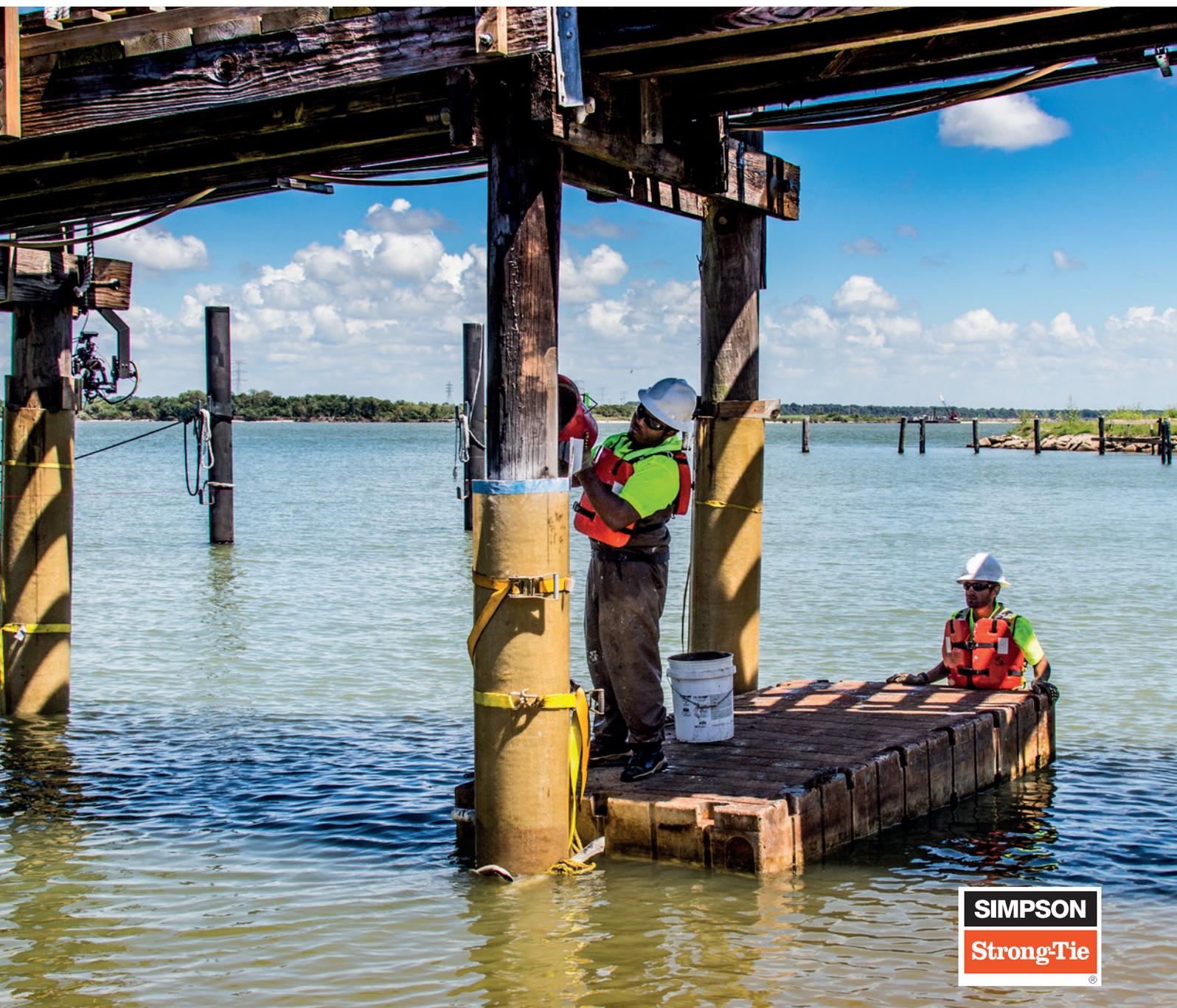




A Simpson Strong-Tie® Company

## **FX-70® Structural Pile Repair and Protection System** for Timber, Concrete and Steel Structures



**SIMPSON**  
**Strong-Tie**

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 realise extended service life as a benefit of the corrosion-resistant FX-70® system.

