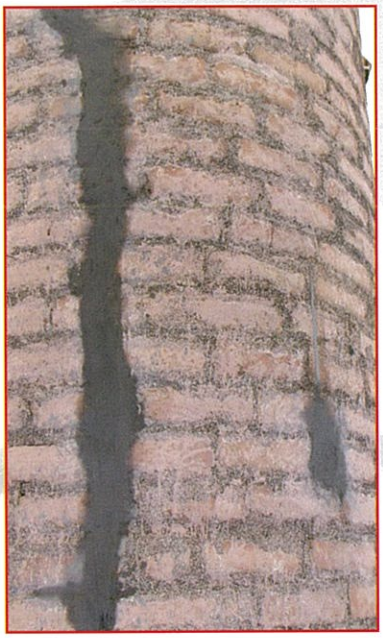




slender reinforced concrete
ced protection covering.

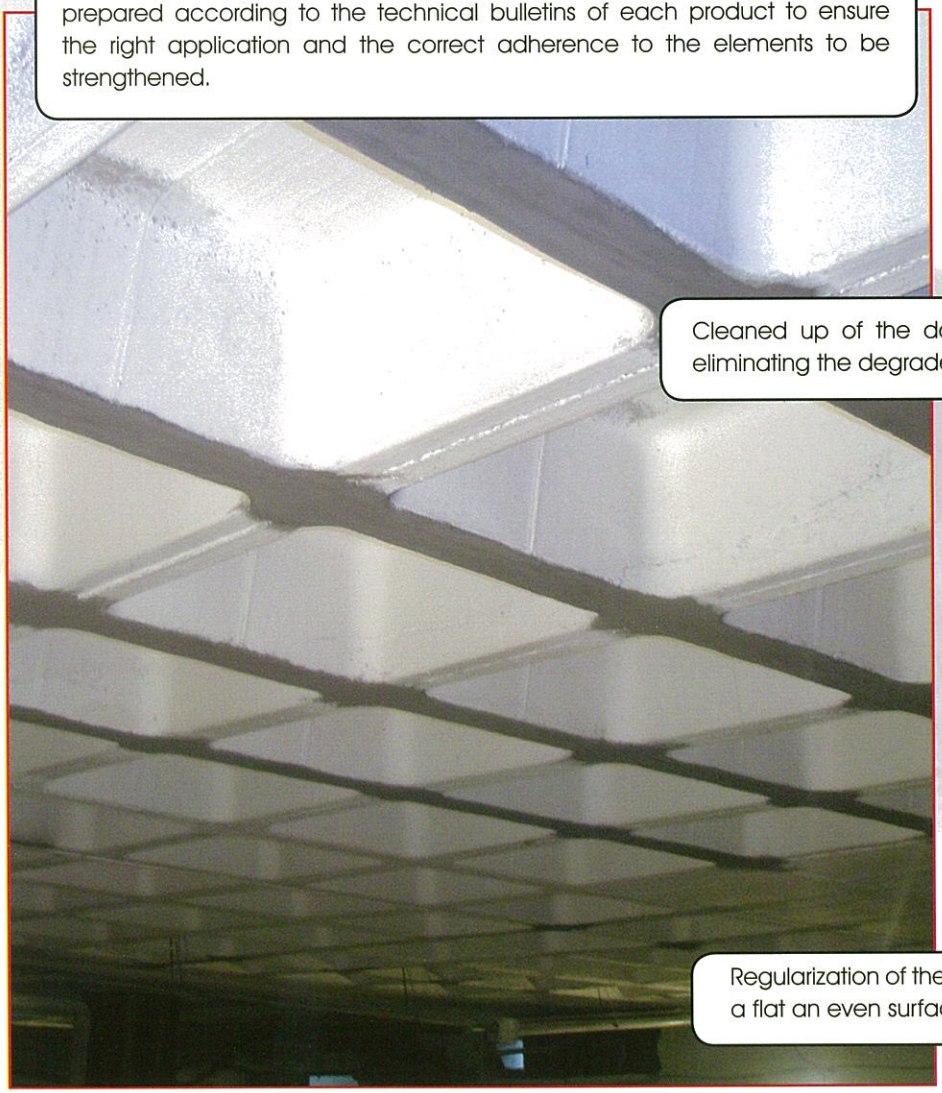
Strengthening of concrete structures by requirements of load increases, improvement of in service capability and/or specification changes of use.

