



# Tyfo® Fibrwrap® Systems

## for the Strengthening & Protection of Waterfront Structures

- Fibrwrap® Strengthening of Wharf, Pier and Waterfront Structures
- Pre-fabricated Fibrwrap® Systems
- Fibrwrap® Strengthening Underwater
- Special System for Passive Corrosion Control and Strengthening



# FYFE COMPANY PROFILE

The Fyfe Group is comprised of engineers, designers, material specialists, material manufacturers and project support personnel. Working together, this team provides innovative construction products and technical support to meet the needs of engineers, contractors and owners.

Fyfe Co LLC specializes in the Tyfo® Fibrwrap® Advanced Composite Systems for the strengthening, protection and repair of structures. These systems are comprised of carbon, glass and aramid fiber reinforced polymer (FRP) materials.

Fyfe Company also offers other innovative construction products and structural systems. Among these are disc bearings, expansion joints, concrete repair products, blast mitigation and ballistic products.

## TYFO® FIBRWRAP® SYSTEMS

The Tyfo® Fibrwrap® Systems are comprised of specialized fabrics and resins, which in unique combination, create tested and proven composites. Carbon, glass or aramid reinforcing fibers are combined with high quality resins to produce a multitude of high performance FRP strengthening systems, which gives design engineers a wide range of options to meet the individual needs of a project.

Our Tyfo® FRP Systems have a successful performance record with nearly two decades of use. This includes extensive testing as well as performing as designed during seismic events on three continents.



Friendship Trail Bridge, Florida - corrosion mitigation



Haw River Bridge - North Carolina



Lehigh Heidelberg Cement - beam repair

Data sheets available upon request or at our website

[www.fyfeco.com](http://www.fyfeco.com)



# WATERFRONT STRUCTURE STRENGTHENING



NASSCO Pier, California



NASSCO Pier, California - corroded piles repaired



Redondo Beach Restaurant, California



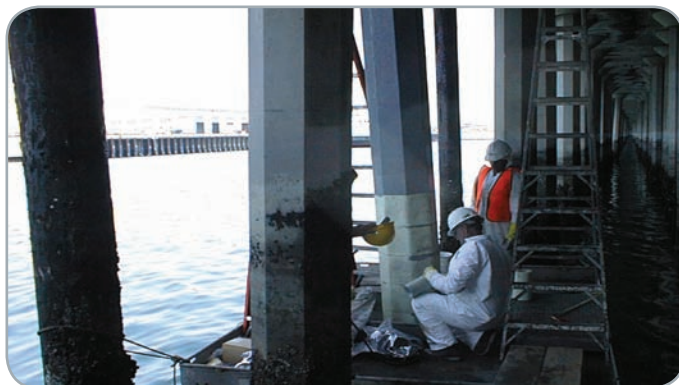
Redondo Beach Restaurant - beam, pile & slab repairs



Residence, Malibu, California - pile repair



Darnley Bridge, Canada - wood pile retrofit



Port of Long Beach, California - pier repair

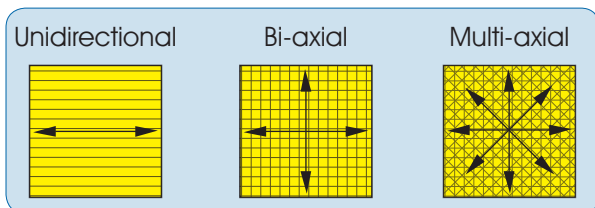


Port of Long Beach, California - pier repair



## The Problem

The corrosive nature of marine environments can destroy the aesthetics of a structure, hinder its serviceability, or render it useless. The amount of structural distress varies with each project. Fyfe Co. LLC is the leader in retrofitting reinforced concrete and wood structures with Tyfo® advanced composites, rehabilitating and preserving existing structural elements.



Multi-axial fabric architecture can be built into the pre-fabricated shell

## How it Works

- Step 1 Identify existing conditions and quantify the level of performance desired. Fyfe Co. LLC engineers provide technical assistance at no obligation.
- Step 2 Choose the appropriate Tyfo® PR System design to achieve to project requirements.
- Step 3 Fyfe Co. LLC technicians pre-fabricate the Tyfo® PR Jackets using the appropriate Tyfo® advanced composite systems.
- Step 4 Fyfe Co. LLC trained and certified applicators install and grout the jackets as specified.



Fort Mason, San Francisco, California



Fort Mason - pile strengthening



Fort Mason



Fort Mason



Fisherman's Wharf, San Francisco, California - wood pile retrofit



Malibu Residence - pile strengthening



Malibu Residence - pile strengthening



Malibu Residence - pile strengthening

## The Tyfo® Advantage

Tyfo® PR jackets are pre-fabricated using the Tyfo® Fibrwrap® Systems. The Tyfo® Fibrwrap® Systems are thoroughly tested, accepted and installed all over the world. They are comprised of carbon, glass, and aramid reinforcing fibers, combined with Tyfo® epoxies. The jackets can be constructed to conform to circular, rectangular, octagonal and H-pile sections, as required for each individual project.

Fyfe Co. LLC provides an excellent "no-obligation" technical support service, including engineers who can provide project feasibility, preliminary calculations, drawings, details, specifications and answers to technical questions. The difference with Fyfe Co. LLC Tyfo® PR System jackets lies in the superior materials, the excellent technical support service, and the trained technicians and certified applicators to get the job done right.

## The System Composition

### Tyfo® SW Epoxy

Is a specially formulated NSF (ANSI) listed, two-component epoxy designed for partial or complete underwater cure.

### Tyfo® PR Jackets

Are pre-fabricated Tyfo® Fibrwrap® System jackets that bond back onto themselves using Tyfo® SW epoxy. Some applications can incorporate additional Tyfo® Fibrwrap® System "wet-lay-up" layers to optimize jacket performance. Stainless steel screws are used to help develop the bond strength for overlap.

### Tyfo® Underwater Grout

Is specially designed cementitious grout that can expand over time. This expansion stresses the system and strengthens it. Epoxy grout can also be used.

## Design Features of the Tyfo® PR System

- Pre-fabricated and shipped to job site or pre-fabricated on-site (if field conditions permit)
- Prevents intrusion of corrosive agents, oxygen and marine organisms
- Low profile
- Custom designed by in-house engineers to provide specified strengthening where required
- Specialty designs for bent caps, bulkheads, walls, beams and wood available
- The single seam design allows for faster installations
- Protective, pigmented epoxy coating provides improved aesthetics and long-term durability
- Proven long-term durability
- Lightweight



# TYFO® FIBRWRAP® FOR UNDERWATER APPLICATIONS

The Tyfo® SW Fibrwrap® System is designed to add strength and protection to existing in-water structures. This system is comprised of high strength fibers and a specially designed epoxy. It is designed to be installed at or below the water line in both fresh and salt water at temperatures as cold as 44°F (6.7°C).

## Product Features

- Thoroughly tested at independent laboratories
- Can prevent the onset of corrosion when applied to new structural elements
- Can be installed below the water line
- Excellent long-term material properties in water
- Can be used on circular, square, rectangular, hexagonal, flared and other shaped piles
- Cost-effective



SK Port, Korea



SK Port - beam, pile repairs



Canada East - wood pile repairs



Port of Long Beach, California - pier pile repairs

# TYFO® SYSTEMS FOR CATHODIC PROTECTION

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Friendship Trail Bridge, Florida - corrosion mitigation

For additional information, design assistance or questions about a potential project, please contact us ...

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