With over 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 **+41 41 825 00 70**  
or visit **[sp-reinforcement.eu](http://sp-reinforcement.eu)**.

## Innovative and versatile

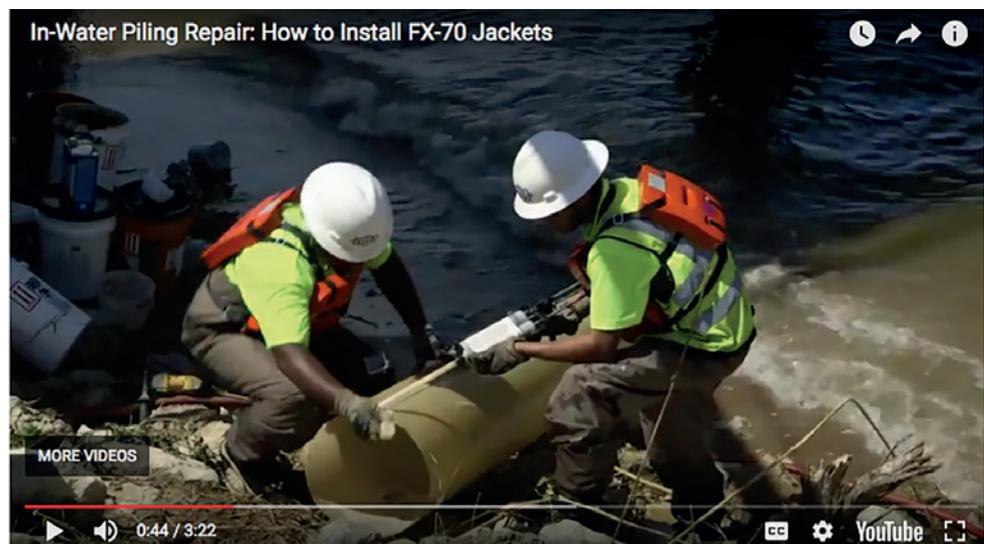
The FX-70® system features custom-made tongue-and-groove seamed fibreglass jackets that provide a corrosion-resistant protective shell for the life of the repair. High-strength, water-insensitive repair grouts and mortars are used to strengthen and protect damaged piles. These products displace existing water and can be easily pumped, tremied or poured into the FX-70® jacket even while it is submerged in water.



The FX-70® system provides corrosion-resistant protection for the life of the repair.

## 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 piles
- Structure can generally remain in service while the repair is carried out
- 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



 Search 'FX-70' at YouTube to see "How to Install FX-70 Jackets in Water".

# FX-70® Applications

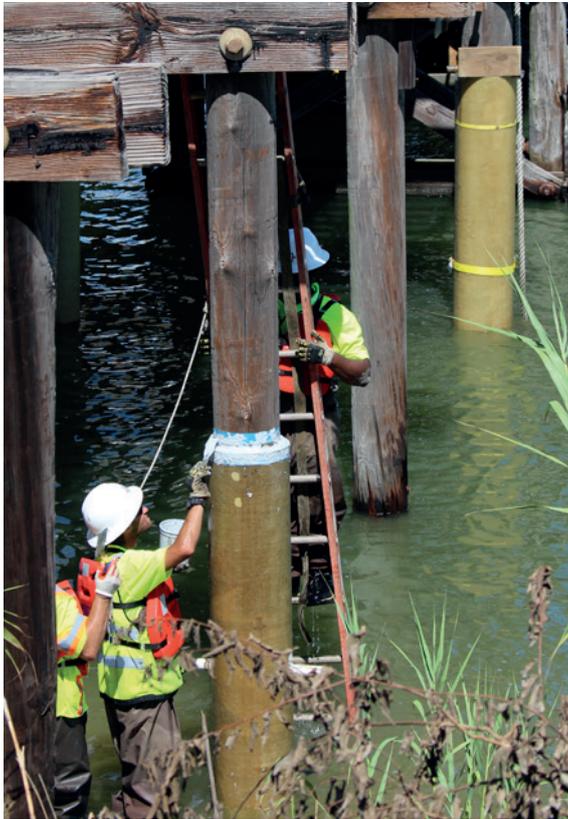
The FX-70® fiberglass jacket serves as a stay-in-place form and durable protective shell for concrete, timber and steel piles of almost any size and shape.

