

**SIMPSON**

**Strong-Tie**

®

In the Specs – On the Job – At Your Service™

# FX-70<sup>®</sup>

**Inert Corrosion-Free  
Structural Repair and  
Protection System**

(800) 999-5099  
[www.strongtie.com](http://www.strongtie.com)

## Innovative, Versatile Solutions with FX-70

Severe structural damage of concrete, steel and wood piles is a global phenomenon. In 1970, Fox Industries, Inc. (now a part of Simpson Strong-Tie) began development and testing of a repair system to offer the construction industry an alternative to costly full-scale replacement. The FX-70® Inert Corrosion-Free Structural Repair and Protection System made in-place repair of damaged piles possible and practical, an industry first. By eliminating the need to dewater the repair site or take the structure out of service, FX-70 dramatically reduces the overall cost of restoring the damaged structure. As the entire system is corrosion-resistant, aging and new structures can both realize extended service life as a benefit of the FX-70 system. Many of the first repairs using the FX-70 system in 1971 are still in service today. The FX-70 Inert Corrosion-Free Structural Repair and Protection System is customized to the exact specifications of each job, manufactured in the U.S.A., and shipped directly to your jobsite.

### Concrete Piles



### Steel Piles







**Wood Piles**



**New Structures**





System Overview

Attack of structures at the waterline is commonplace in marine environments. Tidal action, river current, salt water exposure, chemical intrusion, floating debris, marine borers, electrolysis and general weathering are all examples of factors affecting the lifecycle of structures in marine environments addressed by the FX-70® Inert Corrosion-Free Structural Repair and Protection System.

**FX-70® Jacket**

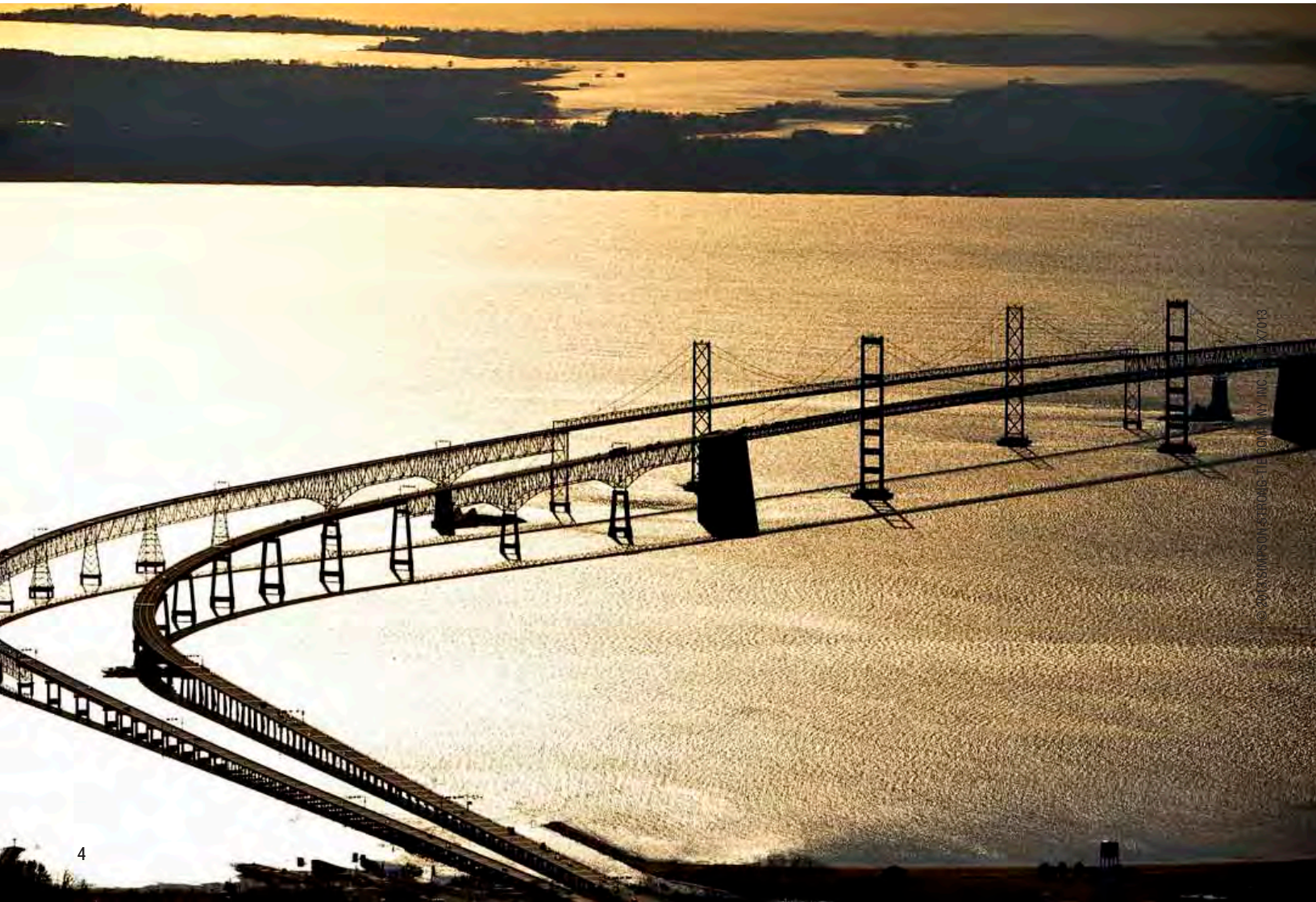
To protect the structure from external attack, the FX-70 Inert Corrosion-Free Structural Repair and Protection System starts with a high-strength fiberglass interlocking jacket. The tongue-and-groove seamed jacket provides a corrosion resistant shell to the repair site, ranges from 1/8" to 1/2" thickness, and is UV resistant.

