SIMPSON Strong-Tie®

Repair, Protection and Strengthening Application Guide

PROVEN SOLUTIONS FOR CONCRETE, STEEL AND TIMBER APPLICATIONS

(800) 999-5099 | www.strongtie.com

Simpson Strong-Tie® Repair, Protection and Strengthening products are designed, tested and manufactured to offer high-performance solutions that provide lasting results. We address your specific condition with a repair plan tailored to your needs, while minimizing downtime or loss of structure use.

From custom-manufactured fiberglass jackets to fiber-reinforced polymer systems and underwater epoxies, we have developed an array of formulations designed to offer structural repair, strengthening and protection against exposure, corrosion, chemical attack, abrasion and other destructive forces commonly found in commercial, industrial, marine and agribusiness environments.

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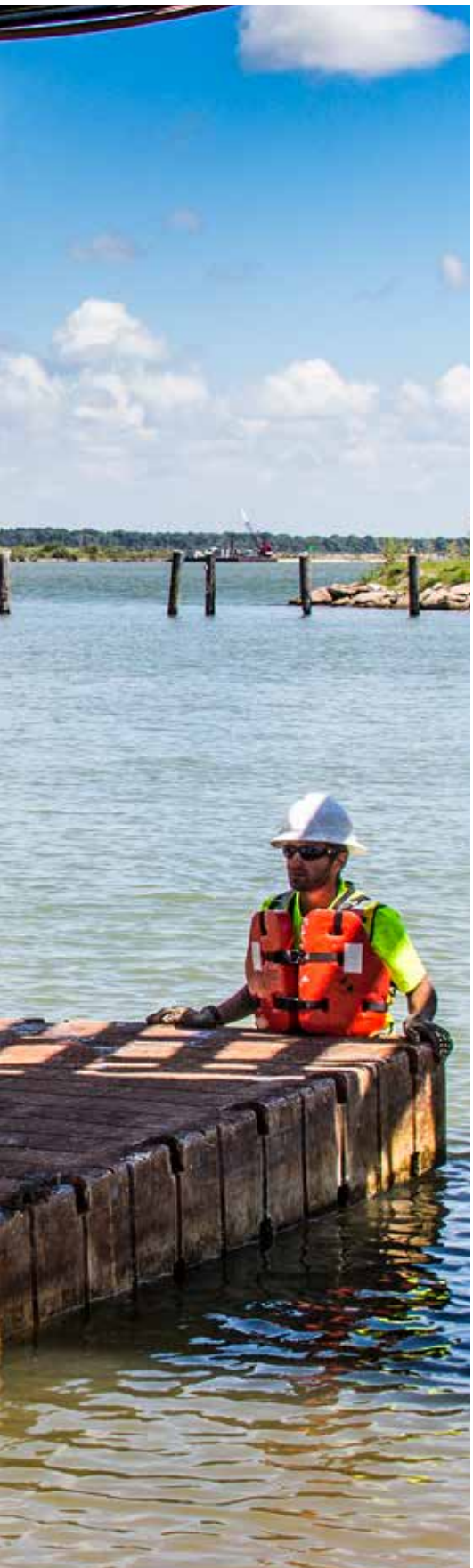
REPAIR

SIMPSON Strong-Tie®



FX-70® Structural Pile Repair and Protection Systems for Concrete, Timber and Steel Structures

In 1970, the FX-70® Structural Pile Repair and Protection System made in-place repair of damaged marine 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 and time of restoring the damaged structure.

FX-70® Structural Pile Repair and Protection Systems

Degradation of structures at the waterline is common in marine environments. Tidal action, river current, saltwater exposure, chemical intrusion, floating debris, marine borers, electrolysis, wet-dry cycles and general weathering are all examples of destructive marine factors addressed by the FX-70® Structural Repair and Protection System.

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 repair grouts are used to strengthen and protect damaged piles. These products displace existing water and can be easily pumped or poured into the FX-70 jacket even while it is submerged in water.

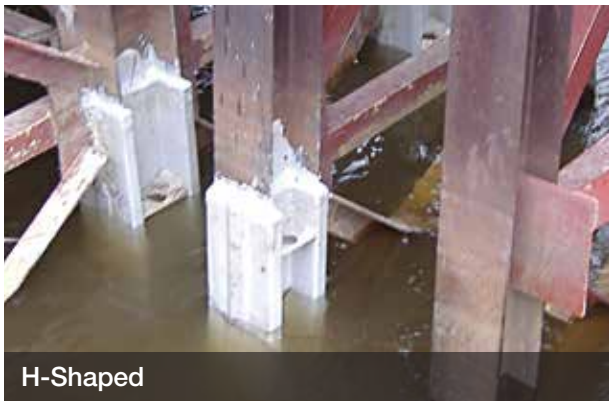
FX-70® System Advantages

- Economically repair damage to concrete, timber and steel pilings without taking the structure out of service
- No need for cofferdams or dewatering
- No need for heavy lifting equipment
- Resists corrosion, deterioration, weathering and abrasion
- Low-impact installation in marine environments
- Easily blends with existing structure
- Manufactured in the U.S.