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

## Concrete Piles

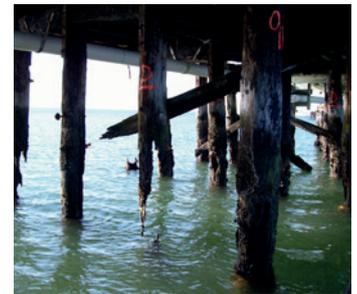
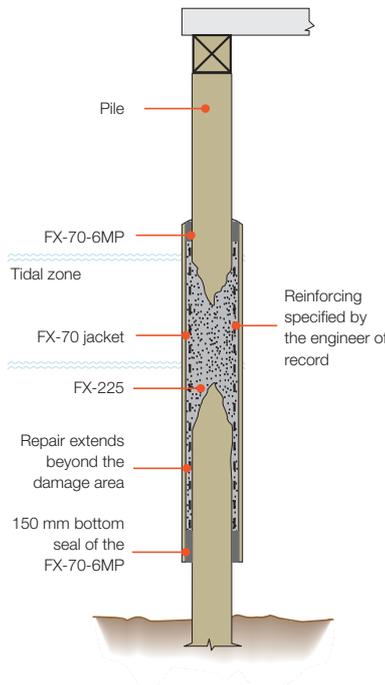


# Timber Piles



## 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



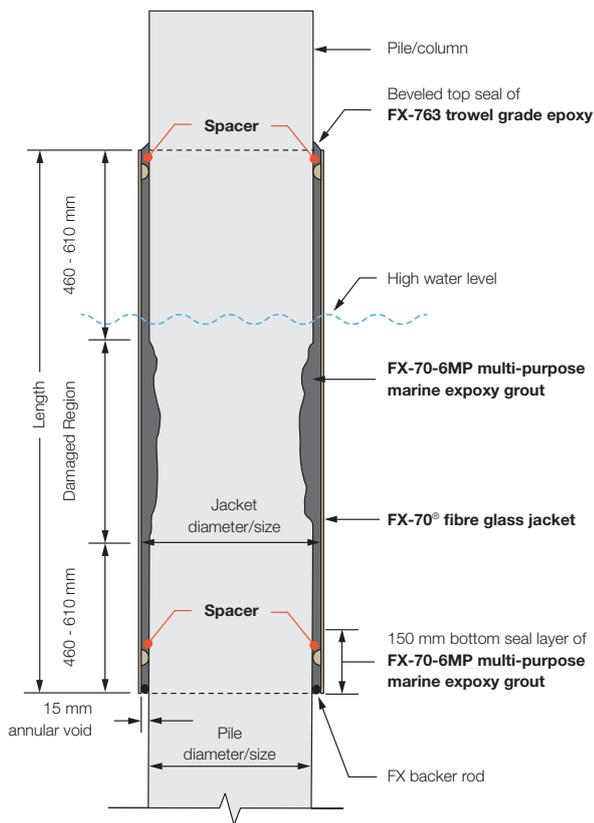
## New Construction Reinforcement and Protection