**High-Strength Grouting Materials**

FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout and FX-225 Non-Shrink Non-Metallic Underwater Grout are both high-strength, water-insensitive repair compounds. FX-70-6 MP provides excellent bond to concrete, steel, wood and other common building materials. These products displace existing water and can easily be poured into the FX-70 jacket without the costly building of cofferdams or dewatering of the repair site. FX-70-6 MP is ideal for repairs to structures with less than 25% section loss, and is commonly combined with FX-225 to reduce material cost on large jobs or to repair structures with greater than 25% section loss.

**Advantages**

- Repair damage in-place, no need to dewater or take structure out of service
- High-strength materials bond well to various substrate materials
- Corrosion-free system prevents deterioration, weathering and erosion
- Accommodates piles of various shape and size
- System is low-maintenance following repair
- Safe for use in marine-life habitats
- UV-resistant





FX-70® Fiberglass Jacket



ROUND



SQUARE



H-SHAPED



OCTAGON

Each FX-70 jacket is custom-made to the precise specifications of each repair project. As the pioneer in jacket repair, Fox Industries, Inc. (now a part of Simpson Strong-Tie) has refined production and quality control standards over the past 40 years to ensure only the highest-quality products are shipped to the jobsite. Hand-made and assembled in the U.S.A., the FX-70 jacket has over 40 years of in-service performance.

FX-70 Jackets are available in the following shapes:

- Round
- Square
- H-Pile
- Octagonal

**Technical Specifications**

Property	Test Method	Result
Water Absorption	ASTM D 570	1% Max
Compressive Strength	—	18,000 psi min.
Ultimate Tensile Strength	ASTM D 638	15,000 psi min.
Flexural Strength	ASTM D 796	25,000 psi min.
Flexural Modulus of Elasticity	ASTM D 790	700,000 psi min.
Barcol Hardness	ASTM D 2583	45 +/- 5



CUSTOM SIZES





**FX-70-6 MP Hydro-Ester® Multi-Purpose Marine Epoxy Grout**

FX-70-6 MP is a 100% solids, three-component, moisture-insensitive epoxy grout. FX-70-6 MP is specifically designed for underwater use with the FX-70® Structural Repair and Protection System.

**Performance Features:**

- Special blend of “C” component promotes workability; easily pumped or poured
- High-strength, low absorption, impact-resistant grout with extended pot life
- Dewatering not required; can be placed underwater
- Resistant to chemical and aggressive water environments

**Where to Use:**

- As an epoxy grout in the FX-70® system
- As a high-strength grout in dry or wet applications

**Limitations:**

- Do not use in ambient or water temperatures below 40°F.

**Package Size:**

- 15 gallon unit
- 3 gallon unit

**Shelf Life:**

2 years in original, unopened packaging.