FX-70® Structural Pile Repair and Protection Systems


Round


Square


H-Shaped


Octagon

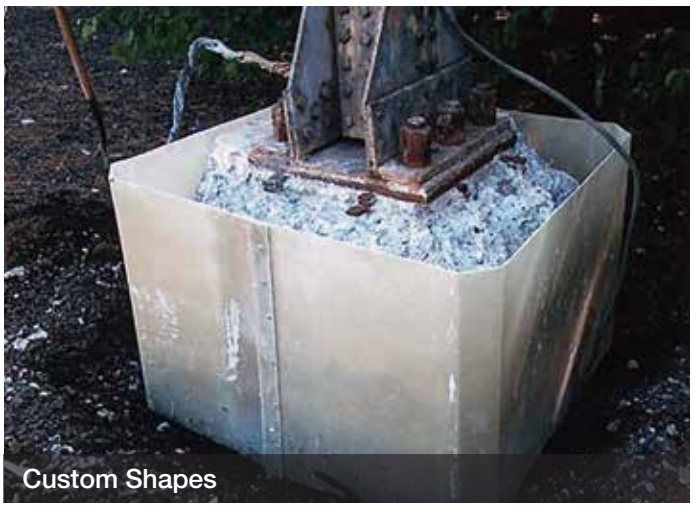
Each FX-70® high-strength fiberglass interlocking jacket is custom-made to the precise specifications of the repair project. Hand-made and assembled in the U.S., the FX-70 tongue-and-groove seamed jacket provides a corrosion-resistant shell with over 40 years of demonstrated in-service performance.

Fiberglass Jacket Specifications

Property	Test Method	Result
Water Absorption	ASTM D570	1% max.
Ultimate Tensile Strength	ASTM D638	15,000 psi, 103 MPa min.
Flexural Strength	ASTM D790	25,000 psi, 172 MPa min.
Flexural Modulus of Elasticity	ASTM D790	700,000 psi, 4,826 MPa min.
Barcol Hardness	ASTM D2583	45 ± 7

FX-70 Jackets are available in the following shapes:

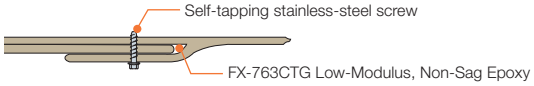
- Round
- Square
- H-Pile
- Octagonal
- Panels and custom shapes also available for additional applications such as pile foundations, piers and seawalls


Custom Shapes

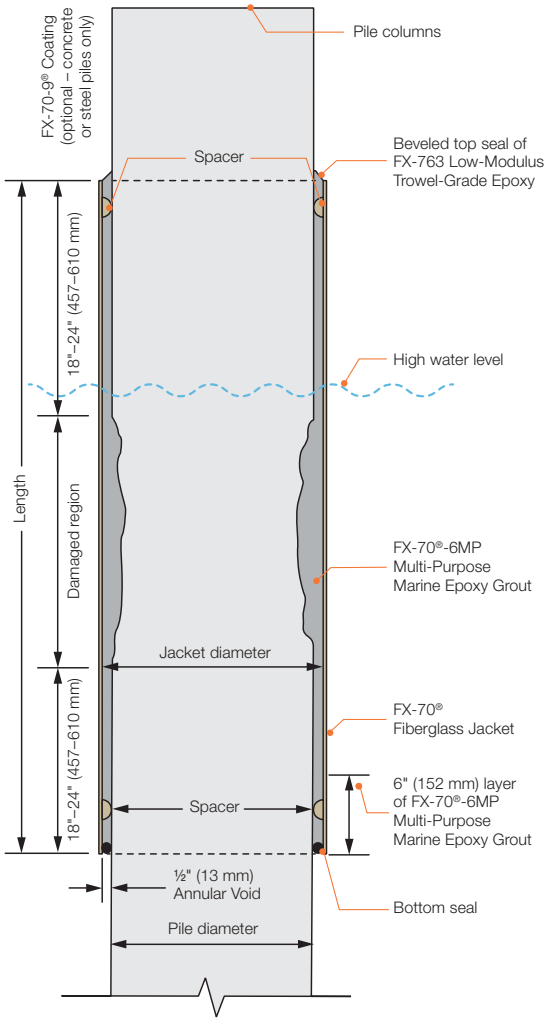

Custom Sizes

Components

Cross-Section of Tongue-and-Groove Joint

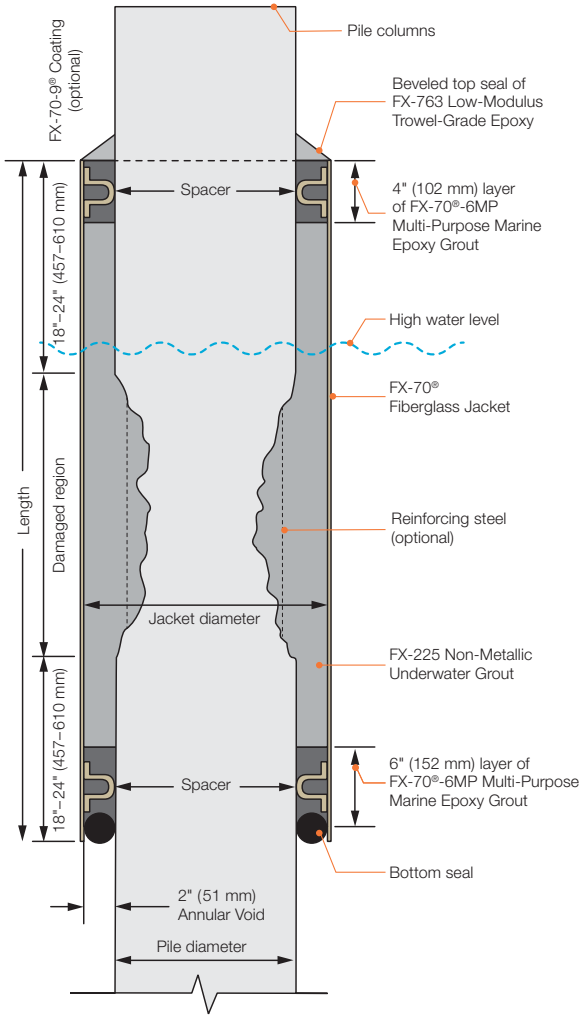


For Section Loss ≤ 25%

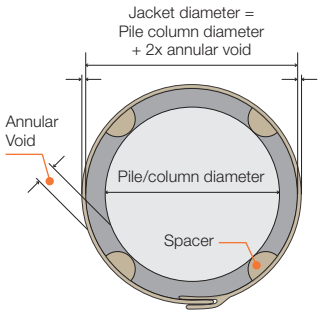


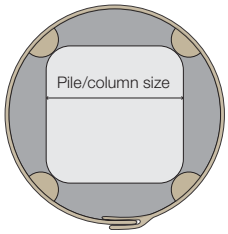
- FX-70®-6MP Multi-Purpose Marine Epoxy Grout used for bottom seal and repair
- Typical annular void of ½" (13 mm)
- ¾" (19 mm) annular void for H-piles