# System Components

## Epoxy Grout Method

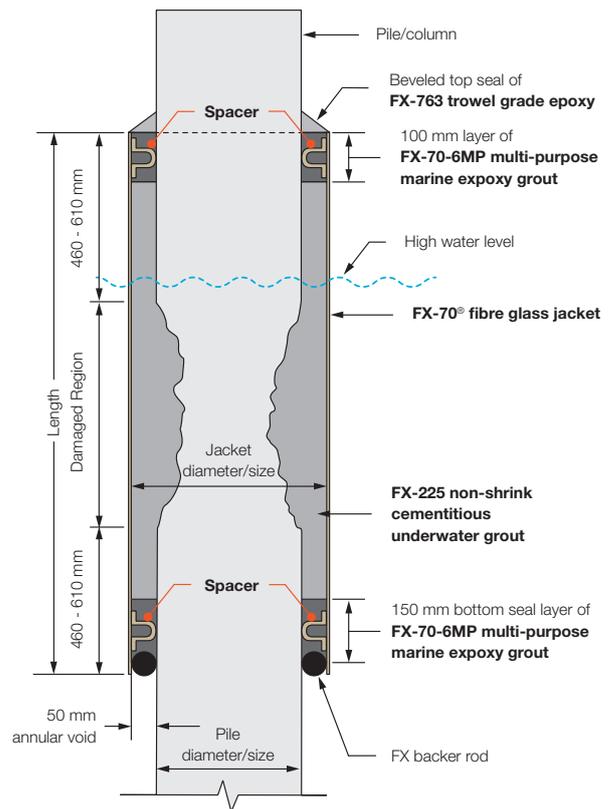
Typically for piles with less than 25% section loss, the jacket is sized for a 15 mm annulus, and then completely filled with FX-70-6MP™ multi-purpose marine epoxy grout.



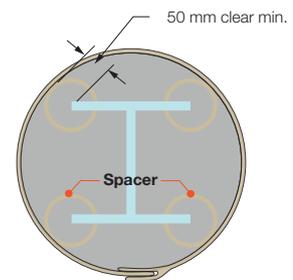
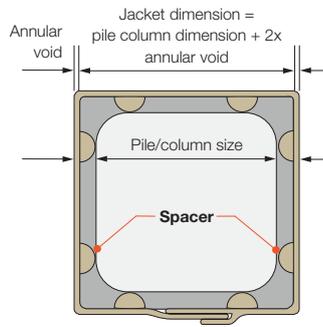
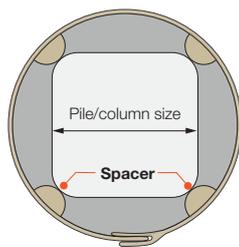
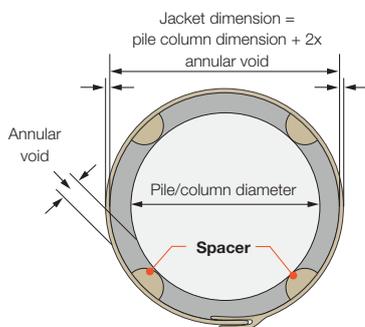
- FX-70-6MP multi-purpose marine epoxy grout used for bottom seal and repair
- Typical annular void of 15 mm
- 20 mm annular void for H-piles

## Combination Method

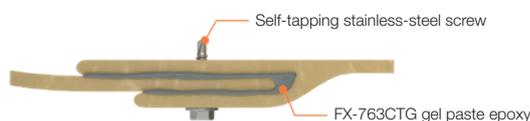
Typically for piles with greater than 25% section loss, the jacket is sized for a 50 mm annulus, and then filled with a combination of FX-70-6MP multi-purpose marine epoxy grout and FX-225 non-shrink underwater grout.



- 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 50 mm



## Cross-Section of Tongue-and-Groove Joint



# 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

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



FX-70 jacket with tongue-and-groove joint

## Fiberglass Jacket Specifications

Property	Test Method	Result
Flexural strength	ASTM D790	25,000 psi, 172 MPa
Flexural modulus	ASTM D790	700,000 psi, 4,826 MPa
Ultimate tensile strength	ASTM D638	15,000 psi, 103 MPa
Barcol hardness	ASTM D2583	45± 7
Water absorption	ASTM D570	Less than 1%

### Packaging

#### Available Shapes and Sizes:

Thickness            3 mm and 5 mm  
 Shapes                Round, square, H-piles, octagonal and custom  
 Available colors    Translucent, light grey, grey, brown and black



