



DRIZORO[®]

WRAP 600

UNIDIRECTIONAL CARBON FIBER SHEET WITH HIGH WEIGHT AND MECHANICAL PROPERTIES FOR STRUCTURAL REPAIR AND STRENGTHENING

DESCRIPTION

DRIZORO[®] WRAP 600 is a unidirectional carbon fiber sheet of high weight (600 g/m²), with high tensile strength and elasticity modulus, which bonded on substrate with epoxy adhesive, forms "in situ" a composite system designed for repair and strengthening of concrete structures.

APPLICATION FIELDS

- Restoration works in existing structures.
- Strengthening of concrete elements due to changes in construction uses.
- Repair of damaged structures by accidents, pathologies, or both.
- Adaptation to new regulations.
- Rectification of design or job constructions defects.
- Repair and strengthening of concrete structures damaged by earthquakes.
- Restoration of bridges, chimneys, silos and outstanding concrete structures.

ADVANTAGES

- Low weight. It weights 5 times less than standard steel strengthening.
- High tensile strength and fatigue. It is 10 and 3 times stronger than steel and fibreglass systems respectively. Highly resistant to fatigue.
- High modulus tensile. It reduces the tensile strength in the reinforcing bars.
- Long lasting. It withstands almost all chemicals, marine environments and freeze-thaw cycles. It is a non-corroded system.
- Easy and quick to apply. It does not required maintenance.
- A versatile system. It can be applied to complex structures, and to reinforce large variety of structural elements to flexural, shear and compressive stress.
- Low thickness with a minimum increasing for the cross-section of the strengthened structural

elements. It allows maintaining the geometry and appearance of the strengthened elements.

APPLICATION INSTRUCTIONS

Application Procedure

There are eight main steps in the application procedure of the **DRIZORO[®] WRAP 600 System** as described below: (1) Concrete surface preparation, (2) Primer application, (3) Putty application -if required-, (4) Cutting of carbon fiber sheets, (5) Under-coating resin application, (6) Carbon fiber sheet placement, (7) Sealing coat on carbon fiber sheet and (8) Protective coating application -if required-.

(1) Concrete Surface Preparation

The effectiveness of carbon fiber system relies upon the bond between the fiber itself and the concrete surface it is being applied to. So that concrete surface must be fully properly prepared.

Surface must be sound (Compression strength, at 28 days, 15 N/mm² measured in a 15 x 30 cm cylindrical specimen), dry and clean, free from dirt, remains of paints, gypsum, efflorescences, greases, oils, as well as demoulding agents, curing agents or any coating, which could affect the adhesion. Using a disk grinder, or other similar device, remove the above-mentioned substances. Grind any unevenness on the concrete surface to less than 1 mm. Concrete surface must be even with a variance of less than 2 mm over a length of 300 mm. Carbon fiber strengthening is not effective around sharp edges. So, corners and edges must be rounded (chamfered) to a radius greater than 3 cm, with a desirable of 50 cm to prevent a significant reduction in the tensile strength of the system. Generated dust or other residue must be removed by pressurized air or clean wiping rags.

After the initial surface abrasion, many defects greater than 5 mm can be exposed. So that all these surface damages such as defects, cavities, honeycombs, peelings should be filled

with a structural repair mortar. Remove all concrete around structural reinforcement affected by corrosion. These reinforcements should be cleaned of rust and scale and then, coated with the oxide converter and anti-corrosive protection **MAXREST® PASSIVE** (Technical Bulletin n° 12). Repair the area with a structural repair mortar such as **MAXREST®** (n° 4) or **MAXRITE® -500/-700/-S** (Technical Bulletin n° 50, 51 y 57 respectively).

Repair cracks of size greater than 0,3 mm by injection of low viscosity epoxy resin **MAXEPOX® INJECTION** (Technical Bulletin n° 78) or **MAXEPOX® INJECTION -R** (Technical Bulletin n° 79) according to temperature.

(2) Primer Application

MAXPRIMER® -C is mixed using an electric hand mixer in clean container at a weight ratio resin/hardener of 4:1 to produce a product with uniform consistency. Do not use any mixed primer that has exceeded the specified pot life. Using a clean roller or brush, apply one or two layers, in a uniform manner, with a total consumption from 0,20 to 0,35 kg/m² (standard 0,25 kg/m²). The applied primer must become tack-free (no longer sticky) before next step.

(3) Putty Application (if required)

If after primer application, concavities, gaps or pinholes up to 5 mm are seen on the surface, **MAXEPOX® -CP** putty must be applied to smooth the concrete surface prior to application the carbon fiber sets. Check that primer previously has dried and becomes tack-free. If more than 7 days have passed since the primer application, then primer surface must be roughened with sandpaper and wipe clean before putty application.