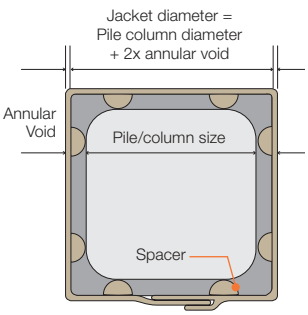
For Section Loss > 25%

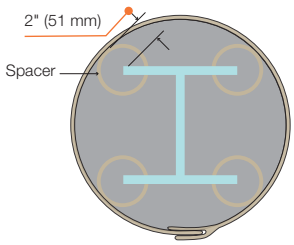


- FX-70®-6MP Multi-Purpose Marine Epoxy Grout used for top and bottom seal
- FX-225 Non-Metallic Underwater Grout used for repair
- Typical annular void of 2" (51 mm)









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Grouting Materials

FX-70®-6MP™ Multi-Purpose Marine Epoxy Grout

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

Performance Features:

- Suitable for installations at 40°F (4°C) and above
- Easily pumped or poured
- High-strength, low-absorption, impact-resistant grout
- Superior bonding capacities to jacket and wood, concrete and steel piles
- Dewatering not required; can be placed underwater

Where to Use:

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

FX-225 Non-Shrink Underwater Grout

FX-225 is a cohesive, non-segregating, high-strength cementitious grout that has been designed for underwater concrete repair. FX-225 may be pumped or tremied into place to provide a durable, cost-effective corrosion-resistant repair.

Performance Features:

- Suitable for installations at 35°F (2°C) 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 pumped or tremied through water
- No dewatering required

Where to Use:

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

Epoxy and Repair Paste

FX-763 Low-Modulus Trowel-Grade Epoxy

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

Performance Features:

- Bonds to dry or damp surfaces
- May be feather-edged and will not shrink
- 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 in. (25 mm)
- As a paste-over material for pressure injection ports
- As a top-bevel material for the FX-70® system

FX-763CTG Low-Modulus, Non-Sag Epoxy Cartridge

- Easily applied through cartridge dispensers
- Used as a jacket seam sealer for the FX-70® system
- Clear color

FX-764 Splash Zone and Underwater Paste

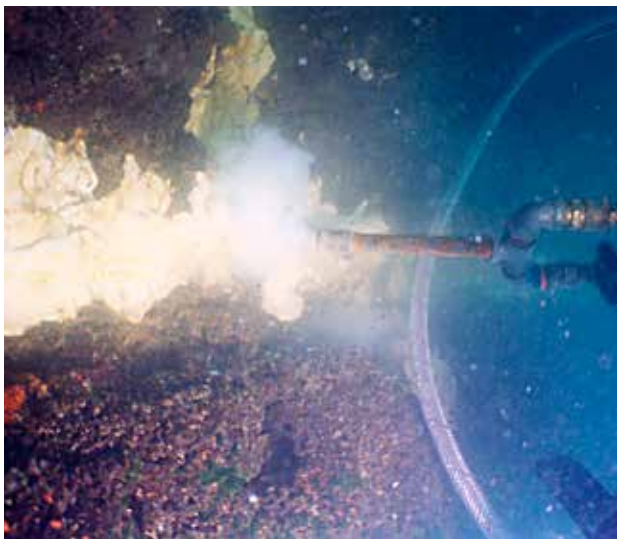
FX-764 is a 100% solids, two-component, moisture-insensitive epoxy resin system ideal for concrete, steel and timber pile repairs above or below the water line in marine environments.

Performance Features:

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

Where to Use:

- Underwater repairs to concrete, wood and steel



Installation

An in-place repair begins by placing spacers and 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.

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 mixed with FX-701 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 can now be removed. The repair is complete.

For detailed installation instructions, visit **strongtie.com/rps**.

Watch How to Install FX-70® Jackets in Water at **strongtie.com/videolibrary**.

STRENGTHEN

Reinforcement Solutions Using Composite Strengthening Systems™

Simpson Strong-Tie® Composite Strengthening Systems™ (CSS) provide efficient solutions for the structural reinforcement of structures in need of repair or upgrade. This fiber-reinforced polymer (FRP) system features a complete line of fabrics, saturants and precured laminate, and is designed to the specific requirements of each project.

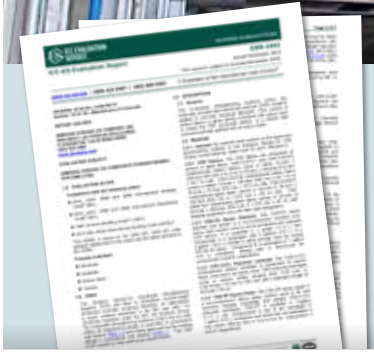
Strengthening Solutions Using Composite Strengthening Systems™

Simpson Strong-Tie® Composite Strengthening Systems™ (CSS) are engineered, specified and installed to solve a host of structural deficiencies or demands in existing structures.

