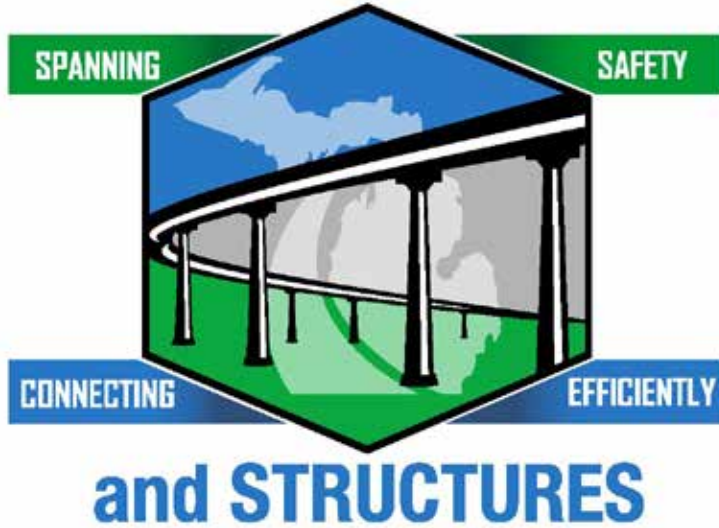


# BUREAU of BRIDGES



**Statewide Bridge Support Unit  
Bridge Preservation  
Bureau of Bridges and Structures**

## Fiberglass Column Jacket Repair



2024 Michigan Bridge Week Conference – Maintenance Track



# Agenda

- § Extent of damage
- § Repair Options
- § Column Preparation Including depth of chipping & blasting
- § Fiberglass Jacket Installation
- § Epoxy Grout Installation
- § Other Projects
- § Summary

**Jacob Creisher, P.E.**  
Engineer Manager  
Statewide Bridge Support  
Unit  
(517) 243-7821

**Aaron Porter**  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

**Tom Ranck**  
Engineer  
Statewide Bridge Support  
Unit  
(517) 242-2077

**Cliff Graves**  
Statewide Concrete  
Specialist  
(517) 275-1710



# Extent Of Damage



**Jacob Creisher, P.E.**  
Engineer Manager  
Statewide Bridge Support  
Unit  
(517) 243-7821

**Aaron Porter**  
Statewide Bridge  
Support &  
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(517) 275-1710



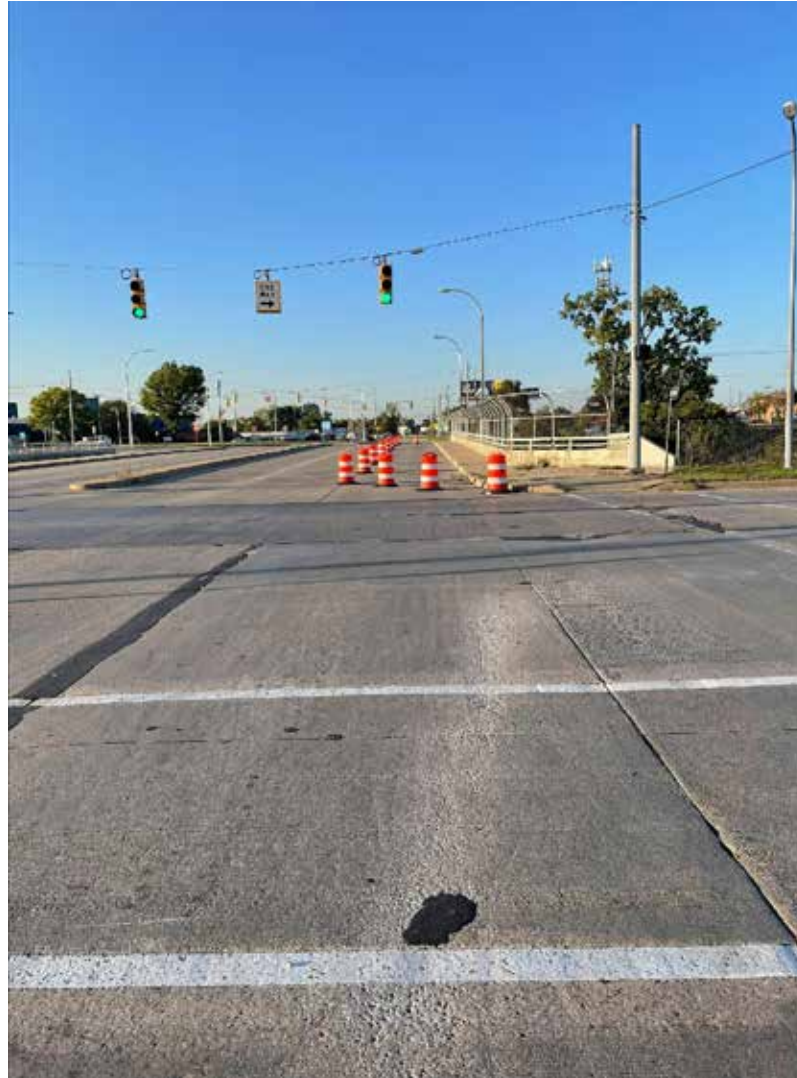
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Engineer Manager  
Statewide Bridge Support  
Unit  
(517) 243-7821