Custom shapes and sizes



Round



Square



H-pile



Octagonal

## System Components

### 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

2 bag kit: 13.3 kg (comp. A+B) + 50 kg filler (2 x 25 kg bags comp. C)

3 bag kit: 13.3 kg (comp. A+B) + 75 kg filler (3 x 25 kg bags comp. C)



### 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
- Ready to use — simply add clean 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

25 kg 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

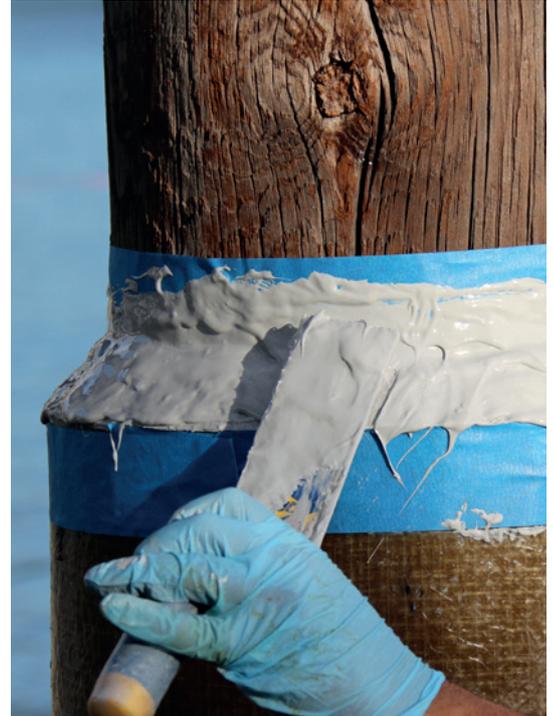
- Bonds well to most construction materials
- Bonds to dry or damp surfaces
- Suitable for saltwater marine applications
- Easily applied with trowel or putty knife
- Can be feather edged
- Excellent abrasion resistance

#### Applications

- 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

5 kg kit (comp. A + B)



### 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

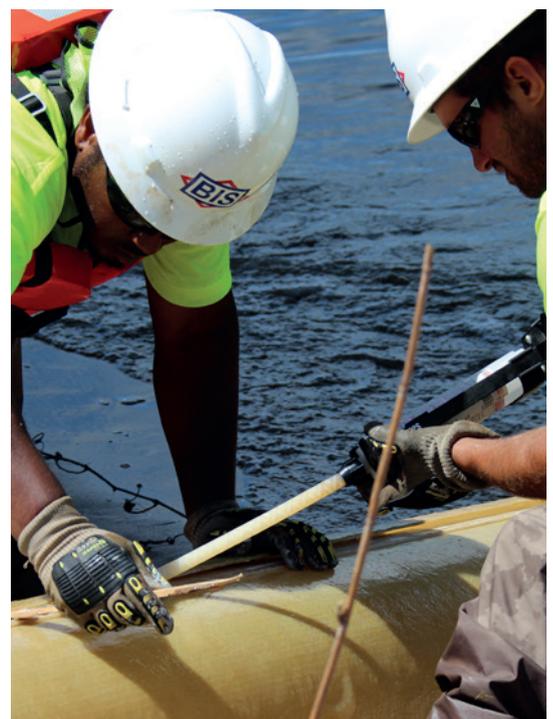
- Bonds well to most construction materials
- Bonds to dry or damp surfaces
- Suitable for saltwater marine environments
- Easily applied

#### Applications

- As a jacket joint sealer for the FX-70® structural pile repair and protection system

#### Packaging

600 ml dual cartridge



## Accessories

### EDT22S Manual Dispensing Tool

The EDT22S epoxy adhesive tool features a steel carriage and is engineered for high-volume, continuous use.

**Packaging**

EDT22S Manual dispensing tool



### FX-Backer Rod

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 20 mm and 60 mm. Other sizes available upon request.

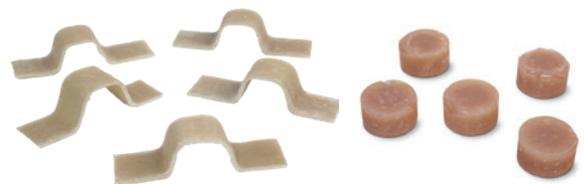


### FX-Spacers

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 15 mm and 50 mm (other sizes available on request).