**FX-225 Non-Shrink Non-Metallic Underwater Grout**

FX-225 is a cohesive, non-segregating, high-strength grout that has been designed for underwater concrete repair. FX-225 can be poured or pumped underwater and compensates for shrinkage to provide a durable repair with corrosion resistant properties.

**Performance Features:**

- FX-225 complies with Corps of Engineers CRD-C79, CRD-C 227, CRD-C 621, CRD-C 226 and ASTM C 1107, Grades A, B and C.
- Suitable for marine environments at 35°F and above
- Ready-to-use with the addition of water
- May be extended by up to 50% by weight with clean, coarse aggregate
- Can be poured or pumped through water
- Will not stain or rust
- No dewatering required

**Where to Use:**

- Marine structure restoration, where forming is required
- As a high-strength, non-shrink, non-metallic grout to encapsulate wood, concrete or steel

**Limitations:**

- Do not use at ambient or water temperatures below 35°F.
- Do not exceed 1.15 gallons of water per 55 lb. bag.
- Minimum thickness of 2"

**Package Size:**

- 55 lb. bag
- 1000 lb. bulk
- 2500 lb. bulk

**Shelf Life:**

1 year in unopened, original packaging



Epoxy and Repair Paste

**FX-763 Hydro-Ester® Low-Modulus Trowel-Grade Epoxy**

FX-763 is a 100% solids, two-component, non-sag, low-modulus moisture-insensitive epoxy adhesive.

**Performance Features:**

- Exceeds the requirements of ASTM C 881-99, Types I, II and V, Grade 3, Classes B and C.
- Bonds to dry or damp surfaces
- May be feather-edged and will not shrink
- Easily dispensed through cartridge dispensers
- Excellent resistance to gasoline, oil, sewage and aggressive water
- Non-sag material ideal for vertical and overhead repairs
- May be applied with trowel, putty knife or squeegee

**Where to Use:**

- As a high-strength construction adhesive for common building materials
- For vertical and overhead concrete patching maximum lift thickness of 1.
- As a paste-over material for pressure injection ports
- As a jacket sealer and top-bevel material for the FX-70 system.

**Package Size:**

- 15 gallon kit
- 3 gallon kit
- 15 fl. oz. dual cartridge

**Shelf Life:**

2 years in original unopened packaging

**FX-764 Hydro-Ester® Splash Zone and Underwater Paste**

FX-764 is a 100% solids, two-component, moisture-insensitive epoxy resin system ideal for concrete, steel and timber pile repair above or below the water line in marine environments.

**Performance Features:**

- May be applied underwater
- Restores structural integrity
- Bonds to wet surface and resists wave action
- Convenient 1:1 mixing ratio and long pot-life
- Hand-applied

**Where to Use:**

- Repair of structural elements in marine environments.
- Underwater repairs to concrete, wood and steel

**Package Size:**

- 10 gallon kit
- 4 gallon kit
- 2 gallon kit
- 2 quart kit

**Shelf Life:**

2 years in original unopened packaging



**Installation Procedures**

**Evaluation**

On-site evaluation should be conducted by a licensed inspector before initiating any repair protocol. This evaluation is critical when planning any marine repair to develop the most effective repair solution for each situation, and should include:

- Column type, shape, diameter
- Overall length of affected area
- Estimated % section loss of affected area
- Water temperature range
- Tidal zone range
- Notation of environmental factors potentially contributing to damage

**Site Preparation**

Areas of application must be free of marine growth, laitance, grease, oil, and debris that could inhibit bond. For best results, prepare surface to be treated with water or sand blasting. Blow or brush clean to remove remaining debris.

**FX-70 Jacket Spacers**

Spacers to ensure a consistent annular void surrounding the area to be repaired may be installed during jacket fabrication, or in the field. Field installation is advisable for large jobs to maximize shipping efficiency. See pg. 9 for recommended annular void recommendations.

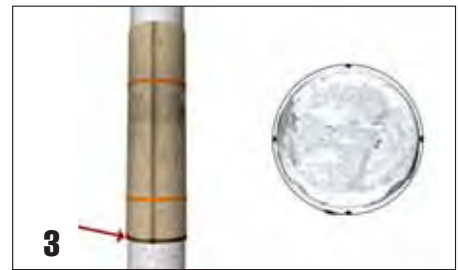
**Installation (Round pile shown; other applications similar)**



**1** Install a bead of FX-763 Hydro-Ester® Low-Modulus Trowel Grade Epoxy into the locking groove of the jacket and place FX-70 jacket around the pile to be repaired.