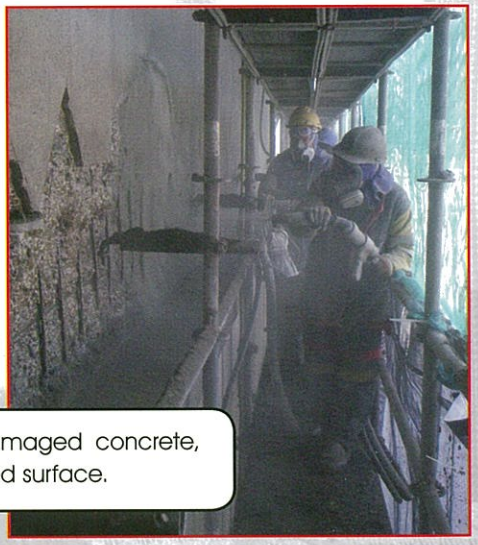
Substrate Preparation



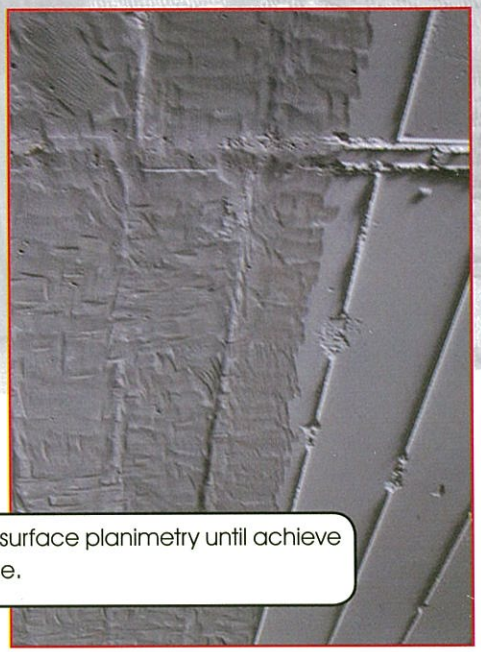
Elimination of sharp edges such as the concrete burrs.

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.





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



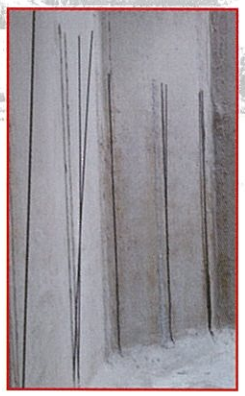
Regularization of the surface planimetry until achieve a flat an even surface.

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® E*** 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***.

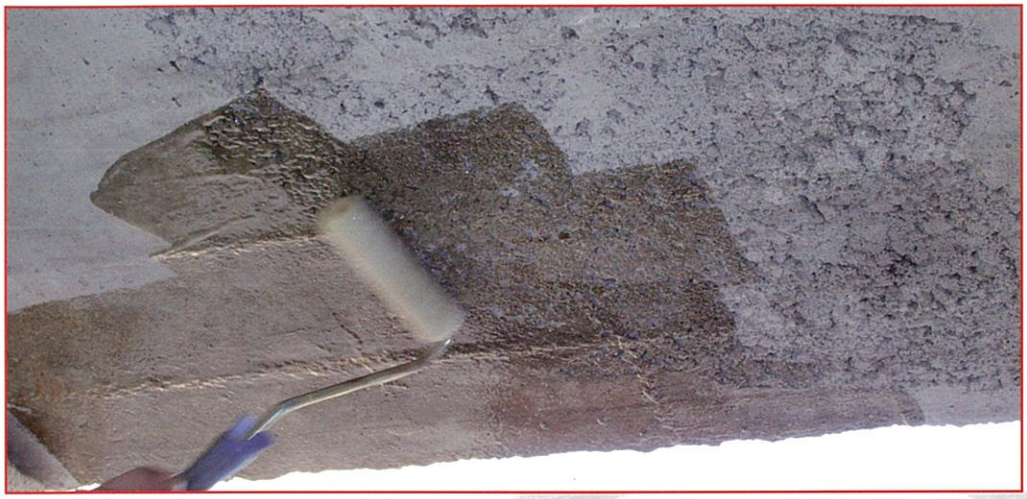
Placing of rods inside of the groove.

Anchoring of the rod into the slab using ***MAXFIX® E***.

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

APPLICATION OF CARBON FIBER STR

DRIZORO® WRAP Application

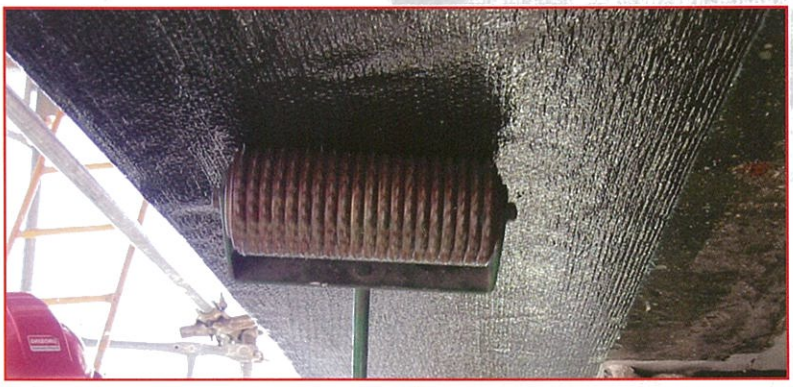


1.- Once prepared the surface, apply the priming ***MAXPRIMER® -C***. This primer penetrates into the substrate, increasing its strength and improving the adherence of the ***DRIZORO® WRAP*** system.

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 epoxy resin ***MAXEPOX® -CS***. 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.



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.

