FIVE STAR PRODUCTS, INC.

Rehabilitation & Stabilization for
Marine Facilities &
Underwater Structures

For use in hostile marine environments.

Marine Encapsulation Systems

Don't Replace. Restore.

Most trusted to provide the total solution™

1-800-243-2206
FiveStarProducts.com
FRP Pile Rehabilitation Jackets

Meeting the challenge in hostile marine environments such as exposure to ice, floating debris, chemical pollution, oils, acids, salt water and tidal action.

Five Star® PileForm™ F FRP (Fiberglass Reinforced Plastic) pile rehabilitation jackets meet and exceed marine engineering specifications for use in hostile marine environments where exposure to ice, floating debris, chemical pollution, oils, acids, salt water and tidal action may occur. PileForm™ F FRP Pile Rehabilitation Jackets are available in thicknesses of 1/8" nominal to 1/2" minimum, and they can be translucent, pigmented or gel coated to any specified color.

These fiberglass encasements are field tested and proven in actual marine conditions by experienced commercial divers and engineers. We develop what our customers require to complete their work with excellent results! You’ll find more details about each of the offerings in this brochure on our website.

USES

- For application around timber, steel or concrete piles
- Available in permanent reusable varieties that can be assembled topside or in the water
- Permanent repair of steel, timber or concrete marine piles
- Offshore platform risers and platform legs
- Other customized pile forming applications

FEATURES

- Engineered for easy installation so projects go faster
- Lightweight for easy maneuvering by divers
- Easy to install in or out of the water
- Non-corrosive
- Excellent solvent and chemical resistance
- High abrasion and impact resistance
- High-strength with interlocking tongue and groove closures available for any pile size
- Safe for use in marine environments
- Handmade in the USA with a quick manufacturing turnaround time
Sizing and Configuration
PileForm™ F FRP jackets can be manufactured in lengths from 1 to 25 feet (0.30 to 7.62m).
An engineering specialist will work with you to create the length and thickness required for your specific application.
Jacket closures are tongue and groove.

PileForm™ F FRP Pile Rehabilitation Jacket Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Strength, ASTM D 790</td>
<td>34,000 psi (230 MPa)</td>
</tr>
<tr>
<td>Flexural Modulus, ASTM D 790</td>
<td>1.0 x 10^6 psi (6,900 MPa)</td>
</tr>
<tr>
<td>Ultimate Tensile Strength, ASTM D 638</td>
<td>20,000 psi (137.9 MPa)</td>
</tr>
<tr>
<td>Tensile Modulus, ASTM C 638</td>
<td>1.5 x 10^6 psi (10,342.1 MPa)</td>
</tr>
<tr>
<td>Elongation, ASTM D 638</td>
<td>1.6%</td>
</tr>
<tr>
<td>Izod Impact (Notched), ASTM D 256</td>
<td>20 ft lbs/inch</td>
</tr>
<tr>
<td>Barcol Hardness, ASTM D 2583</td>
<td>40-50</td>
</tr>
<tr>
<td>Water Absorption, ASTM D 570</td>
<td>&lt; 0.3%</td>
</tr>
<tr>
<td>Standard Color</td>
<td>Translucent</td>
</tr>
<tr>
<td>Wall Thickness (nominal and minimum)</td>
<td>1/8&quot; to 1/2&quot;</td>
</tr>
<tr>
<td>UV Resistance, Carbon Arc Weathering, ASTM G153-04</td>
<td>Pass (No Detrimental Effect)</td>
</tr>
</tbody>
</table>

Professional Engineering Support
Five Star engineers and technical representatives will help you consider a number of design elements for the perfect custom solution and are available for job site assistance when required.

Call for a free consultation:
1-800-243-2206

PileForm™ F FRP Pile Rehabilitation Jackets
Your cost effective alternative to the high expense of removing and driving new piles. Plus, PileForm™ F does not add any substantial weight to the piling. PileForm™ F jackets can be wrapped around a deteriorated pile to create an impervious layer of high confining pressure. The annular space is then filled with an appropriate Five Star Products’ cementitious or epoxy fill to penetrate all voids and cracks in the pile. This provides a much stronger and stable pile which is resistant to the constantly harsh marine environment.