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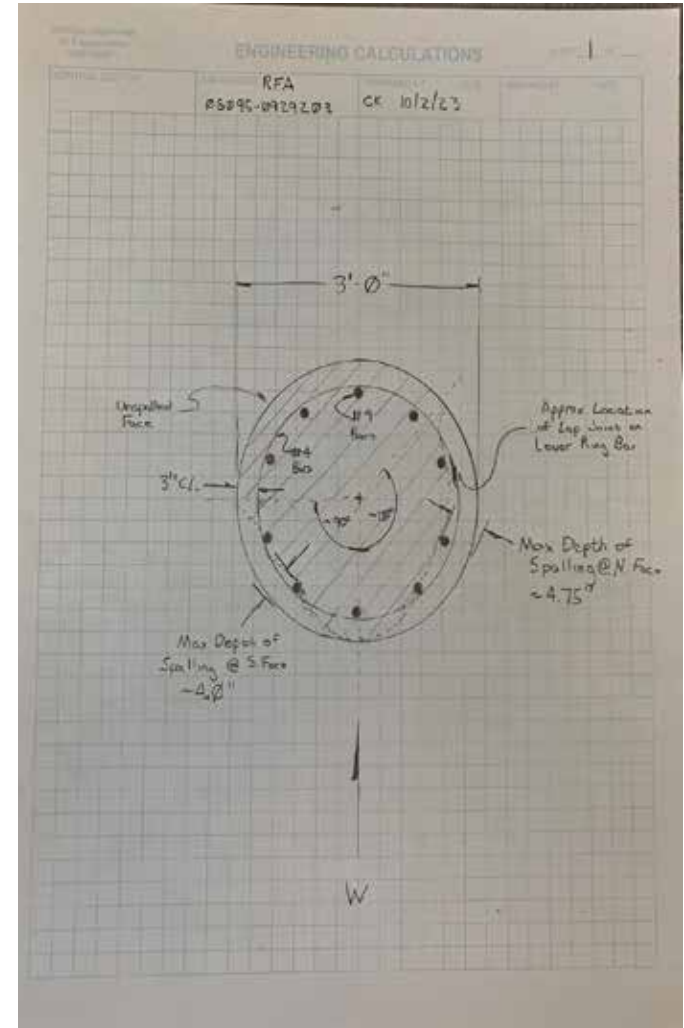
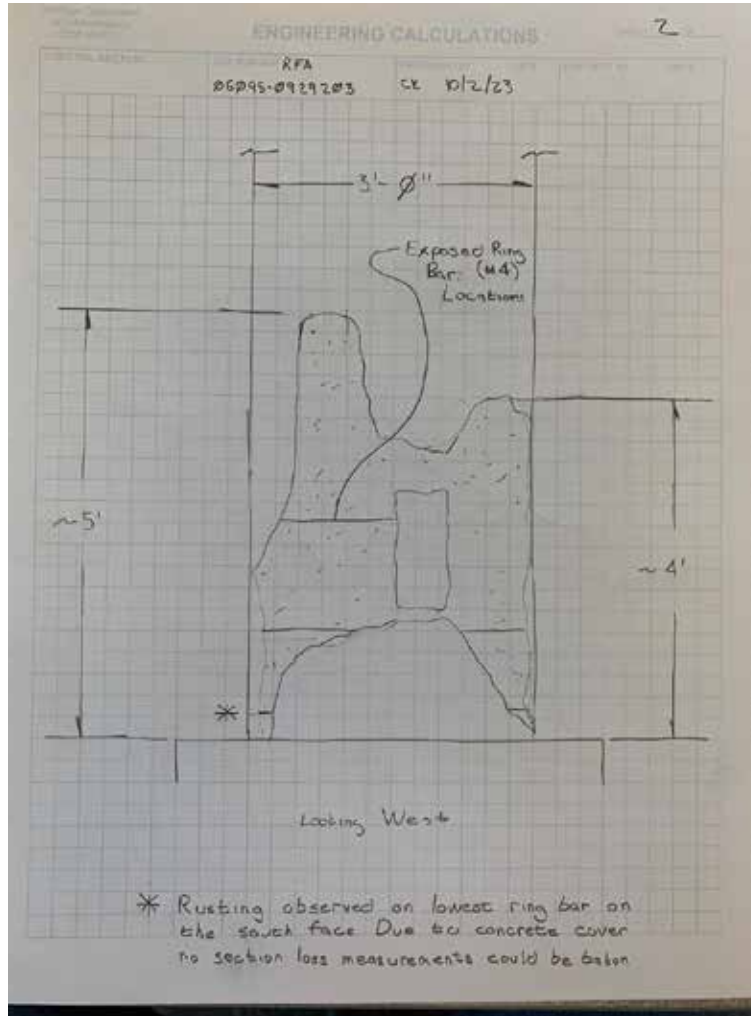
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**Jacob Creisher, P.E.**  
 Engineer Manager  
 Statewide Bridge Support  
 Unit  
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 (517) 275-1710