### Self-Tapping Stainless-Steel Screws

Screws are 25 mm in length and hex-headed.

**Packaging**

A4 stainless steel screws (500 per box)

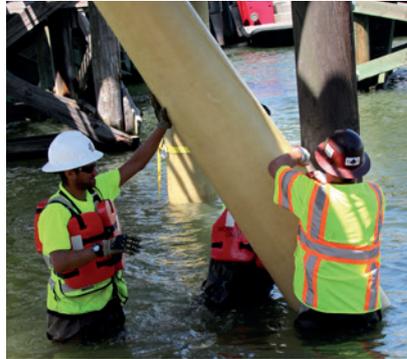


# Installation

For detailed installation instructions, see FX-70® Structural Repair and Protection System Installation Guide.



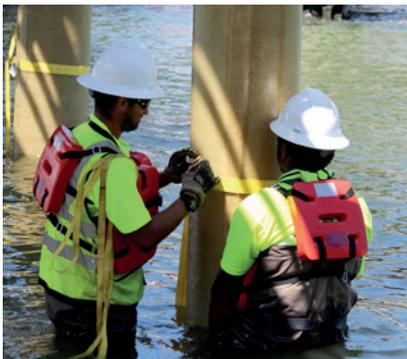
An in-place repair begins by placing spacers inside the jacket and applying a bead of FX-763CTG into the locking groove of the jacket.



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



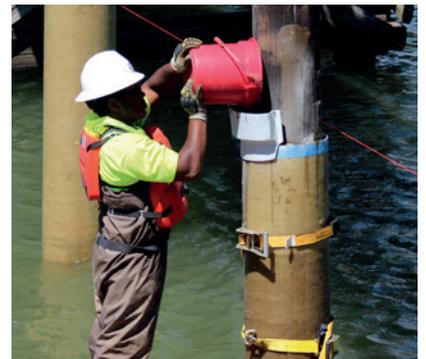
Install a temporary backer-rod bottom seal to contain the initial epoxy grout installation.



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 150 mm.



Pour or pump at least 150 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 100 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 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, visit [sp-reinforcement.eu](http://sp-reinforcement.eu).



Search 'FX-70' at YouTube to see "How to Install FX-70 Jackets in Water".

