

FX-225

Non-Shrink Underwater Grout

SIMPSON

Strong-Tie

®

CSI Specification: 03.01.00 Maintenance of Concrete

DESCRIPTION

FX-225 Non-Shrink Underwater Grout is a flowable, high-strength, non-metallic, non-segregating grout designed with a special anti-washout admixture, corrosion inhibitors, and polymers. FX-225 can be pumped or tremied underwater to grout Simpson Strong-Tie® FX 70® and fiberglass pile jackets and as a structural repair mortar for formed applications above and below water without dewatering.

ASSESSMENT

WHERE TO USE

- Concrete repairs in marine structures
- Underwater grouting applications
- Pile jacket repairs with the FX-70 structural repair and protection system
- Seawall repairs without dewatering
- Form and pour repairs above water

FEATURES

- Flowable and pumpable
- No de-watering or cofferdams required
- Shrinkage compensated
- Bonds well to concrete
- May be extended with clean, washed nominal 3/8 in. (9 mm) pea gravel
- Ready to use — simply add potable water
- Suitable for saltwater marine applications

PRODUCT DATA

All testing performed at 73°F (23°C) and 50% R.H.

Generic Description

Cementitious underwater grout

Packaging

55 lb. (24.9 kg) bag (FX225)

2,500 lb. (1,134 kg) bulk bag (FX225-B2500)

Product Yield ASTM C138

0.47 ft.³ (0.013 m³) per 55 lb. (24.9 kg) bag

0.64 ft.³ (0.018 m³) per 55 lb. (24.9 kg) bag extended with 30 lb. (13.6 kg) of pea gravel

Working Time

30 minutes at 75°F (24°C)

Set Time

ASTM C191

Initial 2.5 hours minimum

Final 3.5 to 7 hours

Storage

Store dry between 40° and 95°F (4°–35°C)

Shelf Life

1 year in unopened packaging

VOC

0 g/L

TECHNICAL INFORMATION

The data herein is based on laboratory testing under controlled conditions. Variations may result from mixing methods and jobsite conditions. All testing performed at 73°F (23°C) and 50% R.H., unless otherwise noted. Results were performed using 134 fl. oz. (4.0 L) water per 55 lb. (25 kg) of FX-225.

Splitting Tensile Strength

ASTM C496

28 days 600 psi 4.14 MPa

Density

ASTM C138

134 lb./ft.³ 2,146 kg/m³

Compressive Strength

ASTM C109

24 hours 4,000 psi 27.5 MPa

3 days 5,000 psi 34.5 MPa

7 days 6,000 psi 41.3 MPa

28 days 7,000 psi 48.2 MPa

Height Change

ASTM C1090

Shows positive expansion

28 days

Less than 0.1% expansion

Volume Change

ASTM C827

Less than 0.5% expansion

Flexural Strength, 28 days

ASTM C348

1,200 psi 8.3 MPa

Freeze Thaw Resistance

ASTM C666, 300 cycles

100% durability factor

Bond Strength

ASTM C882M, hardened to plastic grout

28 days 3,000 psi

Modulus of Elasticity

ASTM C469, 29 days

4.9 x 10⁶ psi 33,780 MPa

Resistance to De-icing Salts

ASTM C672, 50 cycles

Excellent resistance – 0 grams loss / 0 visual rating

Bleeding

ASTM C232-C940

No bleeding

Length Change

ASTM C157

Wet Cured 0.03%

Dry Cured -0.18%

Flow Table

ASTM C1437 modified per ASTM C1107

75 – ideal for pump or tremie applications underwater

PLANNING

LIMITATIONS

- Do not apply in water temperatures below 40°F (4°C)
- Do not apply in water temperatures above 90°F (32°C)
- Underwater product placement should only be attempted only by certified and experienced diving contractors
- Underwater placement by pump or tremie only
- Always follow ACI 305 and 306 for hot or cold weather installations for best results beyond published recommendations
- Not designed as a leveling mortar, must be formed
- Do not mix partial bags
- Avoid contact with aluminum surfaces
- Site conditions can greatly affect cure times and product performance

Application Thickness Limits

	Annular Space FX-70 Jacket	Above Water Application	Underwater Application
Minimum Neat	2" (51 mm)	½" (13 mm)	1" (25 mm)
Maximum Neat	8" (203 mm)	3" (76 mm)	8" (203 mm)
Minimum Extended	3" (76 mm)	2" (51 mm)	2" (51 mm)
Maximum Extended	—	8" (203 mm)	24" (610 mm)

PREPARATION

SURFACE PREPARATION

FX-70 Jackets

Surface must be at least 35°F (2°C) prior to application. All surfaces must be sound, free of loose rust, marine growth, oil, and other contaminants. Consult a qualified professional engineer in all cases when section loss exceeds 25% only.