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(517) 275-1710



# Repair Options

## Repair Options

§ Pier Column Repair – Could do it in house.

§ Remove unsound concrete

§ Sand blast the concrete area and exposed reinforcement

§ Would require forming a column

§ Recast using Latex concrete

§ The latex concrete could be made on site or by a special contractor

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# Repair Options

## Repair Options

### § Pier Column Replacement

- § Out of in-house capability
- § Would not be able to do it before winter
- § Expensive to contract out
- § Would involve temporary supports
- § Longer construction time

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# Repair Options

## Repair Options

### § Fiberglass column jacket repair

- § Could easily do it with In-house forces
- § It is practical and can be done in a few days
- § Cost-effective and is a long-term solution
- § High strength materials bonds well with existing concrete
- § Protective system prevents corrosion, deterioration, and weathering
- § Easily blends with existing structure

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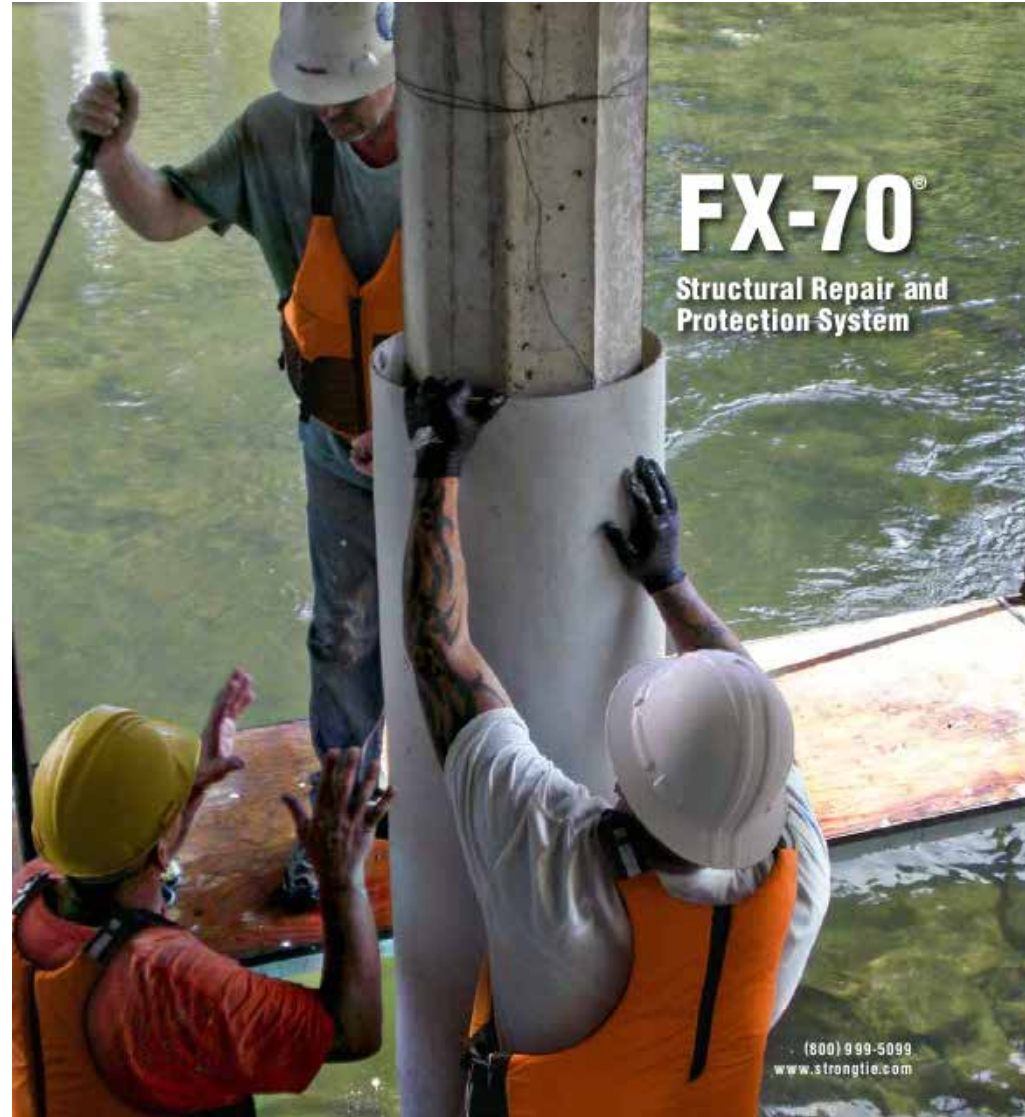
# Simpson Strong-Tie FX-70

**Jacob Creisher, P.E.**  
Engineer Manager  
Statewide Bridge Support  
Unit  
(517) 243-7821

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Statewide Bridge  
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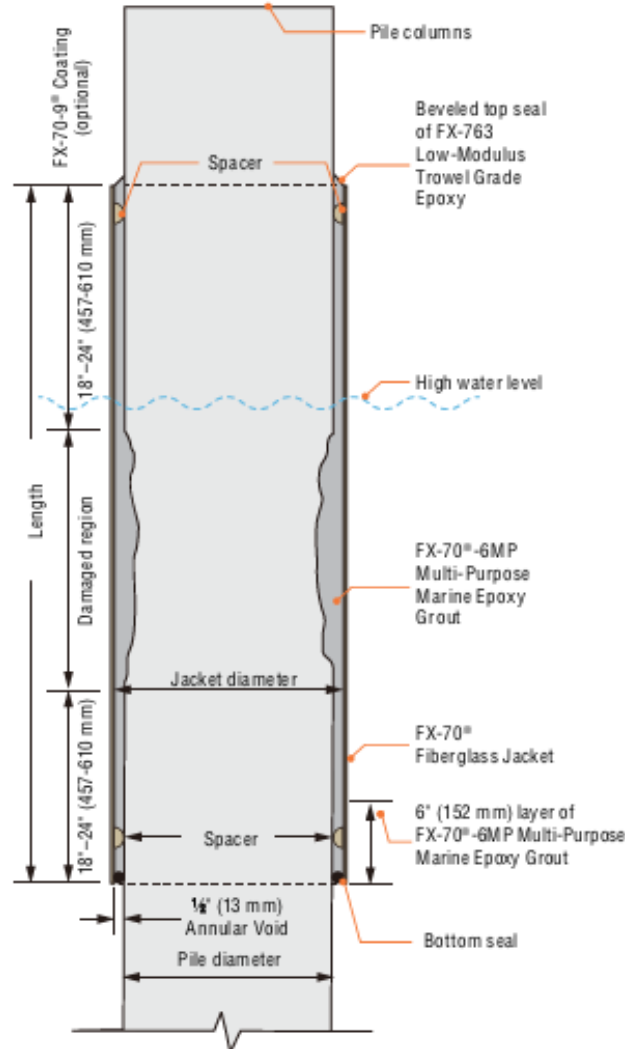
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Statewide Concrete  
Specialist  
(517) 275-1710





