FX-70® Structural Pile Repair and Protection System
for Timber, Concrete and Steel Structures
The State of Maryland chose the FX-70® structural pile repair and protection system to repair and protect more than 300 damaged piles of the Chesapeake Bay Bridge in the mid-1980s. A follow-up inspection of these piles in 2012 showed no deterioration since installation.
Don’t replace.
Repair in place with FX-70®.

The structural damage of timber, concrete and steel piles at the waterline is commonplace in marine environments. Tidal action, river current, saltwater exposure, chemical intrusion, floating debris, marine borers, electrolysis and general weathering are all examples of factors affecting the lifecycle of these structures.

The FX-70 structural pile repair and protection system was the first in-place repair solution for damaged concrete, steel and wood piles when it debuted in 1970, and many of those first repairs remain in service today. By eliminating the need to dewater the site or build cofferdams, the FX-70 system drastically reduces the overall expense and loss-of-use cost as the structure can generally remain in service while the repair is executed.

Both aging and new structures can realize extended service life as a benefit of the corrosion-resistant FX-70 system.

With 45+ years of proven performance, our FX-70 structural pile repair and protection system is a cost-effective, practical and long-term solution for your repair projects.

To learn more about the FX-70 and other products that repair, protect and strengthen, call us at (800) 999-5099 or visit strongtie.com/rps.
The FX-70 system features custom-made tongue-and-groove seamed fiberglass jackets that provide a corrosion-resistant protective shell for the life of the repair. High-strength, water-insensitive repair grouts and mortars are used to strengthen and protect damaged piles. These products displace existing water and can be easily pumped, tremied or poured into the FX-70 jacket even while it is submerged in water.

Innovative and Versatile

FX-70 System Advantages

- Economically repair damage in place — no need for costly cofferdams or dewatering
- High-strength, water-insensitive materials bond well to concrete, timber and steel pilings
- Structure can generally remain in service while the repair is executed
- Protective system prevents corrosion, deterioration, weathering and erosion
- Accommodates piles of various shapes and sizes
- No need for heavy-lifting equipment
- System is low-maintenance following repair
- Safe for use in marine-life habitats
- Easily blends with existing structure

Watch “How to Install FX-70 Jackets in Water” at strongtie.com/FX70
FX-70® Applications

The FX-70 fiberglass jacket serves as a stay-in-place form and durable protective shell for concrete, timber and steel piles of almost any size and shape.

- Bridge columns
- Piers, docks and wharfs
- Water and wastewater facilities
- Port infrastructure
- Marine structures
- New construction
- Piles installed underwater and in dry environments

Concrete Piles
Timber Piles — Full-Section Loss

The FX-70® structural pile repair and protection system can be an effective repair solution in instances of full-section loss of timber piles. In the example shown, the Engineer of Record specified a rebar cage to reinforce the area between the two pile sections. Using FX-70-6MP™ multi-purpose marine epoxy grout and FX-225 non-shrink underwater grout inside an FX-70 jacket can restore the performance of the timber pile.
Steel Piles

New Construction Reinforcement and Protection
System Components

Epoxy Grout Method

Typically for piles with less than 25% section loss, the jacket is sized for a ½” (13 mm) annulus, and then completely filled with FX-70-6MP™ multi-purpose marine epoxy grout.

- **FX-70-6MP™** multi-purpose marine epoxy grout used for bottom seal and repair
- Typical annular void of ½” (13 mm)
- ¾” (19 mm) annular void for H-piles

Combination Method

Typically for piles with greater than 25% section loss, the jacket is sized for a 2” (51 mm) annulus, and then filled with a combination of FX-70-6MP™ multi-purpose marine epoxy grout and FX-225 non-shrink underwater grout.

- **FX-70-6MP™** multi-purpose marine epoxy grout used for top and bottom seal
- **FX-225** non-metallic underwater grout used for repair
- Typical annular void of 2” (51 mm)

Cross-Section of Tongue-and-Groove Joint

- **FX-763CTG** gel paste epoxy
- Self-tapping stainless-steel screw
System Components

FX-70® Fiberglass Jacket

The FX-70 high-strength fiberglass protective jacket is a fiber-reinforced polymer (FRP) composite that is used as a stay-in-place form in the FX-70 structural pile repair and protection system. Each jacket is custom-made and assembled to the precise specifications of each repair project and is available in round, square, H-pile and octagonal shapes. Custom shapes and panels are also available. Spacers are provided to ensure that a consistent annulus is maintained.