Concrete: Prepare surface by high-pressure water-blasting or other mechanical means to meet ICRI Guideline 310.2R CSP 6-9. Repair or replace any reinforcing steel as determined by a qualified professional engineer.

Steel: Prepare surface by high-pressure water-jetting or other mechanical means necessary to meet SSPC-SP12/NACE 5 WJ-4. Repair or replace any structural steel elements with excessive section loss as determined by a qualified professional engineer.

Wood: Prepare surface by high-pressure water-blasting or other mechanical means necessary to achieve a sound surface, free of all contaminants.

All submerged forms should be installed by certified professional divers. All forms must be sealed appropriately to prevent grout leakage during installation.

Formed applications: Concrete and reinforcing steel to receive repair mortar must be sound, clean, and free of all contaminants that could impair product adhesion, bond, or performance. Concrete should be a minimum of 28 days old or substantially cured to the equivalent design strength prior to FX-225 installation. Prepare concrete and reinforcing steel in accordance with ICRI Guideline 310.1R. Saw-cut the perimeter of the repair area, taking care to avoid cutting any reinforcing steel. Remove all loose or deteriorated concrete by chipping hammer, water jetting, or other mechanical means to reach sound concrete and achieve an open pore structure and surface profile per ICRI Guideline 310.2R CSP 5-9, taking care to avoid micro-cracking. Remove all corrosion, rust, and surface contaminants from reinforcing steel by sandblasting or other mechanical means. Remove all cleaning media and debris by water jetting, vacuum or blowing with high-pressure, oil-free air.

Above water applications: For added corrosion protection, prime exposed reinforcing steel with FX-406 Zinc-Rich Primer. Prior to installation of FX-225, saturate the surface with potable water by ponding or other means to achieve a saturate surface dry (SSD) surface condition. The substrate should be saturate surface dry (SSD) with no standing water remaining at the time of application. When impractical to achieve an SSD surface condition or to improve bond strength, apply a bonding agent such as FX-792LPL Long-Pot-Life Epoxy Bonding Agent to the repair area prior to FX-225 installation. FX-225 must be applied while bonding agent is still wet. Do not apply more bonding agent than can be effectively covered with FX-225 while remaining wet.

Forming: Forms must be liquid tight to prevent leakage during installation. Use appropriate sealants or putties to seal all surfaces to prevent leaks. Use an appropriate release agent prior to erecting forms to improve release. Do not allow release agent to be applied to any non-formed surfaces as it can inhibit the bond of FX-225.

MIXING

For optimal product performance, condition to 70°F (21°C). Do not prepare more material than can be used in the working time of the product. Mix with a mortar mixer or a low-speed (300–600 rpm) drill and mixing paddle. For best results, start with 90% of total mixing water and slowly add entire contents of FX-225 while mixing to avoid clumping. Adjust using remaining 10% of total mixing water until desired consistency is achieved scraping unmixed material from the sides and bottom of mixing container as needed to ensure all material is mixed. **Consult the printed instructions on the product package for the maximum recommended amount of mixing water.** Mix for approximately 3 minutes. Do not re-temper. Continue to slowly agitate to prevent product from setting in the mixer up to the maximum working time of 30 minutes at 75°F (24°C).

FX-225 can be extended with ¾ in. (9 mm) pea gravel up to 30 lb. (13.6 kg) per bag, and requires the use of a mortar or grout mixer with stationary barrel and moving mixing blades. Aggregate used must be nonreactive, clean, well graded, and saturated surface dry (SSD), have low absorption and high density in compliance with ASTM C1260, C227 and C289. Do not use limestone aggregate.

APPLICATION

FX-70 Jackets

For pumping applications, pump properly mixed FX-225 as follows: Install pumping ports at 90 degrees from tongue- and-groove joint, alternating sides. Place the first port approximately 1 ft. (30 cm) from the bottom of the jacket. Place subsequent ports at a maximum 5 ft. (1.5 m) vertical spacing, alternating sides. Begin pumping from the lowest port and move up from port to port. Do not exceed 10 ft. (3 m) pumping distance from any individual port.

For tremie applications, make sure the hose extends all the way to the bottom of the form. Fill the form to the desired level, allowing water to displace from the top of the form. Depending on the head pressure, depth of pour, and size of the vessel, the tremie hose may need to be retracted as the form fills to maintain flow.