- Durability problems due to poor or inappropriate construction materials
- Inadequate design or construction
- Increased loading requirements due to changes of policy or use of structures
- Aggressive environments not properly assessed during the design stages
- Increased life-span requirements made on aging infrastructure
- Exceptional or accidental loading
- Seismic strengthening
- Blast mitigation

CSS® Advantages

- Economically increase capacity without significant weight or mass
- Extremely high tensile strength
- Single source engineering and materials
- Very lightweight and easy to work with
- Non-corrosive
- Low aesthetic impact
- Compatible with many finish and protective coatings
- No-cost engineering services and technical support



Featuring the first code-compliant precured laminate in North America

Our fiber-reinforced polymer (FRP) solutions are now code listed. With this code report, Simpson Strong-tie offers the first code-compliant precured laminate in North America. As part of our Composite Strengthening Systems™, our code-listed carbon fabrics also provide some of the highest design values on the market.

Our fabrics include both unidirectional and bidirectional carbon and E-glass, and our precured laminate can be ordered and cut to size.

Strengthening Solutions Using Composite Strengthening Systems™

Traditionally employed in applications requiring high strength-to-weight ratio and rigidity like the civil, aerospace, and automotive industries, these advanced fiber-reinforced polymer (FRP) composite materials act like external rebar for concrete and masonry elements. Composites can be used in similar configurations to rebar but are applied on the exterior surface of the element being strengthened.

CSS® enhances the structural capacity of existing structural elements which require additional strengthening, rehabilitation and repair in such applications as seismic retrofit, structural preservation, force protection, blast mitigation, and corrosion-related repair and rehabilitation. CSS effectively increases capacity where adding weight or mass through traditional strengthening methods is not feasible.

System Solutions for Reinforcement

Type	Slab	Beam	Wall	Column/Pile
Externally Applied Laminates	Flexural/Collector	Flexural/Collector	Tensile/Flexural	Flexural
Near-Surface Mounted Laminates	Flexural/Collector	Flexural/Collector	Tensile/Flexural	Flexural
Fabrics	Flexural/Collector	Shear/Flexural/Collector	Shear/Flexural/Tensile	Shear/Flexural/Confinement

1. Slab — Adds collector reinforcement, negative (not shown) and positive moment flexural capacity

2. Slab opening — Trim reinforcement

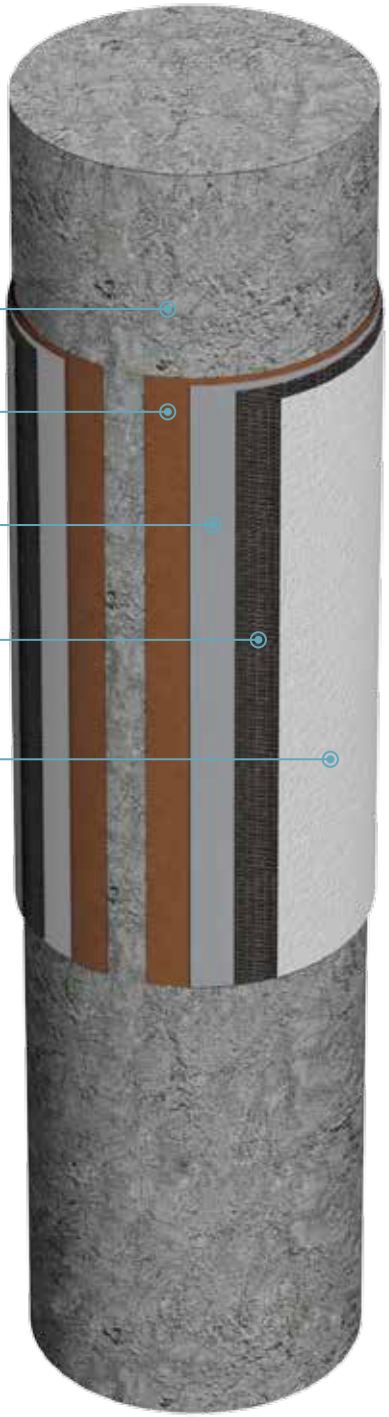
3. Beam — Laminates or fabrics for flexure and/or collector reinforcement, fabrics for shear stirrup reinforcement and potential use of FRP anchors (shown in orange)

4. Wall — Stiffening, flexural, shear or tensile reinforcement

5. New wall opening — Trim reinforcement

6. Column wrapping — Full column wrap to achieve required strengthening, possibly with additional near-surface mounted laminates or fabric for flexure; effective solution for under-reinforced column ties

Components



Several types of FRP fabrics are available to meet specifier and contractor requirements. Field lamination provides flexibility and short installation times, resulting in lower labor costs and less downtime than traditional retrofit methods.

Carbon Fiber Fabrics

Code-Listed Unidirectional Carbon Fabric

CSS-CUCF11* – 11 oz./yd.^{2} (370 g/m^2)
CSS-CUCF22* – 22 oz./yd.^{2} (740 g/m^2)
CSS-CUCF44* – 44 oz./yd.^{2} (1490 g/m^2)

Unidirectional Carbon Fabric

CSS-UCF10 – 10 oz./yd.^{2} (340 g/m^2)
CSS-UCF20 – 20 oz./yd.^{2} (680 g/m^2)

Bidirectional Carbon Fabric

CSS-BCF06 (0/90) – 6 oz./yd.^{2} (204 g/m^2)
CSS-BCF018 (0/90) – 18 oz./yd.^{2} (611 g/m^2)
CSS-BCF418 (+/−45) – 18 oz./yd.^{2} (611 g/m^2)

E-Glass Fiber Fabrics

Code-Listed Unidirectional E-Glass Fabric

CSS-CUGF27* – 27 oz./yd.^{2} (915 g/m^2)

Code-Listed Bidirectional E-Glass Fabric

CSS-CBGF424* (+/−45) – 24 oz./yd.^{2} (814 g/m^2)

Bidirectional E-Glass Fabric

CSS-BGF012 (0/90) – 12 oz./yd.^{2} (407 g/m^2)
CSS-BGF018 (0/90) – 18 oz./yd.^{2} (611 g/m^2)

Epoxies

Epoxy Primer and Saturant

CSS-ES is a two-component, high-strength, high-modulus epoxy resin used to prime substrates and saturate CSS fabrics. When extended with fumed silica, thickened CSS-ES is used as a high-performance substrate repair material and CSS finish coating.