**2** “Close” the jacket by inserting the tongue into the locking groove of the jacket. Position the jacket so there is 18–24” of undamaged pile inside the jacket above and below the damaged area.



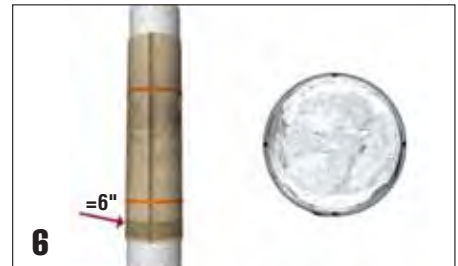
**3** Install temporary bottom seal at base of jacket. Seal may be installed prior to placing jacket.



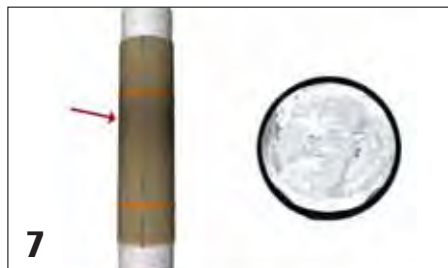
**4** Install external bracing. Ratchet straps shown for round pile bracing.



**5** Install a stainless steel, self-tapping machine screw every 6” o.c. to secure the tongue-and-groove joint.



**6** Install 6” of properly mixed FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout to create bottom seal; **allow grout to cure overnight.**



**7** For piles with ≤ 25% section loss, fill remaining void in jacket with FX-70-6 MP. For piles with > 25% section loss fill void with FX-225 Non-Shrink Non-Metallic Underwater Grout, leaving 4” open at head of jacket. Allow repair grout to cure overnight. For FX-225 repairs, fill remaining 4” void with FX-70-6 MP, and allow grout to cure overnight.



**8** Install FX-763 Hydro-Ester® Low-Modulus Trowel Grade Epoxy at the head of the jacket and finish to a 45° tapered bevel, creating a water- and chemical-resistant barrier to the repair system.

