



TYFO[®] SCH-41-2X Composite using Tyfo[®] S Epoxy

DESCRIPTION

The Tyfo[®] SCH-41-2X Composite is comprised of the Tyfo[®] S Epoxy and Tyfo[®] SCH-41-2X reinforcing fabric. Tyfo[®] SCH-41-2X is a custom, uni-directional carbon fabric orientated in the 0° direction. Tyfo[®] SCH-41-2X is twice the thickness of Tyfo[®] SCH-41. The Tyfo[®] S Epoxy is a two-component epoxy matrix.

USE

The Tyfo[®] SCH-41-2X fabric is combined with Tyfo[®] S Epoxy to provide an ambient-cure, wet-layup, composite system for strengthening bridges, buildings, pipelines and other structures.

ADVANTAGES

- ICC-ES ESR-2103 listed product
- IAPMO UES ER-595 listed product
- UL listed, fire-rated assembly component
- Tyfo[®] Systems are NSF/ANSI Standard 61-G certified
- Proven long-term performance and durability
- Excellent wet-out and handling properties
- 100% solids, solvent-free epoxy matrix
- Low viscosity, long working time
- Ambient cure application

PACKAGING

Tyfo[®] SCH-41-2X: 24" x 150 lineal ft. (300 sq. ft.)
Typically ships in 12" x 13" x 27" boxes.
Tyfo[®] S Epoxy: Pre-measured 5-gallon units with a combined material volume of 4 gallons or in 55-gallon drums.

COVERAGE

Approximately 3 to 4 units of Tyfo[®] S Epoxy per roll of the Tyfo[®] SCH-41-2X fabric.

CONSUMPTION RATE

Fabric-to-epoxy ratio by weight:
For Tyfo[®] SCH Fabrics: 1 : 1
For Tyfo[®] SEH Fabrics: 1 : 0.8

SHELF LIFE

Epoxy - two years in original, unopened and properly stored containers.
Fabric - 10 years in proper storage conditions.

STORAGE CONDITIONS

Store epoxy at 60°F to 100°F (15°C to 38°C). Resin is susceptible to crystallization at temperatures below 50°F. If crystallized, epoxy must be reheated until clear. Store fabric rolls flat, not on ends, and at temperatures below 100°F (38°C). Avoid moisture and water contamination.

Typical Dry Fiber Properties

Material properties are based on standard laboratory conditions (23°C, 50 percent relative humidity.)

Property	Typical Test Value
Tensile Strength	620,000 psi (4.3 GPa)
Tensile Modulus	36.0 x 10 ⁶ psi (250 GPa)
Ultimate Elongation	1.7%
Density	0.064 lbs./in. ³ (1.77g/cm ³)
Minimum weight per sq. yd.	40 oz (1,424 g/m ²)
Fabric roll weight	85 lbs.

Composite Gross Laminate Properties

Property ³	ASTM Method	ACI 440.2R Properties ¹	Design Properties ²
Ultimate Tensile Strength in Primary Fiber Direction	D3039	131,000 psi (903 MPa)	131,000 psi (903 MPa)
Elongation at Break		0.90%	0.90%
Tensile Modulus	D7565	14.6 x 10 ⁶ psi (100 GPa)	12.6 x 10 ⁶ psi (87 GPa)
Tensile Strength per inch width		10,480 lbf/in (1835 N/mm)	10,480 lbf/in (1835 N/mm)
Tensile Stiffness per inch width	D1777	1.17 x 10 ⁶ lbf/in (204 kN/mm)	1.01 x 10 ⁶ lbf/in (176 kN/mm)
Nominal Laminate Thickness		0.08 in. (2.0 mm)	0.08 in. (2.0 mm)

¹ Strength is defined as the mean strength (171 ksi) minus 3 standard deviations. Modulus is defined as the reported mean modulus, and elongation is defined as the calculated strain from the design strength and modulus.

² Tensile modulus is defined as the 5th percentile value representing the 80% lower confidence bound of a 2 parameter Weibull distribution (ASTM D7290).

³ Design values may require additional reduction factors based on expected exposure conditions, type of application, and design life assumptions.

Additional Composite Properties

Property ⁴	ASTM Method	Typical Test Values	Design Values
Flexural Strength	D790	110,000 psi (758.4 MPa)	82,500 psi (568.8 MPa)
Flexural Modulus		8.5 x 10 ⁶ psi (58.6 GPa)	7.0 x 10 ⁶ psi (48.3 GPa)
Longitudinal Compressive Strength	D3410	50,000 psi (344.8 MPa)	42,500 psi (293 MPa)
Longitudinal Compressive Modulus		11.2 x 10 ⁶ psi (77.2 GPa)	9.5 x 10 ⁶ psi (65.5 GPa)
Longitudinal Coefficient of Thermal Expansion	D696	3.6 ppm/°F	
Transverse Coefficient of Thermal Expansion		20.3 ppm/°F	

⁴ Contact FyfeFRP LLC engineers to confirm project specification values and design methodology.