Features
- Custom-made tongue-and-groove seamed fiberglass jackets that provide a corrosion-resistant protective shell for the life of the repair
- Accommodates piles of various shapes and sizes — round, square, H-piles, panels or custom shapes
- Suitable for marine environments

Applications
- Repairs and protection of marine structures
- Pile repairs
- Underwater grouting applications
- Utility pole repairs
- Pile splicing/extensions
- Seawall repairs

Fiberglass Jacket Specifications

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural strength</td>
<td>ASTM D790</td>
<td>25,000 psi, 172 MPa</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>ASTM D790</td>
<td>700,000 psi, 4,826 MPa</td>
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<tr>
<td>Ultimate tensile strength</td>
<td>ASTM D638</td>
<td>15,000 psi, 103 MPa</td>
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<tr>
<td>Barcol hardness</td>
<td>ASTM D2583</td>
<td>45± 7</td>
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<tr>
<td>Water absorption</td>
<td>ASTM D570</td>
<td>Less than 1%</td>
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Packaging

Available Shapes and Sizes:
- Thickness — ¼", ⅜", ⅜"
- Shapes — round, square, H-piles, octagonal and custom
- Available colors — translucent, light gray, gray, brown and black

Custom shapes and sizes

Round
Square
H-pile
Octagonal
FX-70-6MP™ Multi-Purpose Marine Epoxy Grout

FX-70-6MP multi-purpose marine epoxy grout is a three-component, 100% solids, moisture-tolerant epoxy grout specifically designed for underwater applications as part of the FX-70® structural pile repair and protection system. FX-70-6MP provides excellent bond to concrete, steel, wood and other common building materials. This product displaces existing water and can easily be poured into the FX-70 jacket while submerged in water.

Features
- Easily pumped or poured
- High-strength, low absorption, impact-resistant grout
- Can be placed underwater without de-watering
- Resistant to chemical and aggressive water environments

Applications
- As a high-strength epoxy grout component of the FX-70 structural pile repair and protection system
- As a high-strength epoxy grout in wet or dry applications
- As an underwater repair mortar

Packaging
FX70-6MPKT3-2 3 US gallon (11.4 L) kit  
+ (2) 50 lb. (22.7 kg) bags of filler
FX70-6MPKT3-3 3 US gallon (11.4 L) kit  
+ (3) 50 lb. (22.7 kg) bags of filler
FX70-MPKT15-10 15 US gallon (56.8 L) kit  
+ (10) 50 lb. (22.7 kg) bags of filler
FX70-MPKT15-15 15 US gallon (56.8 L) kit  
+ (15) 50 lb. (22.7 kg) bags of filler

FX-225 Non-Shrink Underwater Grout

FX-225 non-shrink underwater grout is a high-strength, non-metallic, non-segregating grout designed with special anti-washout admixtures, corrosion inhibitors and polymers. FX-225 can be pumped or tremied underwater to grout FX-70 fiberglass pile jackets and repair deteriorated concrete without dewatering.

Features
- Flowable and pumpable
- No dewatering or cofferdams required
- Shrinkage compensated
- Bonds well to concrete, even underwater
- May be extended with clean, washed nominal 3/8" (9 mm) pea gravel
- Ready to use — simply add potable water

Applications
- Concrete repairs in marine structures
- Underwater grouting applications
- Pile jacket repairs with the FX-70 structural pile repair and protection system
- Seawall repairs without dewatering

Packaging
FX225 55 lb. (24.9 kg) bag
FX225-B2500 2,500 lb. (1,134 kg) bulk bag
**System Components**

**FX-763 Trowel-Grade Epoxy**

FX-763 trowel-grade epoxy is a two-component, 100% solids, moisture-tolerant, non-sag epoxy designed for vertical, horizontal and overhead applications and uses.