Underwater Epoxy Saturant

CSS-UES is a two-component, high-strength, high-modulus epoxy resin which cures underwater to saturate CSS fabrics for submerged columns and strengthening of FX-70 pile restoration applications. applications. When extended with fumed silica, thickened CSS-UES is used as a high-performance substrate repair material and CSS finish coating.

Epoxy Paste and Filler

CSS-EP is a two-component, high-strength, high-modulus epoxy paste system used to fill and transition irregular substrates and adhere CSS laminates.

Components (cont.)

Code-Listed Carbon Fiber Laminate

CSS-CUCL* is an epoxy-based, pultruded, unidirectional, high-strength, non-corrosive carbon-fiber-reinforced polymer (CFRP) precured laminate for structural reinforcement applications. Available in a variety of widths and thicknesses and may be cut to length for external or near-surface mounted applications.

FRP Anchors

High-strength, non-corrosive CSS-CA carbon or CSS-GA E-Glass FRP anchors are field laminated and used to carry load into the concrete to improve bond, or through the concrete to provide a continuous load path.

Protective Coatings

Elastomeric Metal Coating

FX-501MS Elastomeric Metal Coating is a high-performance, sprayable, single-component, flexible, water-based acrylic elastomeric coating with integral rust inhibitors and exceptional crack-bridging properties.

Water-Based Acrylic Coating

FX-505 Water-Based Acrylic Coating is a single-component, fast-drying, protective architectural coating for concrete, masonry and stucco.

Epoxy Coating

FX-70-9™ Epoxy Coating is a 100% solids, two-component, moisture-tolerant, high-build protective coating designed to protect steel, concrete and wood.

Aliphatic Urethane Coating

FX-442 Aliphatic Urethane Coating is a two-component, UV-stable, high-solids, chemically resistant polyurethane coating.

Slurry Seal

FX-207 Slurry Seal is a two-component, polymer-modified cementitious coating designed for waterproofing and damp-proofing concrete and masonry substrates.

Fire Coating

FX-207 Slurry Seal may be applied over CSS FRP fabrics for fire insulation providing a 4-hour rated system per ASTM E119 and UL 263. And also provide a Class A finish for ASTM E84 flame-spread and smoke-developed classification.

Structural Concrete Fiber-Reinforced Composite System
Fire Resistance Classification
See UL Fire Resistance Directory
(R37897)


Carbon Fiber Laminate


Carbon FRP Anchor


Reinforced Bridge with Protective Surface Coating

* Code-listed fabrics and laminates have been evaluated per ICC-ES AC125 for concrete and unreinforced masonry strengthening using externally bonded fiber-reinforced polymer (FRP) composite systems.

REPAIR

General Concrete Repair

Corrosion and improper design or placement of reinforcement are leading factors that can weaken concrete structures. Simpson Strong-Tie offers a complete range of versatile product solutions to address concrete repair and protection against marine exposure, corrosion, chemical attack, abrasion and other environmental factors.

General Concrete Repair

Simpson Strong-Tie offers an extensive range of versatile product solutions to address concrete repair in a variety of climate and environmental conditions.

Reinforcing Steel Primers

FX-406 Zinc-Rich Primer

Single-component, fast-drying, zinc-rich coating.

FX-408 Zinc-Rich Epoxy Primer

Two-component, zinc-rich epoxy barrier coating.

Bonding Agents

FX-752 Epoxy Bonding Agent

100% solids, two-component, moisture-tolerant epoxy system.

FX-792LPL Long Pot Life Epoxy Bonding Agent

Two-component, 100% solids, moisture-tolerant epoxy resin with long pot life for warm-weather applications.

Cementitious Repair Products

FX-32GMF Repair Mortar with Fibers

High-performance, single-component, shrinkage-compensated repair mortar that incorporates a high-range water reducer for easy placement and workability.

FX-261S Form and Pour Repair Mortar

Cementitious, single-component, fiber-reinforced, polymer-modified, silica fume–enhanced, shrinkage-compensated structural repair mortar with integrated corrosion inhibitor designed with a slower set time for formed applications.

FX-263 Rapid-Hardening Vertical/Overhead Repair Mortar

Cementitious, single-component, fiber-reinforced, polymer-modified, silica fume–enhanced structural repair mortar with integral corrosion inhibitor.

FX-922 Fast-Setting Hydraulic Cement Mortar

Rapid-hardening mortar designed for stopping active leaks in concrete and general patching of concrete and masonry.

Epoxy-Based Repair

FX-763 Low-Modulus Trowel-Grade Epoxy

Two-component, 100% solids, moisture-tolerant, non-sag epoxy designed for vertical, horizontal and overhead applications.

Methyl-Methacrylate Repair

FX-826 Polymer Mortar

Two-component, flowable, rapid-hardening, chemical-resistant, methyl methacrylate (MMA) resin mortar designed for concrete repairs that require high early strength. Cold weather patching down to 20°F (-7°C).

For complete information including product and safety data sheets, please visit **www.strongtie.com/rps.**

Underwater/Waterline Repair

Working at or below the waterline in marine structures poses unique installation challenges for contractors. To reduce preparation and repair cycle times, our underwater repair products do not require forming or the construction of cofferdams.