INSTALLATION OF THE TYFO® SCH-41-2X SYSTEM

DESIGN

The Tyfo® SCH-41-2X system is designed to meet specific project criteria dictated by the engineer of record and any relevant building codes and/or guidelines. The design shall be based on the allowable strain for each type of application and the design modulus of the material. FyfeFRP LLC engineering staff may provide preliminary design, specification wording and application details based on the project requirements.

INSTALLATION

The Tyfo® system is to be installed by FyfeFRP LLC trained and certified applicators in accordance with the FyfeFRP LLC quality control manual, project specifications, and design requirements.

SURFACE PREPARATION

The required surface preparation is dependent on the type of element being strengthened. In general, the surface must be clean, dry and free of protrusions or cavities to prevent voids behind the Tyfo® system. Column surfaces that will receive continuous wraps typically only require a clean, sound substrate. Discontinuous wrapping surfaces (walls, beams, slabs, etc.) require a minimum CSP-2 profile to prepare for bonding, achieved by light sandblast, grinding or other approved methods per ICRI 310.2R. Tyfo® Composite Anchors may be incorporated in the designs. FyfeFRP LLC engineering staff will provide the proper specifications and details based on project requirements.

MIXING TYFO® S EPOXY

For pre-measured units in 5-gallon containers, pour the contents of component B into the component A container. Mix thoroughly with a low speed mixer at 400 to 600 RPM until uniformly blended. Ensure epoxy is transferred between the A and B buckets. For 55-gallon drums, mix component A and component B per the appropriate weight or volumetric mix ratio. Resin may be heated to achieve desired viscosity (i.e. radiant heating, drum heaters, water bath). Mixed Tyfo® S Epoxy may be thickened by adding up to 7 percent by weight of fumed silica (such as Cab-o-sil TS-720) or approved filler such as HDPE fibers. DO NOT THIN. Solvents will prevent proper cure.

PROTECTIVE COATINGS

Apply a final coat of thickened Tyfo® S Epoxy to all fabric edges, including butt splice, termination points and jacket edges. Paint between 24 and 72 hours after final application of epoxy. If more than 72 hours after application, prepare the surface by light sandblast or hand sanding to lightly etch the surface. Please refer to FyfeFRP LLC's NSF Listing for the NSF-61G listed application method (www.NSF.org).

LIMITATIONS

Recommended substrate temperature range is 50°F to 100°F (10°C to 38°C). All coating applications to be performed at a minimum of 5.4°F above the dew point. Maintain conditions for the first 48 hours of cure. Temperatures below 50°F will significantly increase the viscosity of the mixed product. Higher viscosity will reduce fabric penetration, introduce additional air into the system, and extend the cure times beyond 48 hours. DO NOT THIN. Solvents will prevent proper cure.

Epoxy Material Properties

Cure schedule: 72 hour post-cure at 140°F (60°C) ¹		
Property	ASTM Method	Typical Test Value
Glass Transition Temperature, T _g	D4065/E1356	180°F (82°C)
Tensile Strength	D638 Type 1	10,500 psi (72.4 MPa)
Tensile Modulus		461,000 psi (3.18 GPa)
Elongation		5.0%
Compressive Strength	D695	12,500 psi (86.2 MPa)
Compressive Modulus		465,000 psi (3.2 GPa)
Flexural Strength	D790	17,900 psi (123.4 MPa)
Flexural Modulus		452,000 psi (3.12 GPa)
Shore D Hardness	D2240	87±3
Water Absorption (24 hours) Water Absorption (13 weeks)	D570	0.33% 1.98%
Adhesion Strength ² Concrete (ASTM D7522) Steel Epoxy	D4541	>400 psi (concrete failure typ.) >1200 psi >1200 psi

¹ Testing temperature: 73°F (23°C).

² Adhesion strength dependent on surface preparation and substrate thickness. Concrete adhesion strength is dependent on the concrete strength and is based on a minimum CSP-2 profile. Steel adhesion strength is based on SSPC-SP10 and SSPC-SP11 surface preparation methods. Cure schedule: 7 days at 73°F (23°C).

CAUTION!

CLEANUP

Collect with absorbent material. Dispose in accordance with local disposal regulations. Uncured material can be removed with approved solvent. Cured materials must be mechanically removed.

HAZARDS

Consult the Safety Data Sheets (SDS) for associated hazards. SDS will be supplied upon request.

Consult safety data sheet
(SDS) for more information.
For industrial use only.

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