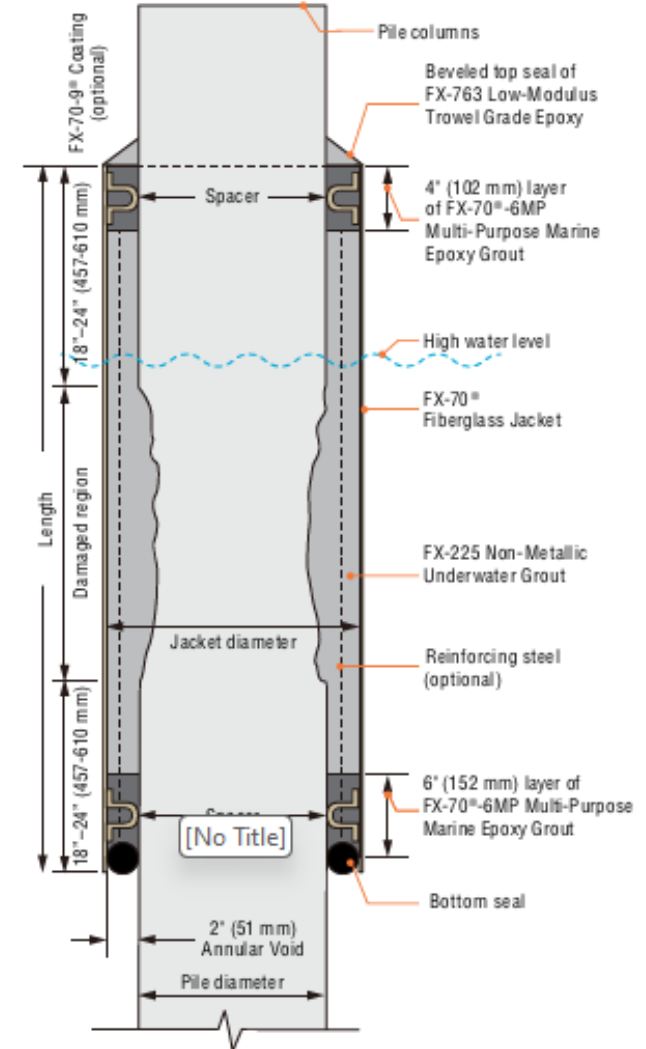
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Section Loss  $\leq 25\%$



Section Loss  $\leq 25\%$

Section Loss  $> 25\%$



Section Loss  $> 25\%$

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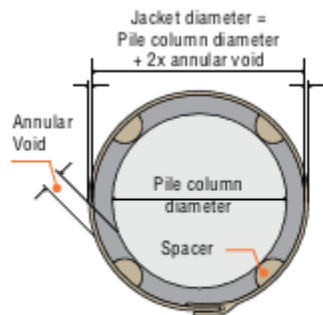
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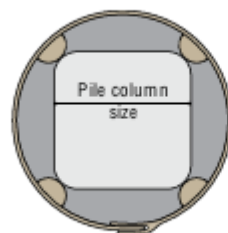
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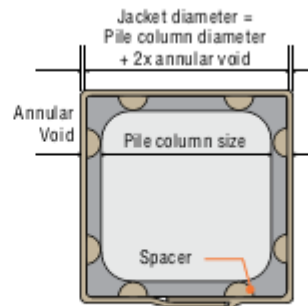
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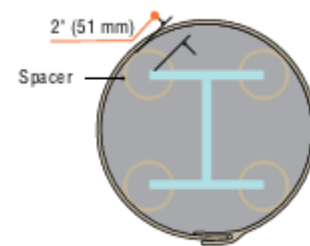
MODEL ONE



