

# Fortec Carbon Tow Sheet 600GSM-VHS

Unidirectional Carbon Fiber Textile or Tow Sheet  
for structural reinforcement and containment



**Product Description:** Fortec Carbon Tow Sheet 600GSM-VHS is a flexible, woven, unidirectional carbon fiber textile that uses very high strength, aerospace grade carbon fibers with a lightweight scrim on both sides designed for use as an externally applied reinforcement for strengthening concrete, timber and masonry structures. Fortec Carbon Tow Sheets are typically field installed using either Fortec #4550 LPL or #1276 LPL Hi-Modulus Fiber Matrix epoxy resins to form an inexpensive carbon fiber reinforced polymer (CFRP) system.



## Key Features

- ❖ Reinforcement & strengthening of irregular shapes
- ❖ Column wrapping
- ❖ Cantilever retaining wall reinforcing
- ❖ Supplementary reinforcing of beams & slabs
- ❖ Inert reinforcement in highly corrosive environments

## Options

- ❖ Custom cross weaves available
- ❖ Can be manufactured in bi-directional weaves

## PRODUCT USE

### Target Applications

- ❖ Structural Retrofit & Upgrades
- ❖ Changes in building use requiring larger loads
- ❖ Increased strength of masonry & concrete walls
- ❖ Increased strength of parking decks & floor slabs
- ❖ Crack and moisture control
- ❖ Seismic retrofits
- ❖ Shear strength improvements
- ❖ Flexural strength improvements
- ❖ Addition of heavy or vibrating machinery
- ❖ Service life increases

### Repair Applications

- ❖ Collision
- ❖ Corrosion
- ❖ Fire
- ❖ Age
- ❖ Overuse

### Structural Benefits

- ❖ Seismic confinement
- ❖ Strength increase
- ❖ Deformation & sag decrease
- ❖ Steel reinforcement stress reduction
- ❖ Crack and moisture control
- ❖ Substrate conforming

## PRODUCT SPECIFICATIONS

### Typical Data

#### 600GSM-VHS

|   |  |
|---|--|
| <b>Base Material</b>  | Carbon filament tows woven into a flexible, unidirectional textile |
| <b>Storage</b>  | Product to be kept from direct sunlight.                           |
| <b>Shelf Life</b>   | Unlimited  |
| <b>Color</b>  | Black  |
| <b>Filament Tensile Strength, ksi (MPa)</b>                     | 700 (4,900)  |
| <b>Filament Tensile Modulus, ksi (MPa)</b>                      | 36,000 (250,000)   |
| <b>Fabric Areal Weight, lb/ft<sup>2</sup> (g/m<sup>2</sup>)</b> | 0.123 (600)  |
| <b>Fabric Nominal Thickness, in (mm)</b>                        | 0.014 (0.34)   |
| <b>Shore D Hardness (ASTM D2240)</b>                            | 84D  |

### Fabric Mechanical and Physical Properties

|                            | Ultimate Tensile Strength <sup>1</sup> $f_{tu}$<br>ksi (MPa) | Modulus of Elasticity <sup>1</sup> $E_f$<br>ksi (GPa) | Ultimate Tensile Strength per Unit Width <sup>2</sup> $f_{tu} \cdot t_f$<br>kips/in (kN/mm) | Tensile Elastic Modulus per Unit Width <sup>2</sup> $E_f \cdot t_f$<br>kips/in (kN/mm) | Ultimate Strain at Rupture $\epsilon_{tu}^*$<br>in/in (mm/mm) | Compressive Strength <sup>3</sup><br>ksi (MPa) |
|----------------------------|--|---|---|--|---|--|
| Design Values <sup>4</sup> | 535 (3,689)  | 36,000 (250)  | 7.2 (1.25)  | 485 (85)   | 0.017   | 99 (683)                                       |

<sup>1</sup>ASTM D3039 <sup>2</sup>Based on Ultimate Tensile Strength divided by nominal fabric thickness <sup>3</sup>ASTM D695

<sup>4</sup>Design values are statistically based as recommended by American Concrete Institute, ACI 440.2R

**Packaging.** 12-inch (300 mm) or 24-inch (600 mm) widths standard. Up to 50-inch (1.3 m) widths are available. Standard packaging includes cardboard core, plastic wrapped, bagged, sealed & boxed. Labeled on inside core, outside of roll, and box.

## HOW TO USE

**Preparation.** Protect the work area from standing water and inclement weather. Surfaces may be damp. Surfaces must be clean and sound. Spalling or other damaged concrete must be removed to solid material. Laitance must be removed. Grinding, chipping, scarifying, shot blasting, sand blasting, or water jet are all acceptable methods. For concrete and masonry applications, patch all uneven surfaces with Fortec #4550 LPL or #1276 Hi-Modulus Fiber Matrix epoxy resins. Broadcast silica sand on patches to avoid amine blush. Use oil-free compressed air to remove any dust debris immediately prior to application of epoxy resins. Keep Fortec Carbon Tow Sheets from contamination. Store in a clean and dry area away from direct sunlight. Keep in original packaging until installation and protect from physical damage. Remove dust, dirt, and any other foreign materials. Remove water, grease, wax, oil or any other liquids with an appropriate solvent.

**Cutting.** Fortec Tow Sheets may be cut to a desired length with sharp scissors or a sharp utility knife. Dull tools tend to fray the ends of the Tow Sheet textile and should be avoided.