Cement Based

FX-70-8DP™ Underwater Repair Mortar

Single-component, rapid-hardening, cementitious repair mortar designed for hand-pack applications underwater.

FX-225 Non-Shrink Underwater Grout

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 machinery, fiberglass pile jackets and repair deteriorated concrete without dewatering.

Epoxy Based

FX-764 Splash Zone and Underwater Paste

Two-component, 100% 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, anchoring, doweling, pinning and general repair of concrete, steel and wood.

FX-70-6 1:1™ Marine Epoxy Grout

Three-component, 100% solids, moisture-tolerant epoxy grout specifically designed for improved pumping characteristics as part of the FX-70® Structural Repair and Protection System.

FX-70-6MP™ Multi-Purpose Marine Epoxy Grout

Three-component, 100% solids, moisture-tolerant epoxy grout specifically designed for underwater applications as part of the FX-70® Structural Repair and Protection System.

Epoxy Injection Resins

ETI Epoxy-Based Injection – Structural

Dispensed through metered pressure injection equipment or through a static mixing nozzle using either a manual, a battery-powered or a pneumatic dispensing tool, these epoxies provide a waterproof, high-strength structural repair.

ETI-SLV Super-Low-Viscosity Structural Injection Resin

Specifically designed for pressure injection of concrete cracks and gravity-feed flood-coat crack-filling applications. Repairs hairline cracks (0.002 in./0.051 mm) and cracks up to ¼ in./6.35 mm in width. Meets or exceeds AASHTO M-235 and ASTM C881 Type I and IV, Grade 1, Class B and C.

ETI-LV Low-Viscosity Structural Injection Epoxy

Ideal for increasing the bond between freshly placed repair mortars or concrete mixes and existing concrete. Repairs fine to medium cracks (1⁄64 in./0.40 mm to ¼ in./6.35 mm in width). Meets or exceeds AASHTO M-235 and ASTM C881 Type I and IV, Grade 1, Class C. Approved under NSF/ANSI standard 61.

ETI-GV Structural Injection Epoxy Gel

For use in vertical and horizontal crack sealing, securing injection ports and general concrete repair applications. Repairs medium cracks (3⁄32 in/2.38 mm – ¼ in./6.35 mm in width). Meets or exceeds AASHTO M-235 and ASTM C881 Type I and IV, Grade 3, Class C.

FX-741LV Low-Viscosity Fast-Setting Epoxy – Non-Structural

A two-component, 100% solids, moisture-tolerant epoxy designed for cold-weather applications or where a fast set time is required.

Also available in bulk packaging

Injection Accessories

E-Z-Click™ Injection System

The E-Z-Click injection system consists of a specially designed fitting and ports that take the mess out of your repair project while allowing you to work faster. The E-Z-Click injection fitting installs onto the end of the Optimix® mixing nozzle and clicks onto the E-Z-Click™ ports during injection.

ETR Concrete Repair and Paste-Over Epoxy

Ideal for pasting over the surface of cracks and attaching ports for pressure injection. The non-sag paste consistency enables paste-up on horizontal, vertical and overhead applications. Fast cure time means shorter time between paste-over and injection.

CIP-F Flexible Paste-Over Epoxy and Crack Sealant

A flexible, peelable and fast-curing polyurea paste-over material. It is used to temporarily seal cracks and to secure injection ports over concrete prior to epoxy or urethane foam injection repair.

FX-763 Low-Modulus Trowel-Grade Epoxy

A two-component, 100% solids, moisture-tolerant, non-sag epoxy designed for vertical, horizontal and overhead applications and uses.

FX-922 Fast-Setting Hydraulic Cement Mortar

A rapid-hardening mortar designed for stopping active leaks in concrete and for general patching of concrete and masonry.

Urethane Injection Resins

RPSInject™ Polyurethane Injection Resins – Non-Structural Waterproofing

RPSInject™ materials are single component, moisture-cured expanding polyurethanes that are injected as a liquid and cure into dense foam to fill cracks in concrete to stop and prevent water leaks and soil stabilization.

RPSInject™100 Super-Low-Viscosity / MDI-Hydrophobic

Cures to form a semi-rigid closed-cell waterproof foam that prevents water infiltration through hairline cracks in concrete and can be used for soil stabilization.

RPSInject™101 Low-Viscosity / MDI-Hydrophilic

Cures to form flexible open-cell foam with high-elongation properties designed to stop and prevent water leaks in concrete structures with continuous moisture exposure. It can be pumped as a single component or as a dual-component system with water and does not require the use of an accelerator.

RPSInject™102 Low-Viscosity / MDI-Hydrophobic

Cures to form flexible, closed-cell, waterproof foam. This material meets the requirements for NSF/ANSI Standard 61 Drinking Water System Components at a maximum surface area-to-volume ratio of 10cm^2/L.

RPSInject™103 Low-Viscosity/MDI-Hydrophobic

Cures to form flexible, closed-cell, waterproof foam. Reacts with small amounts of water and expands to form flexible, closed-cell, waterproof foam that prevents water infiltration through cracks in concrete. Reaction times can be adjusted with the use of RPSInject™110 Accelerator.

Injection Accessories

RPSInject™110 Accelerator

Catalyst designed to speed reaction times of all RPSInject™ urethane injection resins.

RPSInject™120 Injection Ports

Designed for high-pressure urethane injection. The ⅜" (9.5 mm) size is an economical plastic, tap-in port, while the ½" (12.7 mm) and ⅝" (15.9 mm) ports are a mechanical, expanding version. All RPSInject120 ports include Zerk fittings.

RPSInject™130 Pump Flush

Specially-formulated, non-flammable solvent designed to be used before application of RPSInject™ urethane products to ensure a moisture-free pumping system, and as a post-application cleaning solvent for pumping equipment and tools.

