

# Tyfo<sup>®</sup> BC Composite using Tyfo<sup>®</sup> S Epoxy

## DESCRIPTION

The Tyfo<sup>®</sup> BC Composite is an ICC ER-2103 listed material comprised of Tyfo<sup>®</sup> S Epoxy and Tyfo<sup>®</sup> BC reinforcing fabric. Tyfo<sup>®</sup> BC is a custom, bi-directional fabric used in the Tyfo<sup>®</sup> Fibrwrap<sup>®</sup> System. The primary fibers are continuous E-glass orientated in the ±45° directions. The Tyfo<sup>®</sup> S Epoxy is a two-component epoxy matrix material.

## USE

Tyfo<sup>®</sup> BC Fabric is combined with Tyfo<sup>®</sup> S epoxy to provide connections and add strength and ductility to bridges, buildings, and other structures.

## ADVANTAGES

- ICC-ES ESR-2103 listed product
- Good high & low temperature properties
- Long working time
- High elongation
- Ambient cure
- 100% solvent-free
- Rolls can be cut to desired widths prior to shipping

## COVERAGE

Approximately 1,250 sq. ft. surface area with 7 to 8 units of Tyfo<sup>®</sup> S Epoxy and 1 roll of Tyfo<sup>®</sup> BC Fabric when used with the Tyfo<sup>®</sup> Saturator.

## PACKAGING

Order Tyfo<sup>®</sup> S Epoxy in 55-gallon (208L) drums or pre-measured units in 5-gallon (19L) containers. Order Tyfo<sup>®</sup> BC Fabric in 50" x 300 lineal foot (1.3m x 91.4m) rolls. Typically ships in 12" x 13" x 54" (305mm x 330mm x 1372mm) boxes.

## EPOXY MIX RATIO

100.0 component A to 42.0 component B by volume. ( 100 component A to 34.5 component B by weight.)

## SHELF LIFE

Epoxy - two years in original, unopened and properly stored containers.  
Fabric - ten years in proper storage conditions.

## STORAGE CONDITIONS

Store epoxy at 40° to 90° F (4° to 32° C). Avoid freezing. Store rolls flat, not on ends, at temperatures below 100° F (38° C). Avoid moisture and water contamination.

## CERTIFICATE OF COMPLIANCE

- Will be supplied upon request, complete with state and federal packaging laws with copy of labels used.
- Material safety data sheets will be supplied upon request.
- Possesses 0% V.O.C. level.

5/15 Tyfo<sup>®</sup> BC

## TYPICAL DRY FIBER PROPERTIES

|                     |   |
|---------------------|---|
| Tensile Strength    | 470,000 psi (3.24 GPa)                                |
| Tensile Modulus     | 10.5 x 10 <sup>6</sup> psi (72.4 GPa)                 |
| Ultimate Elongation | 4.5%  |
| Density             | 0.092 lbs./in. <sup>3</sup> (2.55 g/cm <sup>3</sup> ) |
| Weight per sq. yd.  | 24 oz. (813 g/m <sup>2</sup> )                        |

## COMPOSITE GROSS LAMINATE PROPERTIES

| PROPERTY   | ASTM METHOD | TYPICAL TEST VALUE                           | DESIGN VALUE*                               |
|--|-------------|--|---|
| Ultimate tensile strength in primary fiber direction, psi  | D-3039      | 40,500 psi (279 MPa)<br>(1.37 kip/in. width) | 32,400 psi (223 MPa)<br>(1.1 kip/in. width) |
| Elongation at break  | D-3039      | 1.5%   | 1.2%  |
| Tensile Modulus, psi                                       | D-3039      | 2.7 x 10 <sup>6</sup> psi<br>(18.6 GPa)      | 2.16 x 10 <sup>6</sup> psi<br>(14.9 GPa)    |
| Ultimate tensile strength 90 degrees to primary fiber, psi | D-3039      | 40,500 psi (279 MPa)<br>(1.37 kip/in. width) | 32,400 psi (223 MPa)<br>(1.1 kip/in. width) |
| Laminate Thickness   |             | 0.034 in. (0.864 mm)                         | 0.034 in. (0.864 mm)                        |

\* Gross laminate design properties based on ACI 440 suggested guidelines will vary slightly. Contact Fyfe Co. LLC engineers to confirm project specification values and design methodology.

## EPOXY MATERIAL PROPERTIES

| Curing Schedule 72 hours post cure at 140° F (60° C). |                 |                           |
|---|-----------------|---------------------------|
| PROPERTY  | ASTM METHOD     | TYPICAL TEST VALUE*       |
| T <sub>g</sub>  | D-4065          | 180° F (82° C)            |
| Tensile Strength <sup>1</sup> , psi                   | D-638<br>Type 1 | 10,500 psi<br>(72.4 MPa)  |
| Tensile Modulus, psi                                  | D-638<br>Type 1 | 461,000 psi<br>(3.18 GPa) |
| Elongation Percent                                    | D-638<br>Type 1 | 5.0%                      |
| Flexural Strength, psi                                | D-790           | 17,900 psi<br>(123.4 MPa) |
| Flexural Modulus, psi                                 | D-790           | 452,000 psi<br>(3.12 GPa) |

<sup>1</sup> Testing temperature: 70° F (21° C) Crosshead speed: 0.5 in. (13mm)/min. Grips Instron 2716-0055 - 30 kips

\* Specification values can be provided upon request.

