

Carbon Fibre Reinforcement Plate System

Guardian CF Plate is a carbon fibre reinforced polymer laminate used for strengthening structures bonded externally by **Guardian CF Adhesive**.

Complies to EN1504 Part 9 and EN1504 Part 4

Principle 4 : Structural Strengthening (SS).

Method 4.3 – Plate Bonding.

USES & ADVANTAGES

Typical uses include strengthening of structures where there are load increases anticipated, structural repairs, modification of the standard system or modifying errors in planning or construction. Applications may be grouped as follows:-

Load Increases

- Higher live load
- Increased wheel loads
- Installation of heavier machines
- Vibration
- Less deformation

Modification of structural system

- Elimination of walls / columns
- Openings cut into slabs

Improvements in suitability for use

- Limitation of deflections
- Reduction of stress in steel reinforcement
- Reduction of crack widths

Damage to structural parts

- Ageing of construction materials / damage caused by fire
- Corrosion of steel reinforcement
- Impact of vehicles

Errors in planning or construction

- Insufficient design dimensions
- Insufficient reinforcing steel section

Advantages include:

- High strength and high modulus.
- 10 times the tensile strength capacity of steel.
- Light weight. Minimal additional dead load.
- Does not corrode. High durability low maintenance.
- Minimal increase in member geometry.
- Easy to hide and overcoat.
- Flexible easy to install on difficult shapes.
- Easy to install minimal down time.
- Chemical resistance.
- Neutralizes the effect of cracks.
- Applied to cracks on concrete surface improves
- Significantly fracture strength.
- Increased flexural strength.
- Applied to lower tension surface of reinforced concrete beam provides substantial strength improvements.
- Improved lateral compression strength of cylindrical structures.
- Encasement of columns for seismic protection.
- Improves a structures ability to withstand lateral distortion and buckling.

The following concrete structures are typical areas of application: Bridges, Piers, Parking Structures, Tunnels, Silos, Chimneys, Dams, Tanks and Slabs, Beams and Columns etc. in buildings.

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APPLICATION METHOD

1. Surface preparation

Ensure that the concrete surface is clean and sound. Remove all contaminants including coatings, grease, oil, dirt, excessive laitance, salts and unsound material by grinding, hammering, etc. Where necessary degrease with chemical degreaser.

Any structural cracks should be injected with **Guardian CIR** epoxy resin injection material.

*Note:- Unsound deteriorated concrete that occurred as a result of corrosion of rebars, needs to be removed to behind rebar. Corroded rebar to be cleaned with rust remover. Apply **Guardian Zinc Primer** on cleaned rebar as a corrosion protective coating. Apply **Guardian WEAP** as a bonding bridge on the prepared concrete surface. Apply **Guardian 600 Series** over **Guardian WEAP** bonding bridge to bring back the profile of concrete. In the case of porous substrates finish the surface defects such as pinholes with **Guardian FC**.*

The recommended minimum concrete pull off test after surface preparation is 1.5 N/mm² and should be tested.

2. Mixing

Mix part A and B of **Guardian CF Adhesive** together at the ratio 1:1 by weight for at least 3 minutes with a (300-400 r.p.m.) slow speed electric drill. Avoid entraining air. Use all material within its pot life. The greater the quantity mixed the shorter will be the pot life. The pot life is longer at lower temperatures & shorter at higher temperatures. The pot life of **Guardian CF Adhesive** is typically 50 minutes @23°C.

3. Guardian CF Plate application

Apply **Guardian CF Adhesive** to the substrate with a notched trowel or spatula/scrapper at a thickness of approximately 1 mm.

Clean the side of **Guardian CF YC-CFRP(S) Plate** to be applied to the concrete and apply 1-2 mm thickness of **Guardian CF Adhesive** to the plate using a spatula.

Within the open time of the **Guardian CF Adhesive** place the **Guardian CF YC-CFRP(S) Plate** on to the prepared sub-strate and press firmly into the Adhesive using a hard rubber roller. Ensure excess material is forced out of both sides of the plate.