MAXEPOX® -CP is mixed by electric hand mixer in a clean container at a weight ratio of resin/hardener of 2:1 to produce a product with uniform consistency (paste) and colour (grey). Do not use any mixed putty that has exceeded the specified pot life. Using a clean trowel or spatula, apply on all indents, defects or pinholes larger than 1 mm, with a total consumption from 0,5 to 1,5 kg/m². The applied putty must become tack-free (no longer sticky) before next step.

(4) Cutting of Carbon Fiber Sheets

Using a scissor or utility cutter cut **DRIZORO® WRAP 600** into different sheets to the specified length according to the drawing and work plan. Prepared sheets should have a maximum length from 4 to 6 meters for easy handling and to prevent wrinkling. Sheets must be handled and stored with care to prevent it from becoming contaminated or damaged. Contact with water is strictly prohibited. Sheets must not be folded or rolled up without a central core.

(5) Adhesive Resin Application

MAXEPOX® -CS is an epoxy adhesive for bonding the carbon fiber sheet to the concrete surface. The resin impregnates into the carbon fibers, which

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once cured, will form the composite to strengthen the concrete element.

Check that primer, putty or both have become tack-free. If more than 7 days have passed since the application, surface must be roughened with sandpaper and wipe clean before putty application.

MAXEPOX® -CS is mixed using an electric hand mixer in a clean container at a weight ratio of resin/hardener of 4:1 to produce a product with a liquid uniform consistency and green colour. Do not use any mixed resin that has exceeded the specified pot life. Using a clean roller or brush, apply one uniform coat on the primed concrete, with a total consumption of 0,8 kg/m².

(6) Carbon fiber sheet placement

Place immediately **DRIZORO® WRAP 600** pressing on the fresh coat of **MAXEPOX® -CS** and no later than 20 minutes. Press and smooth the sheets longitudinally by an air removal metal roller, which also will help to fully saturate the fiber and eliminate any air trapped between sheets. Do not roll in perpendicular direction to the fiber, since it may misalign or damage the fibers.

(7) Sealing coat on carbon fiber sheet

Wait 45 minutes approximately to allow the resin impregnates **DRIZORO® WRAP 600** (If ambient temperature is 10 °C or below, wait 2 h), then finish applying a sealing coat of **MAXEPOX® -CS** with 0,7 - 0,8 kg/m².

If several sheets of carbon fiber is specified, repeat the same procedure until completing the total number of sheets. Do not place at same day more than two sheets on vertical surfaces and three sheets on overhead surfaces respectively, in order to avoid its slump.

For reinforcement of columns and pillars by confinement, the overlap of the different sheets in longitudinal direction should be at least of 20 cm and in transversal direction of 5 cm, to maintain a correct transfer of the stresses.

(7) Final Protective Coating Application

DRIZORO® WRAP 600 allows its aesthetic finish and protection with coatings such as **MAXSEAL® FLEX MAXSHEEN® ELASTIC**, **MAXURETHANE® 2C** or areas exposed to mechanical impacts with mortars **MAXREST®**, **CONCRESEAL® PLASTERING**. To improve adhesion of such finishes on **DRIZORO® WRAP**, spread 1 – 1,5 kg/m² of silica sand (0,1 to 2,5 mm diameter) on the last fresh coat of **MAXEPOX® -CS**.

Application Conditions

Do not apply if substrate/ambient temperature are below 5°C. Viscosity of primer, putty and

resin becomes higher at lower substrate/ambient temperatures. This may cause difficulty in application, poor impregnation on carbon fiber sheet and concrete body, alterations in the tack-free time and the curing time. Heating apparatus (electrical heaters), handled carefully, can be used to ensure that the ambient temperature is greater than 5 °C. If substrate/ambient temperature at the work site are greater than 35°C, reaction rate will increase and *Pot Life* will be greatly reduced. Temperature must be at least 3 °C above dew point.

Do not apply if rain, water contact, dew, condensation is expected within 24 hours. Moisture concrete surface must be below 5 °C.

Curing

Curing time of **MAXEPOX®-CS** is between 5 to 14 days, depending on type of resin used and ambient temperature (See Technical Data Table). Allow to complete curing time before full load transfer.

Cleaning

All tools and equipments can be cleaned immediately with **MAXEPOX® SOLVENT** after use. Once any epoxy-based product (primer, levelling putty or resin) cures, can only be removed by mechanical means.

PACKAGING

DRIZORO® WRAP 600 is supplied in roll of 50 m length and 30 cm width.

MAXPRIMER®-C, **MAXEPOX® -CP** and **MAXEPOX® -CS** are supplied in pre-weighted set of 5 kg and 15 kg. Two versions are available: “**W**” type for use with cold temperature between 5°-15 °C, and “**S**” type for temperature between 15°-35 °C.