MODEL TWO



MODEL THREE



MODEL FOUR

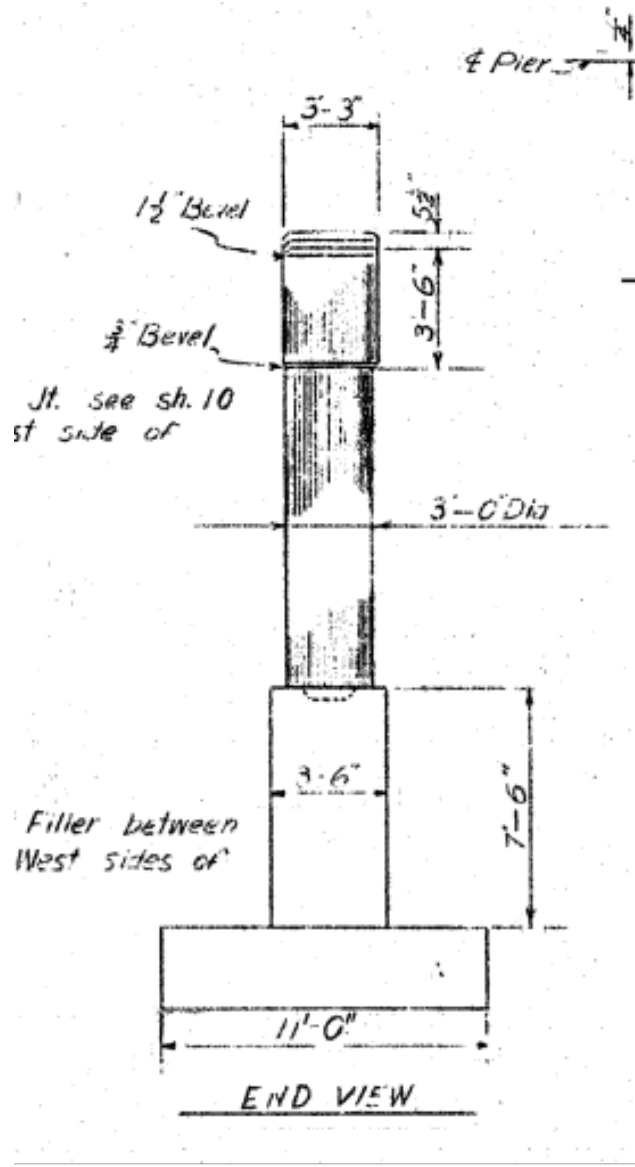
## CROSS-SECTION OF TONGUE-AND-GROOVE JOINT







# Substrate Preparation



**Jacob Creisher, P.E.**  
 Engineer Manager  
 Statewide Bridge Support  
 Unit  
 (517) 243-7821

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$$42'' - 36'' - 0.75'' - 0.75'' = 4.5''$$

$$4.5'' / 2 = 2.25'' \text{ between column \& chamfer}$$

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Unit  
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Statewide Concrete  
Specialist  
(517) 275-1710



# Other Projects



**Jacob Creisher, P.E.**  
Engineer Manager  
Statewide Bridge Support  
Unit  
(517) 243-7821

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Statewide Bridge  
Support &  
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# Fiberglass Jacket Specifications

## SeaShield™ FX-70™ Fiberglass Jacket

High-Strength Fiberglass Interlocking Jacket



### DESCRIPTION

The SeaShield FX-70 high-strength fiberglass protective jacket is a fiber-reinforced plastic (FRP) composite that is used as a stay-in-place form in the SeaShield Series FX-70 structural pile repair and protection system. When used with our specialty underwater grouts, this system allows repairs to be made to concrete, wood and steel structures that are submerged or in tidal zones without constructing costly cofferdams. The custom-made FRP jackets are available in a variety of shapes and sizes.

### WHERE TO USE

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

### FEATURES

- Repair damage in place, with no need to dewater or take the structure out of service
- Corrosion-free system prevents deterioration, weatherizing and erosion
- Accommodates piles of various shapes and sizes – round, square, H-Piles, or custom shapes
- Suitable for marine environments

ASSESSMENT

### PRODUCT DATA

**Generic Description**  
Fiberglass composite

**Available Shapes and Sizes**

Thickness –  $\frac{1}{8}$ ",  $\frac{3}{16}$ ",  $\frac{1}{4}$ "

Shapes – round, square, H-Piles, octagonal, and custom

Colors – translucent and gray. Other colors available upon request.

