

# Tyfo® BC Composite using Tyfo® S Epoxy

## DESCRIPTION

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

## USE

Tyfo® BC Fabric is combined with Tyfo® 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 1,750 sq. ft. surface area with 8 to 9 units of Tyfo® S Epoxy and 1 roll of Tyfo® BC Fabric when used with the Tyfo® Saturator.

## PACKAGING

Order Tyfo® S Epoxy in 55-gallon (208L) drums or pre-measured units in 5-gallon (19L) containers. Order Tyfo® BC Fabric in 50" x 420 lineal foot (1.3m x 128m) rolls. Typically ships in 12" x 13" x 54" (305mm x 330mm x 1371.6mm) 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 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.

11/09 Tyfo® 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) (1.37 kip/in. width)	32,400 psi (223 MPa) (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 (18.6 GPa)	2.16 x 10 <sup>6</sup> psi (14.9 GPa)
Ultimate tensile strength 90 degrees to primary fiber, psi	D-3039	40,500 psi (279 MPa) (1.37 kip/in. width)	32,400 psi (223 MPa) (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 Type 1	10,500 psi (72.4 MPa)
Tensile Modulus, psi	D-638 Type 1	461,000 psi (3.18 GPa)
Elongation Percent	D-638 Type 1	5.0%
Flexural Strength, psi	D-790	17,900 psi (123.4 MPa)
Flexural Modulus, psi	D-790	452,000 psi (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® BC COMPOSITE SYSTEM

### DESIGN

The Tyfo® 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® BC System is 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. Discontinuous wrapping surfaces (walls, beams, slabs, etc.) typically require a light sandblast, grinding or other approved methods to prepare for bonding. Tyfo® Fibrwrap® 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 of Tyfo® S Epoxy in 5-gallon (19L) containers, pour the contents of component B into the pail of component A and mix thoroughly. 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

Feed fabric through the Tyfo® Saturator and apply using the Tyfo® wrapping equipment or approved hand methods. See data sheet on this equipment. Hand saturation is allowable, provided the epoxy is applied uniformly and meets the specifications.

### LIMITATIONS

Minimum application temperature of the epoxy is 40° F (4° C). DO NOT THIN, solvents will prevent proper cure.

## CAUTION!

### COMPONENT A - Irritant:

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

### COMPONENT B - Irritant:

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

Use of an approved particle mask is recommended for possible airborne particles. Gloves are recommended when handling fabrics to avoid skin irritation. Safety glasses are recommended to prevent eye irritation.

### 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.

### TYFO® BC COMPOSITE SAMPLES

Please note that field samples are to be cured for 48-hours at 140° F (60° C) before testing. Testing shall be in accordance with ASTM D-3039 and Fyfe Co. LLC sample preparation and testing procedures.

### 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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