All submerged jackets should be inspected by a certified professional diver during the filling process to check for leaks and proper placement.

Formed applications, below water

For pumping applications, pump properly mixed FX-225 as follows: Install pumping ports as required for the repair. Begin pumping from the lowest port and move up from port to port making sure the form is completely filled and the water is displaced. Do not exceed form design pressure rating.

For tremie applications, make sure the hose extends all the way to the bottom of the form. Fill the form to the desired level, allowing water to displace from the top of the form. Depending on the head pressure, depth of pour, and size of the vessel, the tremie hose may need to be retracted as the form fills to maintain flow. Do not exceed form design pressure rating.

Formed applications, above water

Remove all standing water by vacuum or blowing with oil-free, compressed air prior to installation. FX-225 must be installed on SSD concrete surfaces or in conjunction with a bonding agent. Take appropriate measures to protect repairs from wind and high temperatures until fully cured. Avoid applying in direct sunlight. Do not exceed form design pressure rating.

Installation with Bonding Agent: Immediately following FX-792LPL application, and while bonding agent is still wet, pour FX-225 into the form. Strike off with trowel or screed surface and allow product to set. Finish with a wood or sponge float, or broom.

Installations without Bonding Agent: Pour or pump FX-225 into the form. Strike off with trowel or screed surface and allow product to set. Finish with a wood or sponge float, or broom.

Curing: Immediately following finishing, wet-cure all exposed areas of FX-225 in accordance with ACI 308 or use an ASTM C309 compliant curing compound. The use of curing compounds may affect adhesion of subsequent surface treatments.

CAUTION

May cause serious eye and skin irritation or damage. When combined with water, may cause moderate to severe alkali burns. Contains silica; do not breathe dust.

Protective Measures: The use of safety glasses and chemical-resistant gloves is recommended. Use appropriate clothing to minimize skin contact. The use of a NIOSH-approved respirator is required to protect respiratory tract when ventilation is not adequate to limit exposure below the permissible exposure limit (PEL). Refer to Safety Data Sheet (SDS) available at strongtie.com/sds for detailed information.

FIRST AID

Eye Contact: Immediately flush eyes with plenty of cool water for at least 15 minutes while holding the eyes open. If redness, burning, blurred vision, or swelling persists, seek medical advice.

Skin Contact: Remove product and wash affected area with soap and water. Do not apply greases or ointments. Remove contaminated clothing. Wash clothing with soap and water before reuse. If redness, burning, or swelling persists, seek medical advice.

Ingestion: DO NOT INDUCE VOMITING. Seek medical advice. Never administer anything by mouth to an unconscious person. Rinse mouth out with water. Never leave affected person unattended. If vomiting occurs spontaneously, lay affected person on their side, keeping head below hips to prevent aspiration of material into lungs.

Inhalation: Remove affected person to fresh air. If affected person continues to experience difficulty breathing, seek medical advice.

CLEAN-UP

Spills: Sweep or vacuum material and place in a suitable container. Keep out of sewers, storm drains, surface waters, and soils.

Surface Clean: Remove any residue with hot soapy water. Cured material can be removed only by mechanical means.

Tools and Equipment: Clean with soap and water immediately after use.

Skin: Use a non-toxic, pumice-based soap, citrus-based hand cleaner, or waterless hand-cleaner towel. Never use solvents to remove product from skin.

Disposal: Dispose of container and unused contents in accordance with federal, state, and local requirements. Containers may be recycled; consult local regulations for exceptions.

LIMITED WARRANTY

This product is covered by the Simpson Strong-Tie RPS Product One-Year Limited Warranty, which is available at strongtie.com/limited-warranties or by calling Simpson Strong-Tie at (800) 999-5099.

IMPORTANT INFORMATION

It is the responsibility of each purchaser and user of each product to determine the suitability of the product for its intended use. Prior to using any product, consult a qualified design professional for advice regarding the suitability and use of the product, including whether the capacity of any structural building element may be impacted by a repair. As jobsite conditions vary greatly, a small-scale test patch is required to verify product suitability prior to full-scale application. The installer must read, understand, and follow all written instructions and warnings contained on the Limited Warranty, product label(s), Product Data Sheet(s), Safety Data Sheet(s), and the strongtie.com website prior to use. For industrial use only by qualified applicators. KEEP OUT OF REACH OF CHILDREN!

 **WARNING!** Cancer and reproductive harm — www.P65Warnings.ca.gov.