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

ENGTHENING COMPOSITE MATERIALS

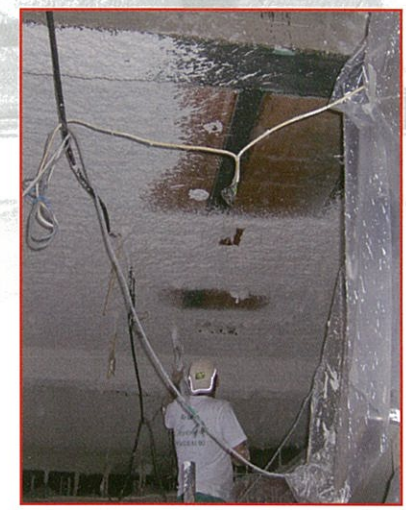
DRIZORO® CARBOMESH Application

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 carbon fiber mesh while the 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.

CONCRESEAL® CARBOFIX

PHYSICAL PROPERTIES OF *CONCRESEAL® CARBOFIX*		
Appearance and colour	Grey powder	
Maximum granulometry, (mm)	0,63	
Powder density, (g/cm3)	1,35 ± 0,05	
Fresh mortar density, (g/cm3)	1,85 ± 0,05	
Mixing water, (%, in weigth)	19 ± 1	
Application and curing conditions		
Substrate and ambient minimum temperature application, (ºC)	> 5	
Pot life at 20 ºC and 50 % H.R., (min)	20 – 30	
Setting time at 20 ºC and 50 % H.R., (h)	Initial	Final
	3 – 4	5 – 6
Maximum waiting time between layers at 20 ºC and 50 % H.R., (h)	8 – 12	
Curing time at 20 ºC and 50 % H.R., (d)	28	
Characteristics for cured mortar		
Compressive strength at 28 days, EN 12190 (MPa)	≥ 20	
Flexural strength at 28 days, EN 196-1	≥ 5,5	
Elastic modulus at 28 days, EN 13412 (MPa)	10.000	
Concrete adhesion, EN 1542 (MPa)	≥ 1,5	
Fire classification EN 13501-1 (Class)	A1	

MAXEPOX® CARBOFIX

PHYSICAL PROPIERTIES OF *MAXEPOX® CARBOFIX*	
A:B mixing ratio (by weight)	2:1
A+B mixture solid content, (% , by weight)	100
A+B mixture density at 20 °C (g/cm3)	1,74 ± 0,1
Characteristics for cured mortar	
Compressive strength at 7 days and 20 °C, (MPa)	80
Flexural strength at 7 days and 20 °C, (MPa)	60
Tensile strength at 7 days and 20 °C, (MPa)	30
Elongation at break at 7 days and 20 °C, (%)	0,39
Compressive modulus at 7 days and 20 °C, (MPa)	4.450
Flexural modulus at 7 days and 20 °C, (MPa)	7.750
Adhesion on concrete at 7 days and 20 °C, (MPa)	> 2
Coefficient of linear expansion, (1/°C)	$6{,}2 \cdot 10^{-5} \pm 0{,}1$
Water absorption, (%, by weight)	0,08
Shore D hardness	80

MAXPRIMER® -C MAXEPOX® -CP MAXEPOX® -CS

PHYSICAL PROPIERTIES OF RESINS *DRIZORO® WRAP / DRIZORO® WRAP QUADRAXIAL* SYSTEM							
Product Name		*MAXPRIMER® -C*		*MAXEPOX® -CP*		*MAXEPOX® -CS*	
Suitable for		-S	-W	-S	-W	-S	-W
Recommended temperature range (°C)		15 – 35	5 – 15	15 – 35	5 – 15	15 – 35	5 – 15
Appearance and colour	Main agent	Pale Liquid		White Putty		Green and Thixotropic Liquid	
	Hardener	Pale yellow Liquid		Black Putty		Pale yellow Liquid	
Mixing ratio (by weigth)	Main agent	4		2		4	
	Hardener	1		1		1	
Specific Gravity (25ºC)	Main agent	1,15	1,13	1,50	1,51	1,12	1,14
	Hardener	0,96	0,97	1,85	1,73	0,96	0,97
Pot life (m)	30 ºC	90	-	50	-	70	-
	23 ºC	130	18	60	40	130	25
	15 ºC	> 180	40	> 180	60	> 180	60
	5 ºC	-	130	-	150	-	120
Tack-free Time (hours)	30 ºC	8,0	-	3,0	-	8,0	-
	23 ºC	11,0	3,0	5,5	3,5	11,0	4,0
	15 ºC	17,0	7,0	10,0	5,5	18,0	7,0
	5 ºC	-	15,0	-	10,0	-	18,0
Curing Time (days)	30 ºC	-	-	-	-	5	-
	23 ºC	-	-	-	-	7	5
	15 ºC	-	-	-	-	14	7
	5 ºC	-	-	-	-	-	14

DRIZORO, S.A.U.
C/ Primavera, 50-52 Parque Industrial Las Monjas
28850 TORREJÓN DE ARDOZ - MADRID (Spain)
Tel.: (34) 91 676 66 76 - (34) 91 677 61 75 FAX: (34) 91 675 78 13
E-mail: info@drizoro.com - Web: www.drizoro.com

ISO 9001
ISO 14001
BUREAU VERITAS Certification
nº: ES021542/ES021543