PROTECT

Performance Coatings

Environmental changes, vehicular traffic and chemicals used in processing can affect surface performance. Simpson Strong-Tie has developed an array of formulations designed to offer high-performance protection against marine exposure, corrosion, chemical attack, abrasion and other environmental factors present in most commercial and industrial facilities.

Cementitious

FX-207 Slurry Seal

Two-component, polymer-modified cementitious coating designed for waterproofing and damp-proofing concrete and masonry substrates. May be applied over CSS FRP fabrics for fire insulation and flame-spread/smoke-developed coating providing a 4-hour rated system per ASTM E119 and UL 263.

Decorative/Protective

FX-460 High-Performance Breathable Coating System

Long-lasting, self-cleaning, decorative and protective coating combined with a penetrating, water-repellent primer (FX-460P Water-Based Penetrating Sealer) for unparalleled protection of concrete and masonry structures. The FX-460 system utilizes a technologically advanced water-based silicone resin backbone that chemically bonds to the substrate to form a tough quartz-like mineral finish with outstanding weathering characteristics.

FX-501MHB High-Build Elastomeric Metal Coating

High-performance, brush-grade, single-component, flexible, water-based acrylic elastomeric coating with integral rust inhibitors and exceptional crack-bridging properties.

FX-501MS Elastomeric Metal Coating

High-performance, sprayable, single-component, flexible, water-based acrylic elastomeric coating with integral rust inhibitors and exceptional crack-bridging properties.

FX-505 Water-Based Acrylic Coating

Single-component, fast-drying, protective architectural coating for concrete, masonry and stucco.

Urethane / Polyurethane / Polyurea

FX-645 Brushable Polyurea

Two-component, UV-stable, 100% solids, chemical- and abrasion-resistant aliphatic polyurea coating designed to provide protection for steel, concrete and wood surfaces.

FX-442 Aliphatic Urethane Coating

Two-component, UV-stable, high-solids, chemical-resistant polyurethane topcoat.

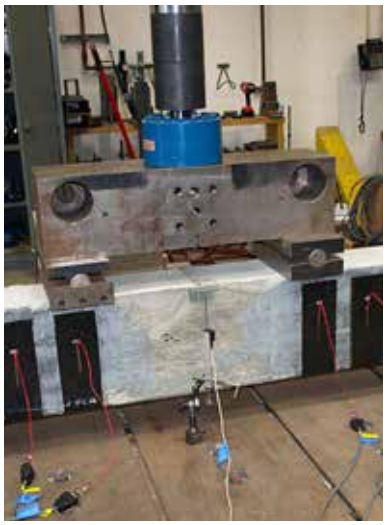
Simpson Strong-Tie – Your Full Solution Partner

Simpson Strong-Tie® Repair, Protection and Strengthening Systems offer the most complete and versatile solutions for restoration and rehabilitation of commercial, industrial, marine and agribusiness structures. More than fifty years of demonstrated excellence in structural engineering, product research, development and testing, and manufacture of the highest-quality structural construction components position Simpson Strong-Tie as the premier choice for performance-critical solutions.

Product Development

Our in-house, IAS-accredited testing and research facility gives us a distinct advantage in understanding how concrete, wood and steel structures perform and fail in challenging conditions, and we use this expertise to develop and test solutions in full-scale, real-world environments. The result is product solutions that address abrasion resistance, freeze/thaw cycling, marine borers, wet-dry cycles, UV-resistance, water intrusion and other factors that stress structures.

Our Repair, Protection and Strengthening Systems for concrete and masonry provide lab-tested, field-proven solutions. From the FX-70® Structural Pile Repair and Protection System to our Composite Strengthening Systems™ for reinforcing concrete, we are committed to providing long-term solutions to the most challenging problems.



Watch the FX-70® Pile Repair Cyclic Testing at **strongtie.com/videolibrary**.

The Tyrell Gilb Research Lab

The Tyrell Gilb Research Lab is the hub of our research and development activities. The lab's highly specialized equipment allows us to test a structure's ability to resist earthquakes, high winds and other natural disasters. Full-scale structural components are tested using the lab's seismic shake table and cyclic/static test frame.

The newest addition to the lab is a designated area to test our new line of Repair, Protection and Strengthening Systems for concrete and masonry. We now have the ability to submerge concrete, steel and timber piles in water to recreate marine conditions for our products used underwater.

No-Cost Engineering and Technical Services

We recognize that specifying Simpson Strong-Tie® Repair, Protection and Strengthening Systems is unlike choosing any other product we offer. Our experienced technical representatives and licensed professional engineers provide complementary design services and support for the entire repair cycle – serving as your partner in meeting the ongoing repair, protection and strengthening needs of your project. Our pledge is to address your specific condition with a complete repair plan tailored to your needs, minimizing downtime or loss of use, at the lowest possible installed cost.