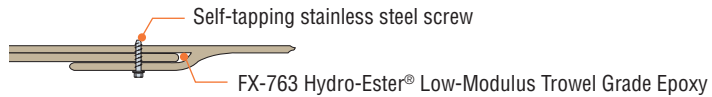


**9** Remove ratchet straps. Repair complete.

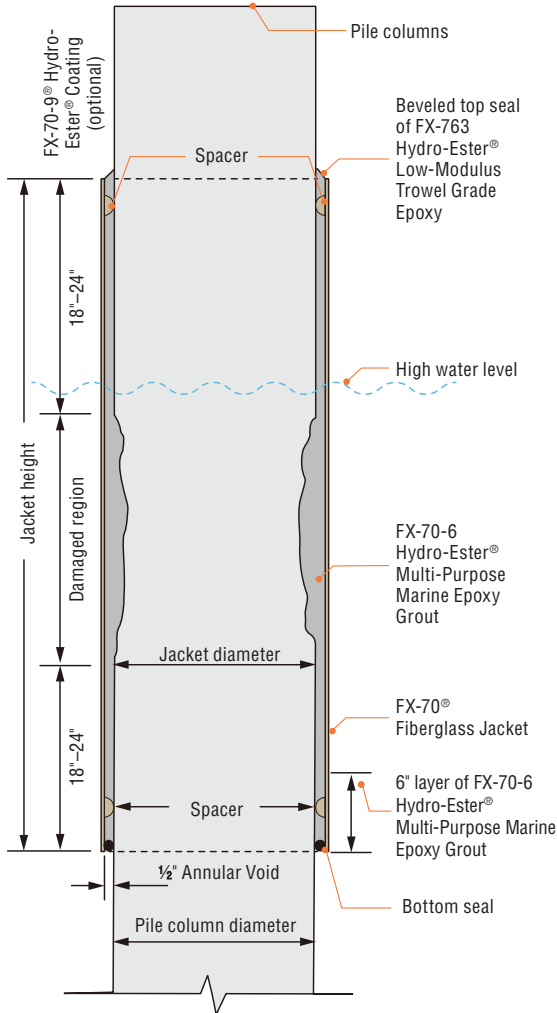


Repair Options Based on Section Loss

CROSS-SECTION OF  
TONGUE-AND-GROOVE JOINT



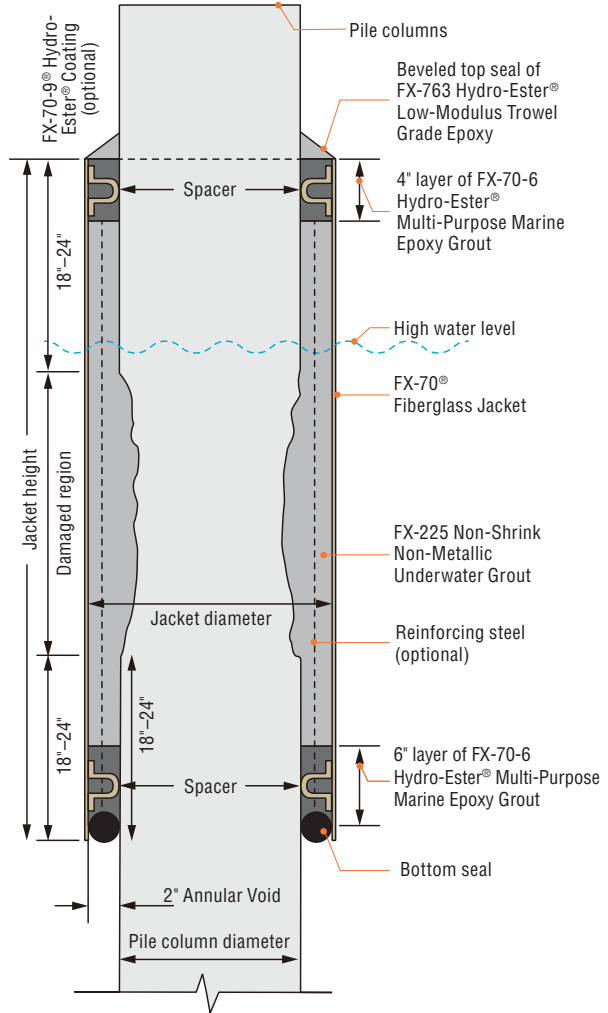
Section Loss ≤ 25%



Section Loss ≤ 25%

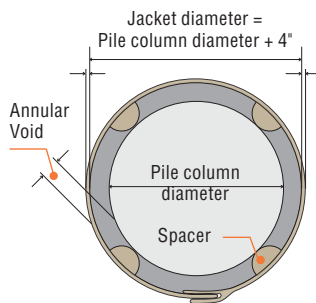
- FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout used for bottom seal and repair
- Typical annular void of 1/2"
- 3/4" annular void for H-piles

Section Loss > 25%

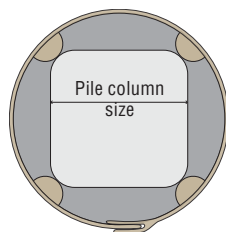


Section Loss > 25%

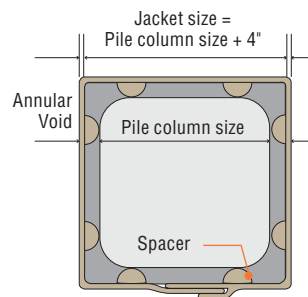
- FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout used for top and bottom seal
- FX-225 Non-Shrink Non-Metallic Underwater Grout used for repair
- Typical annular void of 2"



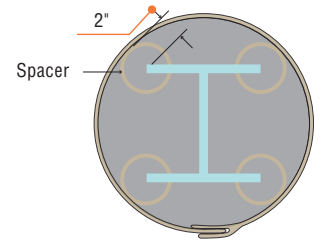
MODEL ONE



MODEL TWO



MODEL THREE



MODEL FOUR

### H-Pile Repair Options

Many bridges are constructed with steel pipe and H-piles. Deterioration is generally caused by:

- Corrosion of steel
- Wetting and drying cycles
- Chemical attack
- Exposure to atmosphere



### H-Shape Repair Method

- FX-70® Jacket fabricated in H-pile shape
- Two-piece construction
- Standard annular void is 3/4"
- FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout used for repair