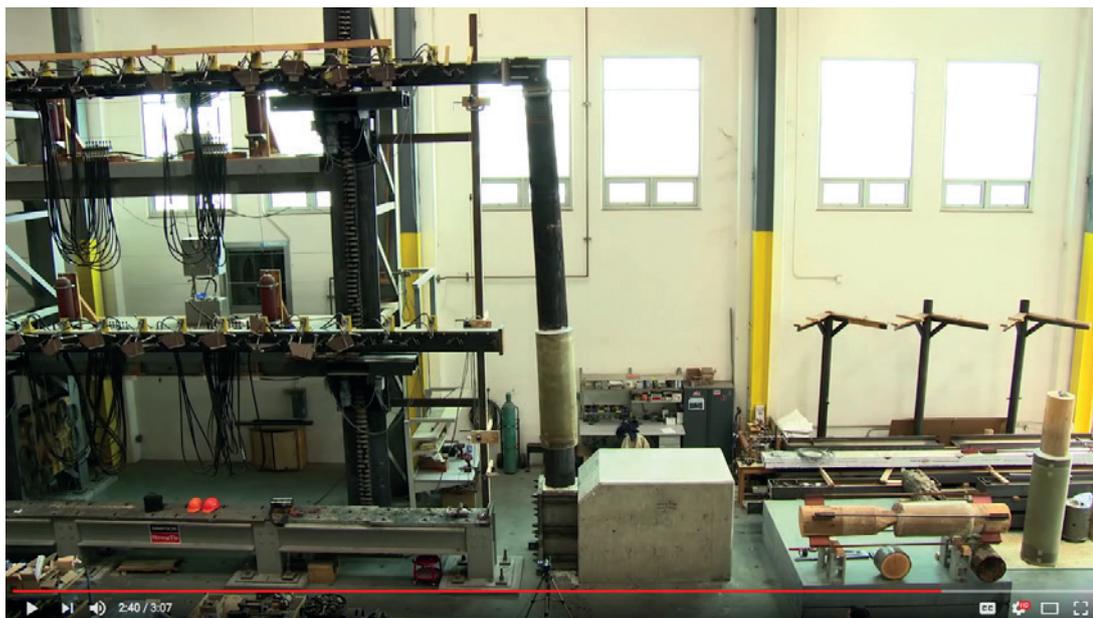
## Repair

### 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](https://strongtie.com/videolibrary), shows how the test was conducted at the Simpson Strong-Tie Tyrell Gilb Research Laboratory in Stockton, CA.

# FX-70® Project 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 and in accordance with General Data Protection Regulation (GDPR).

Contact Name: \_\_\_\_\_ Date : \_\_\_\_\_

Company Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_ City, Region: \_\_\_\_\_

## Project Information

Project Name: \_\_\_\_\_ City, Region,/Country: \_\_\_\_\_

Bid Date: \_\_\_\_\_ Engineer: \_\_\_\_\_

Type of Structure: \_\_\_\_\_ Owner: \_\_\_\_\_

Repair Type:	<input type="checkbox"/> Pile	<input type="checkbox"/> Beams	<input type="checkbox"/> Bulkhead	<input type="checkbox"/> Pier	<input type="checkbox"/> Other _____
Pile Composition:	<input type="checkbox"/> Timber/Wood	<input type="checkbox"/> Concrete	<input type="checkbox"/> Steel	<input type="checkbox"/> Other _____	
Pile Shape:	<input type="checkbox"/> Round	<input type="checkbox"/> Square	<input type="checkbox"/> H Pile	<input type="checkbox"/> Octagonal	<input type="checkbox"/> Other _____
Condition of Pile:	<input type="checkbox"/> Cracked	<input type="checkbox"/> Spalled	<input type="checkbox"/> Rusting	<input type="checkbox"/> Other _____	
Section Loss:	_____ % (section 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:	Metres per Jacket:			Various Lengths: (if various lengths, list each separately): _____		
Jacket Thickness:	<input type="checkbox"/> 3 mm	<input type="checkbox"/> 5 mm	Other _____			
No. 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 _____
Spacers/Standoffs:	<input type="checkbox"/> 15 mm	<input type="checkbox"/> 25 mm	<input type="checkbox"/> 50 mm	<input type="checkbox"/> Other _____		
Size of Annular Void:	<input type="checkbox"/> 15 mm	<input type="checkbox"/> 20 mm	<input type="checkbox"/> 25 mm	<input type="checkbox"/> 50 mm	<input type="checkbox"/> 100 mm	<input type="checkbox"/> Other _____
Filler Material:	<input type="checkbox"/> FX-70-6MP™		<input type="checkbox"/> FX-225		<input type="checkbox"/> Other _____	

*This form can also be found on our website.*



A Simpson Strong-Tie® Company



Since 2012, S&P has been a part of Simpson Strong-Tie®, a world wide organisation committed to helping people design and build better, safer structures.

Originally founded in California in 1956, today Simpson Strong-Tie® has multiple locations throughout Europe, where we have established ourselves as a leader in wood, steel and concrete structural connectors and concrete repair and protection systems.

We are committed to helping customers succeed by providing exceptional, quality approved products, full-service engineering and field support, product testing and training, and on-time product delivery. S&P, continues to expand its offering to include a full array of concrete repair, protection and strengthening solutions. By combining the strengths of our two brands, Simpson Strong-Tie and S&P can offer the highest level of quality and service to meet all your concrete repair, strengthening and restoration needs.

We look forward to working with you on your next project.

Contact us: +41 41 825 00 70 [www.sp-reinforcement.eu](http://www.sp-reinforcement.eu)