Our No-Cost CSS and FX-70 Services Include:

Assessment

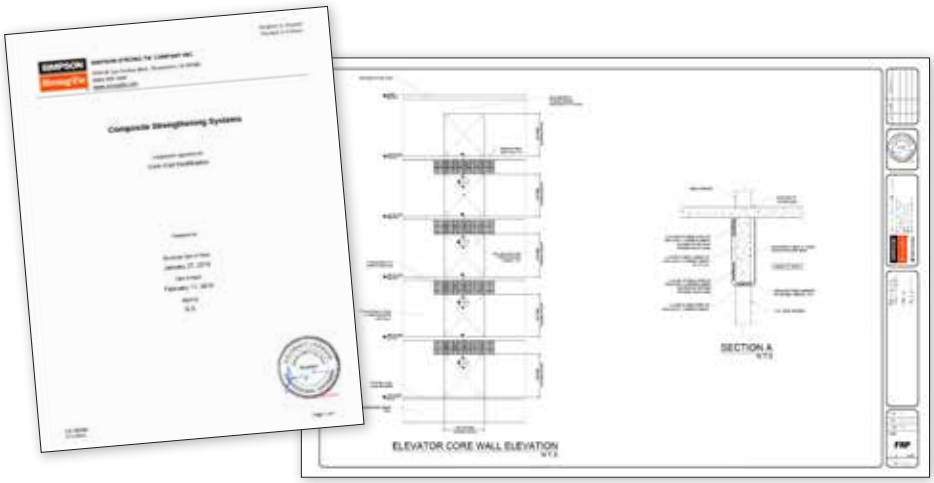
- Feasibility studies to ensure suitable solutions for your application
- Partnering with trained contractor to provide rough order-of-magnitude (ROM) budget estimating

Complete Engineering Package

- Specifications prepared for your unique project requirements
- Detailed proposal documentation, including drawings
- Calculations provided for Engineer of Record reference during submittal review (CSS only)
- Stamped and signed drawings (CSS only) in all 50 states and Canada

Training

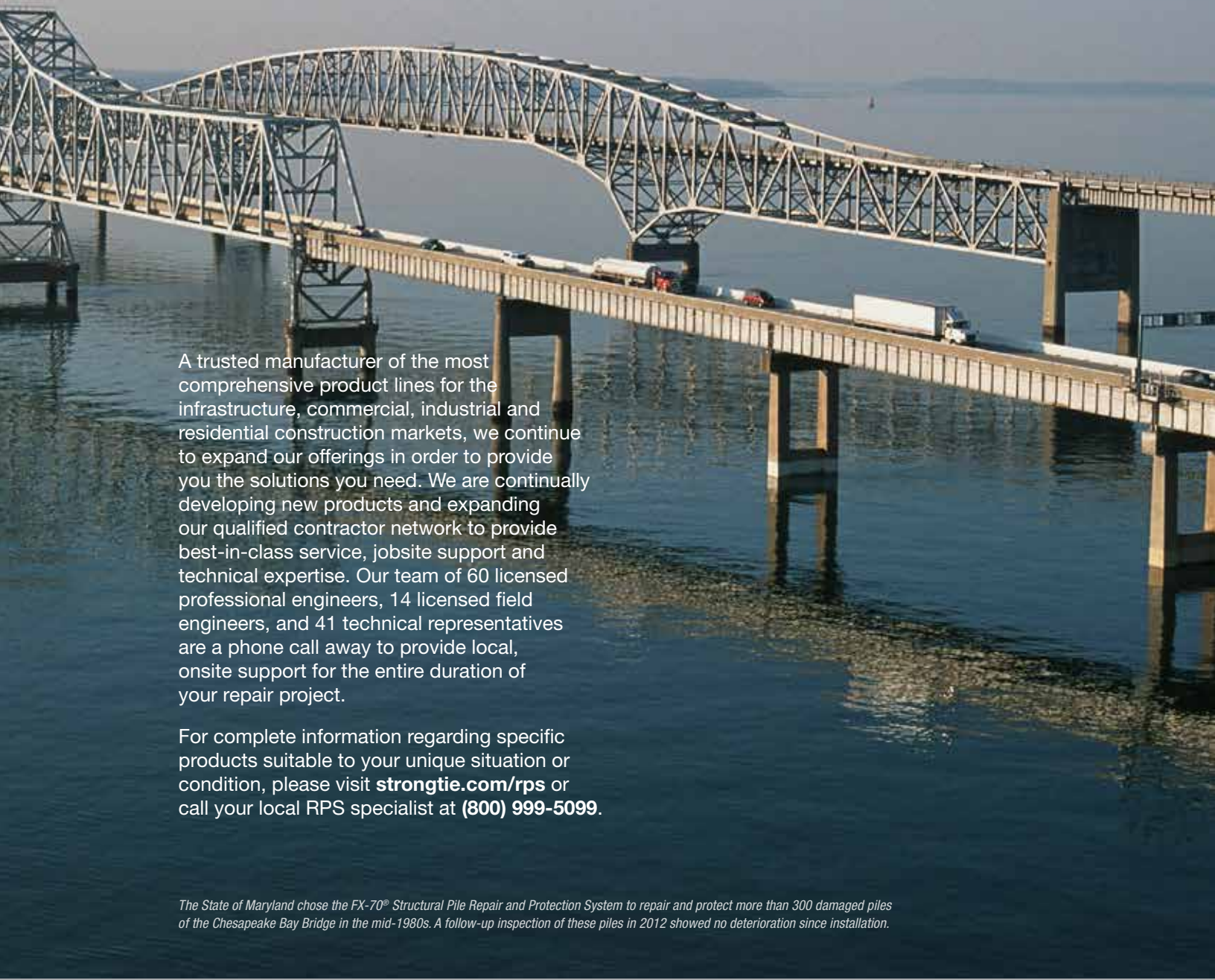
- Online, regional workshop and onsite training



Add Simpson Strong-Tie to Your Design Team

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.

Simpson Strong-Tie® Repair, Protection and Strengthening products are designed, tested and manufactured to offer high-performance solutions and lasting results.



A trusted manufacturer of the most comprehensive product lines for the infrastructure, commercial, industrial and residential construction markets, we continue to expand our offerings in order to provide you the solutions you need. We are continually developing new products and expanding our qualified contractor network to provide best-in-class service, jobsite support and technical expertise. Our team of 60 licensed professional engineers, 14 licensed field engineers, and 41 technical representatives are a phone call away to provide local, onsite support for the entire duration of your repair project.

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**.

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.

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