### Circular Pile Repair Method

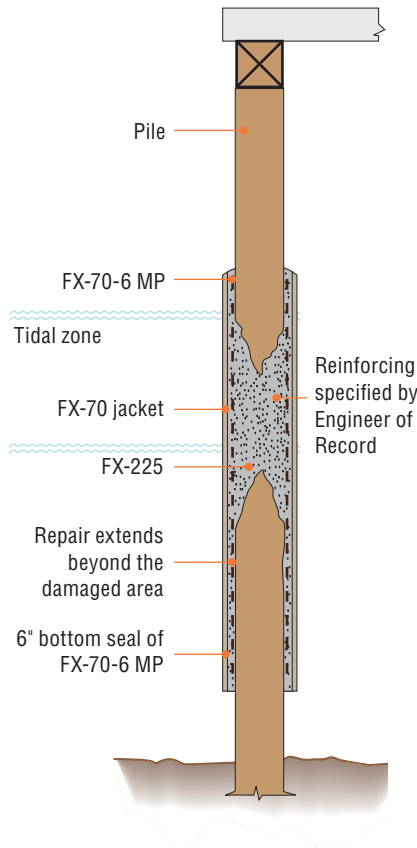
- Round FX-70® Jacket around H-pile
- Fill void with combination of FX-70-6 Multi-Purpose Marine Epoxy Grout and FX-225 Non-Shrink Non-Metallic Underwater Grout
- FX-70-6 placed in bottom 6" and top 4" of void
- Remainder of void filled with FX-225
- FX-70-6 encapsulates FX-225 to protect from moisture and air





**Wooden Pile Repair**

The FX-70® Inert Corrosion-Free Structural Repair and Protection System is an effective repair solution in instances of full-section loss of wooden piles. After removing the damaged or rotten wood, the two sections are connected with steel reinforcement. Using FX-70-6 Multi-Purpose Marine Epoxy Grout and FX-225 Non-Shrink Non-Metallic Underwater Grout inside an FX-70 Jacket can restore capacity of the wooden pile.



**New Pier Reinforcement**





Case Studies – Concrete Pile Repair

**Chesapeake Bay Bridge-Raymond Hollow**

- Repaired and protected over 300 piles
- Exhibited cracks that allowed moisture and salt to penetrate pile
- Exposed to temperatures from 0°F to 100°F
- If untreated, structure was in danger
- Jackets measured: 55" diameter x 1/8" thick x 8' long, with a 1/2" annular void
- Placed in splash zone
- Filled with FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout
- No dewatering required



**1**  
▲ Workboat and divers preparing piling for installation of FX-70® System



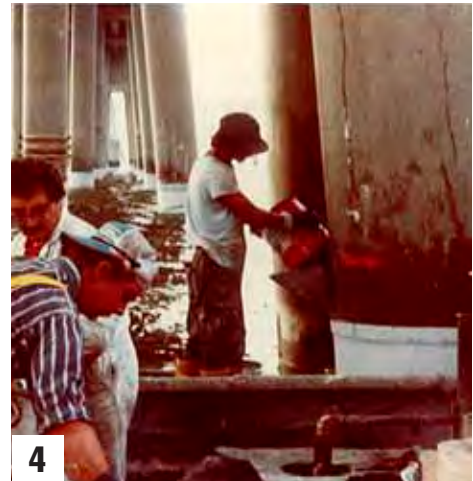
**2**  
▲ FX-70® System in place and ready for FX-70-6 MP grout



▲ Example of pile "scour"



**3**  
▲ FX-70-6 grout mixed in work boat



**4**  
▲ FX-70-6 MP grout placed in jacket without dewatering

**30 Years Later**



View of piles repaired with FX-70® System on western shore approach



Close up of FX-70® repair to Bent #1A; in service 30 years



Paulsboro Refinery



Severe damage to concrete foundation



Foundation prepared and excavated; FX-70 jacket installed below ground level for additional protection



FX-70 jacket installed and backfilled



FX-70-6 Hydro-Ester® Multi-Purpose Marine Epoxy Grout used as bottom and top seal, FX-928® Concrete Mix used to restore structural capacity of foundation



Installation Images

**Before**



**After**





**FX-70® System Project Information Form**

In order to better assist you in making a solution recommendation, complete knowledge of all factors involved in the potential use is necessary. Recommendations can only be based on information at hand today. Our recommendation will be as good as the information you provide. In order to provide the most accurate recommendation possible, send project specifications and drawings along with the completed form. Please be assured that all information will be held in strict confidence.