**Epoxy Resin.** Fortec #4550 LPL or #1276 Hi-Modulus Fiber Matrix epoxy resins are recommended for all applications.

**Applications.** Horizontal and vertical applications may use either the dry or wet lay-up techniques. The wet lay-up technique using an automated impregnator will provide best results for overhead applications. An automated impregnator will typically provide more uniform application of resin using less resin, and improved results with fewer voids and less waste.

**Dry Lay-Up Application.** Apply resin to the substrate at a uniform rate of approximately 45 ft<sup>2</sup>/gal (approx. 35 mils). Coverage yield will vary with substrate roughness. Using gloved hands and a plastic laminating roller, press Fortec Tow Sheet textiles into the resin pressing out any wrinkles and air voids. Allow the resin to squeeze through the textile to assure a proper bond. For a single Tow Sheet layer, apply an epoxy resin top coat at a rate of approximately 160 ft<sup>2</sup>/gal (10 mils) while the base resin is still within its working limit (depending on temperature) and smooth for a finished appearance. If more than one layer of Tow Sheet textile is used, apply intermediate epoxy resin layers at a rate of approximately 100 ft<sup>2</sup>/gal (15 mils). A good measure for dry lay-up applications will use approximately twice the weight of resin to textile. After cure, perform sounding to locate any voids. Inject epoxy resin as needed to fill all voids.

**Wet Lay-Up Application.** Prior to applying the wetted Tow Sheet fabric, apply Fortec #4550 LPL or #1276 Hi-Modulus Fiber Matrix epoxy resin using a rate of approximately 160 ft<sup>2</sup>/gal (10 mils) to a prepared substrate to seal the surface and to provide a tacky surface to apply the Tow Sheet textile. Resin will tack at 30 minutes at 70°F. Saturate and infuse the Tow Sheet textile with Fortec #4550 LPL or #1276 Hi-Modulus Fiber Matrix epoxy resin. For uniform application, the resin infusing process should be completed using an automated impregnator. Apply the saturated Tow Sheet textile to the sealed substrate and press out any wrinkles and air voids with a plastic laminating roller. Apply additional saturated Tow Sheet textile while the previous layer is still within its resin working limit if multiple layers are desired. Finally, apply a top coat of epoxy resin at a rate of approximately 160 ft<sup>2</sup>/gal (10 mils) and smooth for a finished appearance. After cure, perform sounding to locate any voids. Inject epoxy resin as needed to fill all voids.

**Qualifications.** Each structural and life safety application requires the design and certification of a licensed, professional engineer.

**Cautions.** An externally applied CFRP system is a vapor barrier. Consult with a licensed, professional engineer to evaluate results of encapsulating porous substrates. Installation should be performed only by a Fortec trained and approved installer. Caution must be used when handling carbon Tow Sheet textiles. Gloves should be worn to protect against carbon dust skin irritation and exposed fiber ends. Use of an appropriate, properly fitted NIOSH approved respirator is recommended. As with any cutting and adhesive operation, proper eye protection should be used. Always follow OSHA and site safety requirements.

**Keep Out Of Reach of Children - Keep Container Tightly Closed – Not For Internal Consumption – For Industrial Use Only**

The information contained herein is included for illustrative purposes only and is, to the best of our knowledge, accurate and reliable. Fortec cannot however under any circumstances make any guarantee of results or assume any obligation or liability in connection with the use of this information. As Fortec has no control over the use to which others may put its product, the products are to be tested to determine if suitable for a specific application and to verify if our information is valid for a particular application. Responsibility remains with the specifier, contractor, installer, user, and owner for the design, application and proper installation of each product. Fortec reserves the right to change the properties of its products without notice. **Prior to each use of any Fortec product, the user must always read, understand, and follow the warnings and instructions on the product's most current Technical Product Data Sheet, product label and Material Safety Data Sheet available at [www.FortecStabilization.com](http://www.FortecStabilization.com).**

**LIMITED WARRANTY, DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY:** Fortec Stabilization Systems. ("Seller") warrants its products to be free of defects in material and workmanship for a period of ONE (1) YEAR from the date of purchase. Under this Warranty and limitation of liability, Fortec will provide, at no charge, product and containers to replace any product. Fortec's obligation hereunder, is limited solely to such replacement and is subject to receipt by Fortec of a written notice of any alleged defects, promptly after discovery thereof, within the warranty period. Absence of such notice in writing during the warranty period constitutes a waiver of all claims with respect to such product. This Warranty excludes discoloration or change in visual appearance of the product due to the accumulation of or streaking of dirt or other airborne materials deposited on the surface from the atmosphere. Fortec does not warrant the color-fastness of any product unless specifically stated otherwise. Before application, the Buyer shall determine the suitability of the product for the intended use and Buyer assumes all risks and liabilities whatsoever in connection therewith. THIS WARRANTY IS MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IT IS UNDERSTOOD AND AGREED THAT BUYER'S SOLE REMEDY, AND THEREFORE SELLER'S LIABILITY, WHETHER IN CONTRACT, TORT, WARRANTY, IN NEGLIGENCE, OR OTHERWISE, SHALL BE LIMITED TO THE RETURN OF THE PURCHASE PRICE PAID BY PURCHASER OR REPLACEMENT OF ANY DEFECTIVE GOODS SOLD BY SELLER AND UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES. THE PRICE STATED FOR THE GOODS IS A CONSIDERATION IN LIMITING SELLER'S LIABILITY. The terms of this paragraph may not be orally modified. THERE ARE NO WARRANTIES, WHICH EXTEND BEYOND THE FACE HEREOF.