

Milliken Infrastructure

RenewWrap™ ESR CF600 BD

Bi-Directional (0/90) Carbon Fiber Reinforcing Fabric



BRIDGES + ROADWAYS



BUILDINGS + PARKING FACILITIES



OIL, GAS + INDUSTRIAL



RenewWrap™ ESR CF600 BD is a dry, bi-directional (0/90) reinforcing fabric made with high strength, standard modulus carbon fibers.

Benefits

- Lightweight, flexible, high-strength fabric can be wrapped around and externally bonded to structural elements
- Easy to impregnate using wet or dry lay-up methods
- Bi-directional (0/90) fabric provides strength and stiffness in both directions

Limitations

- Design calculations shall be made and sealed by a licensed, independent engineer knowledgeable with the design of FRP strengthening systems.
- Avoid completely encapsulating/covering concrete or masonry members subject to freeze/thaw or moisture vapor transmission.
- Ambient temperature cure wet lay-up FRP strengthening systems are not suitable for applications requiring substantial strengthening and a structural fire rating. For these applications, consider using the **FireStrong™ FRP Strengthening System**.

Packaging

Available in 25 in. (635 mm) widths and 207 ft. (63 m) long rolls suspended in boxes. Each roll yields 430 ft² (40 m²) of material.

Typical Uses

The RenewWrap system may be used to strengthen or retrofit a wide range of concrete and masonry structural member including columns, beams, slabs, walls, pipes, tunnels, desk, piers, piles, etc.

- Strengthen for load increases
- Address changes in structural system, like slab openings
- Retrofit for seismic, wind, or blast
- Restore strength to damaged members like fire or vehicle impact
- Restore strength to deteriorated members subject to corrosion
- Strengthen for design/construction errors

Storage & Shelf Life

Store carbon fiber reinforcing fabric on roll suspended in box in a clean, dry environment at 50-90 °F (10-30 °C). Shelf life is 10 years in unopened packaging.

Caution

Exercise caution when working with carbon fiber materials around sensitive electrical equipment. Carbon fiber filaments may become airborne and could cause electrical shorts in sensitive equipment. SDS are available and should be consulted for additional information.

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Typical Fabric and Fiber Properties¹

PROPERTY	VALUE
Fiber Type	Carbon
Color	Black
Fabric Construction	Bi-Directional (0°/90°)
Fiber Tensile Strength	700 ksi (4830 MPa)
Fiber Tensile Modulus	33,400 ksi (230 GPa)
Fiber Rupture Strain	2.0%
Fabric Areal Weight ²	19 oz./yd ² (640 gsm)

NOTES:

1. Fiber properties are typical values of the fibers used in the manufacture of the reinforcing fabrics. They are based on proprietary test methods employed by the supplier of the carbon fibers. Fiber properties shall not be used for design. They are reported here to provide the designer with a general understanding of the grade of fibers used in the reinforcing fabrics.
2. Reported value represents the minimum fabric areal weight.

Physical Properties

PROPERTY	VALUE	TEST METHOD
Nominal Thickness ¹	0.047 inch (1.19 mm)	
Glass Transition Temperature ²	140 °F (60 °C)	ASTM E1640

Mechanical Properties

PROPERTY	0° DIRECTION	90° DIRECTION	TEST METHOD
Tensile Strength	80 ksi (550 MPa)	77 ksi (530 MPa)	ASTM D3039
Tensile Modulus of Elasticity ²	4540 ksi (31.3 GPa)	4690 ksi (32.3 GPa)	ASTM D3039
Elongation at Break	1.76%	1.66%	ASTM D3039
Tensile Strength/Unit Width	3.77 kip/in./ply (0.66 kN/mm/ply)	3.66 kip/in./ply (0.64 kN/mm/ply)	ASTM D7565
Tensile Modulus/Unit Width ²	215 kip/in./ply (37.6 kN/mm/ply)	221 kip/in./ply (38.7 kN/mm/ply)	ASTM D7565

NOTES:

1. The reported thickness is based on measurements made on panels prepared in the laboratory. Based on experience the typical thickness of a single ply (fibers + saturant), impregnated with **RenewWrap™ ESR Saturant** is approximately 0.05-0.06 inch depending on how the fabric is impregnated in the field. Actual thicknesses measured in the field may vary slightly. As with any FRP strengthening system, the strength/unit width and modulus/unit width should be used for design and for field QC purposes.
2. Modulus of elasticity and unit stiffness are reported as average values in accordance with ACI 440.2R and shall be used for design. They shall not be used for accepting/rejecting results of field QC test results.
3. Test samples are conditioned for 48 hours at 140 °F (60 °C). Tg values based on long term curing at room temperature conditions. Higher Tg values may be obtained by post-curing. Contact Milliken Infrastructure Solutions for more information.

Before using any Milliken Infrastructure Solutions, LLC product, the user must review the most recent version of the product's technical data sheet, material safety data sheet and other applicable documents, available at www.strengtheningsolutions.milliken.com or by calling 1-855-655-6750. LIMITED WARRANTY: Milliken Infrastructure Solutions, LLC is very proud of our innovative RenewWrap™ products (the "Products") and our superior customer service. We hereby warrant to the original purchaser that the Products meet Milliken's standard specifications at the time of delivery from us. If the Products are found to be defective because they do not meet this Warranty, then we will as the sole remedy either (at our option) refund the purchase price for those Products or provide replacement Products (in either case, not including shipping, installation or any other costs). Naturally, we are not responsible or liable for degradation, damage, liability or defect in, or related to, the Products caused by improper storage, use, installation or maintenance, any other party's representations, warranties, actions, or omissions, or acts of God. WE MAKE NO REPRESENTATION OR WARRANTY BEYOND THE EXPLICIT STATEMENTS CONTAINED IN THIS WARRANTY, AND ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, INFRINGEMENT, OR ANY WARRANTIES BASED UPON SAMPLES, MODELS, OR SPECIFICATIONS, ARE HEREBY EXPRESSLY DISCLAIMED. NOTWITHSTANDING ANYTHING TO THE CONTRARY, IN NO EVENT SHALL WE BE LIABLE TO THE ORIGINAL PURCHASER OR ANYONE ELSE FOR ANY CONSEQUENTIAL, INDIRECT, SPECIAL, OR EXEMPLARY (OR ANY SIMILAR TYPE OF) DAMAGES RELATED TO THE PRODUCTS. As each customer's use of our Products and situation may be different, information we provide, including without limitation, use or installation suggestions, test results, samples, etc. is provided in good faith but without warranty and without accepting any responsibility or liability. Each customer must test and be responsible for its own specific use, installation, application, etc. All sales are exclusively subject to our standard terms of sale posted at www.milliken.com/terms (all additional/different terms are rejected) unless explicitly agreed otherwise in a signed writing. This Warranty is governed by the laws of the United States and the State of South Carolina, U.S.A. (without giving effect to its conflict of law principles), and any party desiring to take action under this Warranty hereby submits to the exclusive jurisdiction of the courts in such jurisdiction and waive any inconvenient forum claims related thereto. In the unlikely event that you have a warranty issue, please contact your distributor or sales representative to discuss and resolve the matter in accordance with this Warranty.

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