**Features**
- Bonds well to most construction materials
- Bonds to dry or damp surfaces
- Suitable for saltwater marine applications
- Easily applied with trowel or putty knife
- Can be feather edged
- Excellent abrasion resistance

**Applications**
- Mortar when combined with oven-dried graded silica filler for heavy traffic floor repairs
- For vertical and overhead concrete patching
- Securing ports and paste over for pressure injection applications
- As a jacket top bevel material for the FX-70® structural pile repair and protection system

**Packaging**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Volume</th>
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<tbody>
<tr>
<td>FX763KT3</td>
<td>3 US gallon (11.4 L) kit</td>
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<tr>
<td>FX763KT15</td>
<td>15 US gallon (56.8 L) kit</td>
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</tbody>
</table>

**FX-763CTG Gel Paste Epoxy Cartridge**

FX-763CTG gel paste epoxy cartridge is a two-component, high-solids, moisture-tolerant, gel paste epoxy designed for vertical and horizontal applications and uses.

**Features**
- Bonds well to most construction materials
- Bonds to dry or damp surfaces
- Suitable for saltwater marine environments
- Can be feather edged
- Easily applied

**Applications**
- Vertical and horizontal crack sealing
- As a jacket joint sealer for the FX-70 structural pile repair and protection system

**Packaging**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Volume</th>
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<tbody>
<tr>
<td>FX763CTG</td>
<td>15 oz. (23 in.³) dual cartridge</td>
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<tr>
<td></td>
<td>Includes one static mixing nozzle</td>
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Accessories

EDT22S Manual Dispensing Tool
The EDT22S epoxy adhesive tool features a steel carriage and is engineered for high-volume, continuous use. The tool can be easily converted (conversion parts included) from dispensing a 22 oz. 1:1 ratio cartridge to a 16.5 oz. 2:1 ratio cartridge.

Packaging
EDT22S Manual dispensing tool

FX-Bottom Seal
Fully rounded closed cell polyethylene backer rod material for use at the bottom of the FX-70® system between the FX jacket and the deteriorated pile.

Packaging
Available in diameters of 1" (25 mm) and 3" (76 mm). Other sizes available upon request.

FX-Spacers
Custom-made fiberglass FX-spacers for use between the FX-jacket and the deteriorated pile. The FX-spacers ensure a consistent annulus is present, therefore ensuring that the FX-70 fill materials can be easily installed.

Packaging
Spacers are available in 1" (25 mm), 1½" (38 mm) and 2" (51 mm).

Self-Tapping Stainless-Steel Screws
Screws are 1" (25 mm) in length and hex-headed.

Packaging
FXSSST121-RP100 Type 316 stainless-steel screws, qty. 100
FXSSST121-RP1000 Type 316 stainless-steel screws, qty. 1,000

FX-Pumping Port
2" diameter, stay-in-place grout injection port for the FX-70 jacketing system.

Packaging
FX-PUMP PORT FX-70 pumping port
For detailed pumping port installation and use, see T-R-PORTINSTL17 — Installation Instructions for FX-70 Pumping Port.
Related Products

FX-764 Splash Zone and Underwater Paste

FX-764 splash zone and underwater paste is a two-component, high-solids, moisture-tolerant, non-sag, trowel-grade epoxy designed for use in underwater applications. FX-764 is ideal for underwater crack sealing, securing injection ports and general repair of concrete, steel and wood.

Features
- May be applied underwater
- Hand mixed
- Bonds well to wet surfaces
- “Putty-like” consistency

Applications
- Underwater repair of concrete, wood and steel
- Non-structural underwater repair of marine structures

Packaging

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<tr>
<th>Kit Code</th>
<th>Volume</th>
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<td>FX764KT2QT</td>
<td>½ US gallon (1.9 L) kit</td>
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<tr>
<td>FX764KT2</td>
<td>2 US gallon (7.6 L) kit</td>
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<tr>
<td>FX764KT4</td>
<td>4 US gallon (15.1 L) kit</td>
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<tr>
<td>FX764KT10</td>
<td>10 US gallon (37.9 L) kit</td>
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</table>

FX-70-9™ Epoxy Coating

FX-70-9 epoxy coating is a high-solids, two-component, moisture-tolerant, high-build protective coating designed to protect steel and concrete.