## HOW TO USE THE TYFO<sup>®</sup> S COMPOSITE SYSTEM

### DESIGN

The Tyfo<sup>®</sup> Fibrwrap<sup>®</sup> System shall be designed to meet specific design criteria. The criteria

for each project is dictated by the engineer of record and any relevant building codes and/or guidelines. The design should be based on the allowable strain for each type of application and the design modulus of the material. The Fyfe Co. LLC engineering staff will provide preliminary design at no obligation.

## INSTALLATION

Tyfo® System to be installed by Fyfe Co. LLC trained and certified applicators. Installation shall be in strict compliance with the Fyfe Co. LLC Quality Control Manual.

## SURFACE PREPARATION

The required surface preparation is largely dependent on the type of element being strengthened. In general, the surface must be clean, dry and free of protrusions or cavities, which may cause voids behind the Tyfo® composite. Column surfaces that will receive continuous wraps typically require only a broom cleaning. Discontinuous wrapping surfaces (walls, beams, slabs, etc.) typically require a light sandblast, grinding or other approved methods to prepare for bonding. Sharp and chamfered corners will be rounded off by grinding or using thickened Tyfo® S epoxy (Tyfo® WS epoxy or approved repair mortar). At the time of application, the substrate shall not have any free moisture on it. If moisture cannot be avoided, the use of Tyfo® WP (Wet-Prime epoxy) is recommended. Tyfo® Fibr™ Anchors are incorporated in some designs. The Fyfe Co. LLC engineering staff will provide the proper specifications and details based on the project requirements.

## MIXING

For pre-measured units in 5-gallon (19L) containers, pour the contents of component B into the pail of component A. For drums, premix each component: 100.0 parts of component A to 42.0 parts of component B by volume (100 parts of component A to 34.5 parts of component B by weight). Mix thoroughly for five minutes with a Tyfo® low speed mixer at 400-600 RPM until uniformly blended.

## APPLICATION

Apply one prime coat of Tyfo® S Epoxy on the substrate by using a roller. Saturate the fabric by feeding it through the Tyfo® Saturator. Tyfo® BC may be saturated manually by applying the dry fabric directly to the wet-primed surface and saturating in-place using a roller or trowel. Apply using the Tyfo® wrapping equipment or approved hand methods (See the Tyfo® Saturator Manual). Prior to the application of the saturated fabric, fill any uneven surface with thickened Tyfo® S epoxy. Saturate and apply subsequent layers of the fabric according to the Specifications and the Design Requirements. The use of a roller or hand pressure, ensure proper orientation of fibers, release or roll out entrapped air and ensure that each individual layer is firmly bedded and adhered to the preceding layer or substrate. Apply a final coat of thickened Tyfo® S Epoxy and detail all fabric edges, including butt splice, termination points and jacket edges.

## PROTECTIVE COATINGS

In case of plaster final coating, apply sand by hand for better bonding surface while the final coat of epoxy is still tacky. In case of paint final coating, paint between 24 and 72 hours after final application of epoxy. If more than 72 hours after application, prepare the surface of the final coat of epoxy by light sandblast or hand sanding to slightly etch the surface.

## LIMITATIONS

Application temperature of the epoxy is a minimum 40° F (4° C) and maximum of 100° F (38° C). DO NOT THIN, solvents will prevent proper cure.

## FIELD QUALITY CONTROL

Record batch numbers for fabric and epoxy used each day and note locations of installations. Measure square feet of fabric and volume of epoxy used each day.

## CAUTION!

### COMPONENT A - Irritant:

Prolonged contact to the skin may cause irritation. Avoid eye contact.

### COMPONENT B - Irritant:

Corrosive. Contact with skin may cause severe burns. Avoid eye contact. Product is a strong sensitizer. Use of safety goggles and chemical resistant gloves recommended. Remove contaminated clothing. Avoid breathing vapors. Use adequate ventilation. Use of an organic vapor respirator recommended.

## SAFETY PRECAUTIONS

Avoid breathing vapors. Avoid contact with eyes and skin. Use of an approved respirator with an organic absorption cartridge is recommended for possible vapors. Rubber gloves, rubber boots, and protective suits are recommended for handling and application of this material. Safety glasses or a face shield are recommended to prevent eye contact.

## FIRST AID

In case of skin contact, wash thoroughly with soap and water. For eye contact, flush immediately. For respiratory problems, remove to fresh air. Wash clothing before reuse.

## CLEANUP

Collect with absorbent material, flush with water. Dispose of in accordance with local disposal regulations. Uncured material can be removed with approved solvent. Cured materials can only be removed mechanically.

## SHIPPING LABELS CONTAIN

- State specification number with modifications, if applicable
- Component designation
- Type, if applicable
- Manufacturer's name
- Date of manufacture
- Batch name
- State lot number, if applicable
- Directions for use
- Warnings or precautions by law

**KEEP CONTAINER TIGHTLY CLOSED.**

**NOT FOR INTERNAL CONSUMPTION.**

**CONSULT MATERIAL SAFETY DATA SHEET (MSDS) FOR MORE INFORMATION.**

**KEEP OUT OF REACH OF CHILDREN.**

**FOR INDUSTRIAL USE ONLY.**

# Fyfe Co. LLC

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