### TECHNICAL INFORMATION

**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%

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# Epoxy Grout Specifications

## SeaShield™ FX-70-6MP™

Multi-Purpose Marine Epoxy Grout



CSI Specification: 03 63 00 Epoxy Grouting

### DESCRIPTION

SeaShield 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 SeaShield Series FX-70™ Structural Repair and Protection System.

### ASSESSMENT

#### WHERE TO USE

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

#### FEATURES

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

### PRODUCT DATA

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

#### Generic Description

Underwater Epoxy Grout

#### Color

Dark tan

#### Mixing Ratio

Epoxy: 2A:1B

Filler: 100–150 lb. (45–68 kg) per 3 US gallon (11.4 L) unit of epoxy

#### Product Yield

1.07 ft.<sup>3</sup> (0.030 m<sup>3</sup>) for 3 US gallon (11.4 L) + 2 bags mix

1.34 ft.<sup>3</sup> (0.038 m<sup>3</sup>) for 3 US gallon (11.4 L) + 3 bags mix

#### Pot Life

45 minutes at 70°F (21°C)

#### Storage

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

#### Shelf Life

2 years in unopened packaging

#### VOC

2 g/L (mixed)

### TECHNICAL INFORMATION

All testing performed at 73°F (23°C) and 50% R.H. (+/- 2°F (1.1° C))

	Standard Flow <sup>2</sup>		High Flow <sup>1</sup>	
<b>Compression Strength</b>				
<b>ASTM C579, Test Method B</b>				
<b>1 day</b>	4,300 psi	29.6 MPa	3,600 psi	24.8 MPa
<b>2 days</b>	5,500 psi	37.9 MPa	4,900 psi	33.8 MPa
<b>3 days</b>	6,500 psi	44.8 MPa	6,000 psi	41.4 MPa
<b>4 days</b>	8,700 psi	60.0 MPa	7,800 psi	53.8 MPa
<b>7 days</b>	9,500 psi	65.5 MPa	7,900 psi	54.5 MPa
<b>28 days</b>	11,000 psi	75.8 MPa	9,900 psi	68.3 MPa
<b>Flexural Strength</b>				
<b>ASTM C580, 7 days</b>				
<b>Ambient</b>	3,500 psi	24.1 MPa	2,900 psi	20.0 MPa
<b>Tangent Flexural Modulus</b>				
<b>ASTM C580, 7 days</b>				
<b>Ambient</b>	3.8 x 10 <sup>6</sup> psi	2,600 MPa	3.1 x 10 <sup>6</sup> psi	2,100 MPa
<b>Tensile Strength</b>				
<b>ASTM C307</b>				
<b>7 days</b>	1,800 psi	12.4 MPa	1,700 psi	11.7 MPa
<b>Shrinkage (Unrestrained Linear)</b>				
<b>ASTM C531</b>	0.08%		0.09%	
<b>Effective Bearing Area</b>				
<b>ASTM C1339</b>	>85% – high			
<b>Density</b>				
<b>ASTM C905</b>				
<b>Uncured</b>	131 lb./ft. <sup>3</sup>	20.61 KN/m <sup>3</sup>	118 lb./ft. <sup>3</sup>	18.56 KN/m <sup>3</sup>
<b>Bond Strength to Concrete</b>				
<b>ASTM C882</b>				
<b>7 days</b>	2,500 psi	17.2 MPa		

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Statewide Concrete  
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# Aggregate Specifications