IMPORTANT INDICATIONS

- Mix full quantities of the set supplied and do not add solvents.
- For further information, consult our Technical Department.

TECHNICAL DATA

PROPERTIES FOR DRIZORO® WRAP 600 SHEETS	
Appearance	Unidirectional carbon fiber sheet woven in one direction
Density, (g/cm ³)	1,80 ± 5%
Weight, (g/m ²)	600 ± 5%
Equivalent thickness,(mm)	0,333 ± 5%
Ultimate tensile strength, (MPa)	4.570
Elastic modulus, (MPa)	230.000
Strain at break, (%)	1,78

STORAGE

Storage time for carbon fiber sheet **DRIZORO® WRAP 600** is unlimited in its original unopened packaging. Sheets must not be folded, creased or rolled up without a central core (exceeding 300 mm diameter).

Storage time for epoxy **MAXPRIMER®-C**, **MAXEPOX® -CP** and **MAXEPOX® -CS** is twelve months in its original unopened packaging.

These storage times are considered in a dry and covered place, protected from frost and direct sunlight, with temperatures between 5 °C and 30 °C. Storage at temperatures below 5 °C may lead the crystallisation of epoxy components. Should this happen, it must be heated slowly at moderate temperature while it is regularly stirred until achieving its homogeneous and original lump-free appearance

SAFETY AND HEALTH

Carbon fiber sheet is a highly conductive material. Therefore must not be in contact with electrical apparatus or cables, so that may lead to electric shocks or short-circuiting.

Epoxy resins are not toxic products, but may cause irritation to skin contact. Avoid inhaling vapours generated by heating or combustion. Use full protective clothing, goggles, rubber gloves and masks during application. In case of skin contact, wash affected areas with soap and water. In case of eye contact rinse immediately with clean water but do not rub. Work site must be well ventilated at all time.

Safety Data Sheets for all products of **DRIZORO® WRAP 600 System** is available by request.

The final user must do disposal of the products and theirs empty containers according to official regulations.

Properties for epoxy resins in DRIZORO® WRAP 600 SYSTEM							
PRODUCTS		PRIMER		LEVELLING PUTTY		ADHESIVE-RESIN	
Product Name		MAXPRIMER® -C		MAXEPOX® -CP		MAXEPOX® -CS	
Suitable for		Warm Season (S)	Cool Season (W)	Warm Season (S)	Cool Season (W)	Warm Season (S)	Cool Season (W)
Recommended temperature range (°C)		15 – 35	5 – 15	15 – 35	5 – 15	15 – 35	5 – 15
Appearance	Main agent	Pale Liquid		White Putty		Green and Thixotropic Liquid	
	Hardener	Pale yellow Liquid		Black Putty		Pale yellow Liquid	
Mixing ratio (by weight)	Main agent	4		2		4	
	Hardener	1		1		1	
Specific Gravity (±0,1 g/cm ³ at 25°C)	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 (minutes)	30 °C	90	-	50	-	70	-
	23 °C	130	18	60	40	130	25
	15 °C	> 180	40	> 180	60	> 180	60
	5 °C	-	130	-	150	-	120
Tack-free Time (hours)	30 °C	8,0	-	3,0	-	8,0	-
	23 °C	11,0	3,0	5,5	3,5	11,0	4,0
	15 °C	17,0	7,0	10,0	5,5	18,0	7,0
	5 °C	-	15,0	-	10,0	-	18,0
Curing Time (days)	30 °C	-	-	-	-	5	-
	23 °C	-	-	-	-	7	5
	15 °C	-	-	-	-	14	7
	5 °C	-	-	-	-	-	14
CONSUMPTION (kg/m ²)		0,2 - 0,35 (Standard value: 0,25)		0,5 -1,5 (Depends on volume to level)		0,7 - 0,8 per coat 1,5 - 1,6 per carbon fiber sheet	
Mechanical properties for epoxy resins used in DRIZORO WRAP 600 system (N/mm²)							
Tensile Strength		-		-		> 29	
Flexural Strength		-		-		> 39	
Shear Strength		-		-		> 9,8	
Adhesive Strength		>2,5 (Break concrete)		>2,5 (break concrete)		>2,5 (Break concrete)-	

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. These data are 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 it will 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.



DRIZORO, S.A.U.

C/ Primavera 50-52 Parque Industrial Las Monjas
28850 TORREJON DE ARDOZ – MADRID (SPAIN)
Tel. 91 676 66 76 - 91 677 61 75 Fax. 91 675 78 13
e-mail: info@drizoro.com Web site: drizoro.com

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No. ES045396-1/ES045397-1