TYFO® SEH COMPOSITE ANCHORS

Tyfo Fiber Anchor Systems

DESCRIPTION

The Tyfo SEH Composite Anchors are custom, uni-directional, reinforcing glass fiber bundles that are combined with the Tyfo S Epoxy in anchoring applications.

USE

Tyfo SEH Composite Anchors are manually saturated with Tyfo S Epoxy and installed to improve end details, anchoring and development of tension forces in various Tyfo designs.

ADVANTAGES

- System-compatible anchoring designs
- Excellent wet-out and handling properties
- 100% solids, solvent-free epoxy matrix
- Low viscosity, long working time
- Ambient cure application

PACKAGING

Packaging and weight will vary based on anchor design requirements.

CONSUMPTION RATE

Fabric-to-epoxy ratio by weight:

For Tyfo SEH Anchors: 1 : 0.8

SHELF LIFE

Epoxy – two years in original, unopened and properly stored containers.

Anchors – ten 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

Property	Typical Test Value
Tensile Strength	470,000 psi (3.24 GPa)
Tensile Modulus	10.5 x 10^6 psi (72.4 GPa)
Ultimate Elongation	4.5%
Density	0.092 lbs./in.^{3} (2.55 g/cm^3)

Composite Gross Laminate Properties

Property[3]	ASTM Method	ACI 440.2 Properties[1]	Design Value[2]
Ultimate Tensile Strength in Primary Fiber Direction, 0°	D3039	66,000 psi (455 MPa)	66,000 psi (455 MPa)
Elongation at Break		1.8%	1.8%
Tensile Modulus, psi		3.73 x 10^6 psi (25.7 GPa)	3.40 x 10^6 psi (23.4 GPa)

[1] Strength is defined as the mean strength (83 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.

Epoxy Material Properties

Cure schedule: 72 hour post-cure at 140°F (60°C)[4]

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[5] > Concrete (ASTM D7522) > Steel > Epoxy	D4541	 > 400 psi (concrete failure typ.) > 1200 psi > 1200 psi

[4] Testing temperature: 73°F (23°C).

[5] Adhesion strength dependent on surface preparation and substrate thickness. Cure schedule: 7 days at 73°F (23°C).

INSTALLATION OF THE TYFO SEH ANCHORS

DESIGN

The Tyfo SEH Anchors are designed to meet specific project criteria dictated by the engineer of record and any relevant building codes and/ or guidelines. Tyfo SEH Anchors are incorporated for additional development, anchorage, or end detailing of strengthening system. 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-2013. The SEH Anchors require anchor holes drilled 1/8" to 1/4" larger than the anchor diameter. Round corners to allow for a smooth transition of the anchor fiber. Clean anchor hole with approved cleaning method (vacuum, pipe brush, compressed air, etc.). 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). DO NOT THIN. Solvents will prevent proper cure.

APPLICATION

Manually saturate the Tyfo SEH Composite Anchors with Tyfo S Epoxy. The fully saturated anchor is then applied as detailed on the project drawings.

For anchor embedment, prime the anchor hole with an approved epoxy (such as Thickened Tyfo S or Tyfo TC). Maintain an appropriate slope when transitioning fibers over uneven surfaces. If anchor penetrations are elevated from the bonding surface, use an appropriate transition to slope the anchors from the anchor penetrations onto the bonding surface. A typical slope requirement is a 4:1 transition. Refer to project drawings for the slope detail or contact FyfeFRP LLC. Slope to be filled with a thickened epoxy or epoxy mortar. For slopes greater than 1" height, use an approved epoxy mortar.

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.

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.

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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