## Tech Data

Properties	150 lbs Aggregate/ 3 Gallons of Epoxy	100 lbs Aggregate/ 3 Gallons of Epoxy
<b>Compression Strength (ASTM C579, Test Method B)</b>		
1 Day	4,300 psi (29.6 MPa)	4,300 psi (29.6 MPa)
3 Days	6,500 psi (37.9 MPa)	6,500 psi (37.9 MPa)
7 Days	9,600 psi (72.4 MPa)	7,8000 psi (72.4 MPa)
28 Days	11,200 psi (75.8 MPa)	9,9500 psi (75.8 MPa)
<b>Flexural Strength (ASTM C580, 7 days)</b>		
Ambient	3,640 psi (29.6 MPa)	4,300 psi (29.6 MPa)
<b>Tangent Flexural Modulus (ASTM C580, 7 days)</b>		
Ambient	3.8 x 10 <sup>5</sup> psi (2,600 MPa)	3.1 x 10 <sup>5</sup> psi (2,100 MPa)
<b>Tensile Strength (ASTM C307, 7 days)</b>		
Ambient	2,200 psi (13.8 MPa)	2,200 psi (13.8 MPa)
<b>Density (ASTM C906)</b>		
Uncured	132 lb/ft <sup>3</sup> (21.1 KN/m <sup>3</sup> )	119 lb/ft <sup>3</sup> (19.1 KN/m <sup>3</sup> )
<b>Bond Strength to Concrete (ASTM C882)</b>		
7 days	2,000 psi (13.8 MPa)	2,000 psi (13.8 MPa)
<b>Hardness (ASTM D2240-02)</b>		
	Shore D 82	Shore D 82

Can't →

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# Epoxy Grout Installation



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**BUREAU of BRIDGES**

SPANNING

SAFETY

CONNECTING

EFFICIENTLY

and **STRUCTURES**

# Epoxy Grout Installation



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# Other Projects

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# BUREAU of BRIDGES



Item	Product Description	Qty	Unit	Price	Total
1	<b>SeaShield Fiber-Form Jackets - 37"ID</b> (1 ea. 38" ID x 7') <i>3/16" thick, two-piece, tongue &amp; groove closure, textured interiors, light grey, UV gel coated</i>	7	LF	\$139.30	\$975.10
2	<b>Seashield FX 70 GMP (3 Gallon) Kit (Bottom &amp; top 6" plug)</b> <i>Includes 2 gallons Part "A" &amp; 1 gallon Part "B" Epoxy Yields. 1.34 ft<sup>3</sup> when mixed w/ 2 bags of Part "C" Aggregate I Based on a .5" annular space</i>	9	KIT	\$245.00	\$2,205.00
3	<b>Part "C" Aggregate I (50lb bag)</b>	28	EA	\$16.00	\$448.00
4	<b>Seashield Screws 1 - 1/2"</b> <i>Used to secure tongue &amp; groove includes extra</i>	20	EA	\$0.48	\$9.60
5	<b>Seashield FX 70 TNG (600ml) Cartridge</b> <i>Used to adhere tongue and groove</i>	1	EA	\$42.00	\$42.00
6	<b>FX 763 (1-Liter) Top Seal Bevel Kit</b> <i>Used to create beveled edge between the pile and top of jacket Mixed w/ 1 empty part B tub of Part "C" Aggregate</i>	5	KIT	\$48.00	\$240.00
7	<b>Seashield Static Mixing Tips (600ml)</b>	1	EA	\$3.15	\$3.15
8	<b>SeaShield 600ml Dual Cartridge Gun(600ml)</b>	1	EA	\$175.00	\$175.00
9	<b>SeaShield FX Stand-offs - 1"</b> <i>to be adhered to the inside of the jacket in the field</i>	16	EA	\$1.00	\$16.00
10	<b>SeaShield FX523 Adhesive (2-QT Kit)</b> <i>used to adhere stand-offs inside the jacket</i>	1	EA	\$134.00	\$134.00
11	<b>Estimated Freight to MI</b> <b>Actual Freight TBD at time of shipment</b>	1	EA	\$750.00	\$750.00
	<b>Note:</b> <i>All quantities are estimates only. Contractor to determine actual quantity.</i>				
				<b>Total:</b>	\$4,997.85

**Jacob Creisher, P.E.**  
Engineer Manager  
Statewide Bridge Support  
Unit  
(517) 243-7821

**Aaron Porter**  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

**Tom Ranck**  
Engineer  
Statewide Bridge Support  
Unit  
(517) 242-2077

**Cliff Graves**  
Statewide Concrete  
Specialist  
(517) 275-1710

## BUREAU of BRIDGES



# Questions?????

**Jacob Creisher, P.E.**  
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