Features
- Excellent abrasion resistance in wastewater and other industrial applications
- Resists abrasion and staining
- Suitable for immersion service
- Can be applied to damp concrete
- Self-priming for most applications
- Very low odor
- Can be brush, roller or spray applied
- Excellent bond to many common construction materials

Applications
- Marine applications: protection from salt spray and water intrusion in immersion service applications
- Commercial and industrial applications requiring moderate chemical resistance
- Primary and secondary containment
  Water/wastewater: clarifiers, digesters, sludge thickener tanks, lift stations, manholes
- Food processing plants: walls, trenches, sumps
- Petrochemical applications
- Above- and below-grade applications
- Floor and wall coating

Packaging

| Color: Limestone
<table>
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<tr>
<th>Kit Code</th>
<th>Volume</th>
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<td>FX70-9GN01KT3</td>
<td>3 US gallon (11.4 L) kit</td>
</tr>
<tr>
<td>FX70-9GN01KT15</td>
<td>15 US gallon (56.8 L) kit</td>
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</tbody>
</table>
An in-place repair begins by placing spacers inside the jacket and applying a bead of FX-763CTG into the locking groove of the jacket.

Open the jacket, place it around the pile to be repaired and then close it by inserting the tongue into the locking groove.

Install a temporary backer-rod bottom seal to contain the initial epoxy grout installation.

Temporarily secure the jacket around the pile to keep it correctly positioned during the installation. Add external shoring as needed. Shoring will vary according to jacket shape.

To secure the tongue-and-groove joint, install a stainless-steel, self-tapping machine screw every 6 in./152 mm.

Pour or pump at least 6 in./152 mm of FX-70-6MP™ into the jacket to create the permanent bottom seal.

Once the FX-70-6MP bottom seal has set, fill the remaining space inside the jacket with either FX-225 or FX-70-6MP. If FX-225 is used, leave a 4 in./102 mm gap at the top of the jacket to be filled with FX-70-6MP once cured.

Create a tapered bevel with FX-763 trowel-grade epoxy mixed with FX-702 oven-dried rounded silica filler to eliminate the possibility of water pooling on top and to create a water- and chemical-resistant barrier.

Once the product has set, the temporary positioning device and shoring can now be removed. The repair is complete.

For detailed installation instructions, see T-R-FX70INST18 — FX-70 Structural Repair and Protection System Installation Guide.

Watch “How to Install FX-70® Jackets in Water” at strongtie.com/videolibrary.
Industry’s First Full-Scale Cyclic Testing of Repaired Timber Piles

Simpson Strong-Tie is the leader in engineered structural connectors and building solutions, due in no small part to our commitment to research, testing and product development. The epicenter of our regional testing facilities is the Tyrell R. Gilb Research Laboratory in Stockton, California. Our Engineering/R&D team developed and performed a test protocol for the Simpson Strong-Tie® FX-70® structural pile repair and strengthening system, a featured product in our Repair, Protection and Strengthening systems product line.

We conducted the first full-scale, cyclic tests of repaired timber piles using the FX-70 structural repair and protection system, and verified that the FX-70 jacket system performs as intended and is an effective structural repair solution. The test results also provide engineers with real-world data to help them evaluate the FX-70 system as a potential solution for their structural repair applications.

A three-minute video, available at strongtie.com/videolibrary, shows how the test was conducted at the Simpson Strong-Tie Tyrell Gilb Research Laboratory in Stockton, CA.
Engineering and Technical Services

Assessment
- Feasibility studies to ensure suitable solutions for your application
- Partnering with trained contractors to provide rough order-of-magnitude (ROM) budget estimates

Engineering Services
- Specifications prepared for your unique project requirements
- Detailed proposal documentation, including drawings
- Typical detail sheet showing installation details
- General notes to include in the plans

Contractor Training
- Online, regional workshops and onsite training

Support
- Our team of licensed professional engineers and technical representatives is available to provide you with local, onsite support for the entire duration of your project

Five-Year System Limited Warranty
In order for the Warranty Period for a System to apply, the System must be comprised exclusively of RPS Products and must be installed by a Simpson Strong-Tie trained installer. Otherwise, the one-year warranty period applicable to individual RPS products shall apply. For additional details, visit strongtie.com/limited-warranties.

Certified Contractor Network
Simpson Strong-Tie Certified Restoration Contractors are preselected for their commitment to customer service, quality and reliability. We offer a list of trained and qualified contractors in your area that meet these high standards and satisfy strict requirements.

Certified Restoration Contractors are part of an exclusive network of professionals who meet high standards and strict requirements for professionalism and reliability.

Elite Certified Restoration Contractors are the top tier of a premier network of professionals dedicated to service, reliability and professional craftsmanship. Only they can offer our 10-year enhanced system warranty.

For complete information regarding specific products suitable to your unique situation or condition, please visit strongtie.com/rps or call your local RPS specialist at (800) 999-5099.