In case of **Guardian CF YC-CFRP(S) Plate** intersections allow the 1st application to harden before application of 2nd plate and clean the over lapping plate surface before application of **Guardian CF Adhesive**.

*Note :- **Guardian CF system** should only be applied by specialist applicators who have had training in the installation of this system. Guardian can provide such training & a list of approved applicators.*

PROPERTIES

TYPE	WIDTH	THICKNESS	CROSS SECTIONAL AREA
Guardian CF YC-CFRP(S)Plate	100 mm	1.2 mm	120 mm ²
	50 mm	1.4 mm	70 mm ²

Properties	Result	Test Method
Appearance	Black Colour	-
Fibre Volumetric Content	> 68 %	-
Tensile Strength	2511 Mpa	ASTM D 3039
E Modulus	170 GPa	ASTM D 3039
Elongation Strain at Break	1.71 %	ASTM D 3039
Density	1.5 gm/cm ³	-

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PROPERTIES

TYPE	WIDTH	THICKNESS	CROSS SECTIONAL AREA
Guardian CF YC- CFRP(S)	100 mm	1.2 mm	120 mm ²
(HP) Plate	100 mm	1.4 mm	140 mm ²

Properties	Result	Test Method
Appearance	Black Colour	-
Fibre Volumetric Content	> 68 %	-
Tensile Strength	>2800 Mpa	ASTM D 3039
E Modulus	160-170 GPa	ASTM D 3039
Elongation Strain at Break	> 1.50 %	ASTM D 3039
Density	1.5-1.6 gm/cm ³	-

NOTES ON APPLICATIONS AND LIMITATIONS

Samples: - Witness samples should be made at site and tested in a laboratory to ensure the material meets the responsible designer's requirement.

Dew Point: Substrate temperature should be at least 3°C above the dew point.

The ambient temperature should be above 8°C.

The product should only be used by experienced professionals. In hot or cold conditions precondition the product 24 hours before use.

Protect from rain for 24 hours after application.

Consult a structural engineer for load calculations & design.

A qualified structural engineer must be responsible for designing the works. Care must be taken in selecting suitably experienced and trained contractors

Protect from permanent exposure to direct sunlight moisture & or water.

CONSUMPTION

Approx. 1.5 kg/m² @ 1 mm thickness.

PACKAGING

Guardian CF Plate YC-CFRP(S) = 1.2mm x 100mm x 100 m (10 m²) per roll.

Guardian CF Plate YC-CFRP(S) = 1.4mm x 50mm x 100 m (10 m²) per roll.

Guardian CF Plate YC-CFRP(S) = 1.4mm x 100mm x 100 m (10 m²) per roll.

Other sizes available on request.

STORAGE & SHELF LIFE

Unlimited providing not exposed to direct sunlight stored in dry conditions in original packaging at temperatures less than 50°C.

All statements and data presented herein are given in good faith and believed to be appropriate and reliable. It is given without express or implied warrant or guarantee. Potential users of Guardian's materials are urged to conduct confirmatory trials to satisfy themselves as to the suitability of the selected product for their particular end use prior to purchase.

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QUALITY ASSURANCE

ISO 9001: 2015 verified by TUV Nord.

HEALTH & SAFETY

Refer to advise on the safe handling, storage & disposed of the material in the MSDS available from Guardian.

TECHNICAL SERVICE

The Guardian Coating Service Department is available to assist you in the correct use of our products and its resources are at your disposal entirely without obligation.

DISCLAIMER

Performance data is achieved testing in accordance with International Standards. Testing by others may result in different results from those published as a result of external factors such as poor sampling, incorrect mixing, varying temperatures, curing, crushing procedures etc.

Guardian does not take responsibility nor need to defend others testing that does not achieve the published data.

The user must test the products suitability for the intended application and purpose. Guardian reserves the right to change the properties of the product.

Site conditions and differences in materials are such that no warranty or fitness for a particular purpose, nor liability can be inferred from the published data sheet, written recommendations or from other advise offered.