**Contact Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
**Company Name:** \_\_\_\_\_ **Phone Number:** \_\_\_\_\_  
**Email Address:** \_\_\_\_\_ **City, State:** \_\_\_\_\_

**Project Information**

**Project Name:** \_\_\_\_\_ **City, State/Country:** \_\_\_\_\_  
**Bid Date:** \_\_\_\_\_ **Engineer:** \_\_\_\_\_  
**Type of structure:** \_\_\_\_\_ **Owner:** \_\_\_\_\_

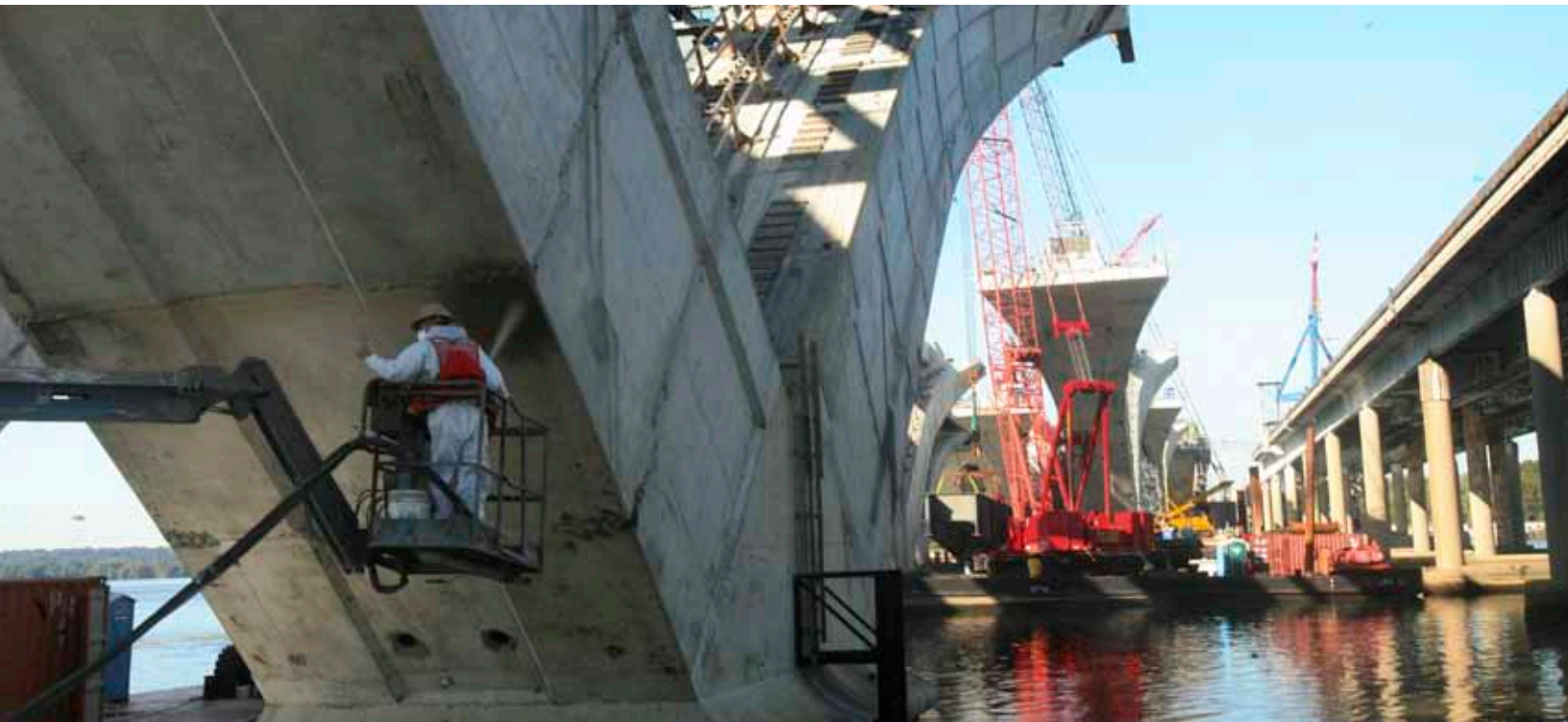
Type of Substrate:	<input type="checkbox"/> Pile	<input type="checkbox"/> Beams	<input type="checkbox"/> Bulkhead	<input type="checkbox"/> Pier	<input type="checkbox"/> Other _____
Substrate Composition:	<input type="checkbox"/> Timber/Wood	<input type="checkbox"/> Concrete	<input type="checkbox"/> Steel	<input type="checkbox"/> Other _____	
Substrate Shape:	<input type="checkbox"/> Round	<input type="checkbox"/> Square	<input type="checkbox"/> H Pile	<input type="checkbox"/> Octagonal	<input type="checkbox"/> Other _____
Condition of Substrate:	<input type="checkbox"/> Cracked	<input type="checkbox"/> Spalled	<input type="checkbox"/> Rusting	<input type="checkbox"/> Other _____	
Section Loss:	_____ % (Sectional loss ratio)				

