

Milliken Infrastructure

# RenewWrap™ ESR GF400 BD

Bi-Directional (0/90) E-Glass Fiber Reinforcing Fabric



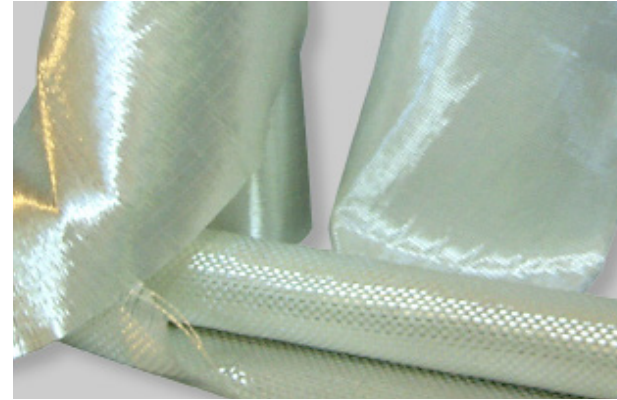
BRIDGES + ROADWAYS



BUILDINGS + PARKING FACILITIES



OIL, GAS + INDUSTRIAL



**RenewWrap™ GF400 BD** is a dry, bi-directional (0/90) reinforcing fabric made with high strength, E-Glass fibers.

## Benefits

- Lightweight, flexible, high-strength fabric can be wrapped around and externally bonded to structural elements
- Bi-directional (0/90) fabric provides strength and stiffness in both directions
- Non-corrosive

## Limitations

- Design calculations shall be made and sealed by a licensed, independent engineer knowledgeable with the design of FRP strengthening systems.
- E-glass fabrics are intended for applications where additional protection or light confinement is required. E-glass is typically not suitable for projects requiring strengthening. For these applications, consider using one of the RenewWrap™ carbon fiber 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 279 ft. (85 m) long rolls suspended in boxes. Each roll yields 580 ft<sup>2</sup> (54 m<sup>2</sup>) of material.

## Typical Uses

RenewWrap™ E-glass fiber systems may be used to provide additional protection, strength, or stability to existing concrete and masonry structural members including columns, beams, slabs, walls, pipes, tunnels, deck, piers, piles, etc.

- Additional protection from environmental conditions
- Confinement of repaired elements
- Insulation barrier between exposed steel and carbon fiber
- Seismic retrofit and strengthening of masonry elements

## Storage & Shelf Life

Store E-glass fiber reinforcing fabric in plastic wrap in box in a clean, dry environment at 50-90 °F (10-30 °C). Shelf life is 10 years in unopened packaging.

## Caution

RenewWrap E-glass fabrics are non-reactive. Wear appropriate PPE and use caution when handling. SDS are available and should be consulted for additional information.

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## Typical Fabric and Fiber Properties<sup>1</sup>

PROPERTY	VALUE
Fiber Type	E-Glass
Color	White
Fabric Construction	Bi-Directional (0°/90°)
Fiber Tensile Strength	500 ksi (3450 MPa)
Fiber Tensile Modulus	11,700 ksi (80 GPa)
Fiber Rupture Strain	4.0%
Fabric Areal Weight <sup>2</sup>	11.8 oz./yd <sup>2</sup> (400 gsm)

### NOTES:

1. Fiber properties are typical values of the fibers used in the manufacture of the reinforcing fabrics. 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 <sup>1</sup>	0.021 inch (0.53 mm)	
Glass Transition Temperature <sup>2</sup>	140 °F (60 °C)	ASTM E1640

## Mechanical Properties

PROPERTY	0° DIRECTION	90° DIRECTION	TEST METHOD
Tensile Strength	45 ksi (310 MPa)	46 ksi (320 MPa)	ASTM D3039
Tensile Modulus of Elasticity <sup>2</sup>	1800 ksi (12.4 GPa)	1740 ksi (12.0 GPa)	ASTM D3039
Elongation at Break	2.56%	3.02%	ASTM D3039
Tensile Strength/Unit Width	0.95 kip/in./ply (0.17 kN/mm/ply)	0.97 kip/in./ply (0.17 kN/mm/ply)	ASTM D7565
Tensile Modulus/Unit Width <sup>3</sup>	38 kip/in./ply (6.6 kN/mm/ply)	36 kip/in./ply (6.2 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 0.03-0.04 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](http://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](http://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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