**FX-70® Jacket Information**

Quantity Required: \_\_\_\_\_

Jacket Shape:	<input type="checkbox"/> Round	<input type="checkbox"/> Square	<input type="checkbox"/> H Pile	<input type="checkbox"/> Octagonal	<input type="checkbox"/> Other _____	
Jacket Size (IN):	Diameter: _____	Square: _____	H-type piles: _____	Octagonal: _____	Other _____	
Jacket Length:	Feet per Jacket :			Various Lengths: (If various lengths, list each separately)		
Jacket Thickness:	<input type="checkbox"/> 1/8"	<input type="checkbox"/> 3/16"	<input type="checkbox"/> 1/4"	<input type="checkbox"/> Other _____		
Number Of Vertical Joints:	<input type="checkbox"/> None	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Other
Jacket Color:	<input type="checkbox"/> Translucent	<input type="checkbox"/> Gray	<input type="checkbox"/> Brown	<input type="checkbox"/> Other _____		
Spacers / Standoffs:	<input type="checkbox"/> 1/2" Spacers	<input type="checkbox"/> 1" Spacers	<input type="checkbox"/> 2" Standoffs	<input type="checkbox"/> Other _____		
Size of Annular Void:	<input type="checkbox"/> 1/2"	<input type="checkbox"/> 3/4"	<input type="checkbox"/> 1"	<input type="checkbox"/> 2"	<input type="checkbox"/> 4"	<input type="checkbox"/> Other _____
Filler Material:	<input type="checkbox"/> FX-70-6 MP Epoxy Grout		<input type="checkbox"/> FX-225 Underwater Grout		<input type="checkbox"/> Other _____	

Please return completed form(s) to [kendallstevens@strongtie.com](mailto:kendallstevens@strongtie.com) along with copies of project specifications and drawings.



### A Shared Commitment to Innovation ...

When the knock came on Barclay Simpson's door in 1956, how could he have known that saying "Yes, I can do that" would be the first step in building the industry leader in the structural wood-connector industry for over 50 years? In 1969, when Douglas L. Fox saw a need for innovative products to repair, protect and strengthen concrete, his belief that 'yes, he could' became the basis of Fox Industries, Inc. For the next 40+ years, Fox Industries built their reputation by continuing to meet customers' needs through innovative product development combined with superior technical and practical expertise. With the acquisition of Fox Industries in 2011, Simpson Strong-Tie has expanded our offering in the commercial, industrial, and marine industries to continue to meet our customers' growing needs.

### Repair, Protect, and Strengthen

Simpson Strong-Tie has offered highest-quality products for post-installed anchorage since 1994, when we introduced Epoxy-Tie® as our first anchoring adhesive. For the past 18 years, Simpson Strong-Tie has continued to develop a variety of mechanical, chemical, and direct-fastening anchor solutions for the residential, commercial, industrial, and infrastructure industries. This flier combines Simpson Strong-Tie product with the innovative Fox Industries offering to create a comprehensive product guide addressing the unique challenges of the Repair, Protection, and Strengthening (RPS) of damaged, deteriorated, or cracked concrete.

### Commitment to Quality and Service:

We help people build, repair and strengthen safer structures economically. We do this by designing, engineering and manufacturing "No Equal" products that meet or exceed our customers' needs and expectations. Our goal is to continue to deliver the highest quality products and services on time and to respond to our customers' needs with personalized attention.



Fox Industries is now part of  
Simpson Strong-Tie.

**Fox Industries/  
Simpson Strong-Tie**  
3100 Falls Cliff Rd  
Baltimore, MD 21211  
Tel: (410)243-8856

*This flier is effective until December 31, 2013, and reflects information available as of April 1, 2013.  
This information is updated periodically and should not be relied upon after December 31, 2013 contact  
Simpson Strong-Tie for current information and limited warranty or see [www.strongtie.com](http://www.strongtie.com).*