Commercial structures such as piers, docks, and bridges rely on the incredible strength of their substructure. Don’t trust your project to anything less than Five Star’s marine products and systems. Products offered range from initial preventive measures to full structural rehabilitation. Whether rehabilitating one pile or an entire structure, Five Star Products is the only manufacturer providing a complete solution.

Round / Square / H Shapes / Pile Capitals / Customized to Your Design
Cementitious & Epoxy Fill Materials

Cementitious Underwater High-Strength Grout

**Cementitious Pile Jacket Grout**

**Five Star® Cementitious Underwater High-Strength Grout** is an underwater pump grade, cement-based, non-shrink grout for pile restoration and similar applications. It is designed for applications including pile repair, rehabilitation and restoration, grouting of underwater structures, grouting areas subject to freshwater, saltwater or brackish exposure, and the installation of anchors and dowels. Contains migrating corrosion inhibitors for superior corrosion resistance.

Pile Jacket Epoxy Grout LV (Low Viscosity)

**Underwater Epoxy Grout System**

**Five Star® Pile Jacket Epoxy Grout LV** is a three component, 100% solids epoxy system specifically designed for underwater grouting and marine pile encapsulation. Five Star® Pile Jacket Epoxy Grout LV is a low viscosity resin and hardener system which is mixed with aggregate to encapsulate concrete, timber, or steel pilings in hostile marine environments.

Pile Jacket Epoxy Grout LPL

**Long Pot Life Underwater Epoxy Grout System**

**Five Star® Pile Jacket Epoxy Grout LPL** is a high-performance epoxy system designed for underwater grouting and pile encapsulation where a longer pot life system is required. Five Star® Pile Jacket Epoxy Grout LPL is a three-component, low viscosity epoxy which is mixed with graded sand to encapsulate concrete, timber, or steel pilings. It may be pumped or poured in place.
Cementitious & Epoxy Fill Materials

Pile Jacket Epoxy Grout HP
Underwater Pile Jacket Epoxy Grout

Five Star® Pile Jacket Epoxy Grout HP is a multi-purpose, three component, 100% solids epoxy grout system specifically designed to cure underwater. Pile Jacket Grout HP has excellent flowability and exhibits outstanding physical properties when placed in wet or dry environments. Moisture insensitive before, during, and after cure, Pile Jacket Epoxy Grout HP also exhibits excellent adhesion to masonry, concrete, wood, steel and most structural materials; it is designed to encapsulate and provide corrosion protection for concrete, timber, or steel pilings.

Concrete Repair Materials

Structural Concrete® Underwater Pump Grade
High Early Strength Pump Grade Underwater Repair Mortar

Five Star Structural Concrete® Underwater PG is a high early strength, single component, permanent concrete repair material designed for pumping underwater. This concrete repair material features excellent pumping properties and minimal washout during large volume placements underwater and is designed for placement in tidal zones and underwater. Five Star Structural Concrete® Underwater PG provides increased corrosion protection of steel reinforced structures with migrating corrosion inhibitor.

Structural Concrete® Underwater Hand Pack
Hand Applied Underwater Repair Mortar

Five Star® Structural Concrete® Underwater HP is a rapid strength gain, permanent concrete repair material intended for underwater application by hand or trowel. This concrete repair material allows small volume underwater hand placements with minimal washout. It is designed for placement in tidal zones and underwater where application thickness may range from one-half inch (13 mm) to several inches in a single installation.
Coatings, Adhesives & Gels

Underwater Epoxy Gel
Epoxy Gel Adhesive

Five Star® Underwater Epoxy Gel is a multi-purpose, two component, 100% solids, moisture insensitive structural epoxy adhesive used in filling cracks up to 1/2 inch (13 mm). Ideal for steel, concrete, and masonry applications, Five Star® Underwater Epoxy Gel is a smooth, nonabrasive gel that can be pressure injected or hand applied.

HP Anchor Gel
Epoxy Acrylate Anchor Bolt Adhesive

Five Star® HP Anchor Gel is a 100% solids, all weather, solvent-free structural epoxy acrylate anchoring adhesive. Using the latest technology, Five Star® HP Anchor Gel has been engineered to gun down to -15°F (-26°C), set up quickly in damp and water-filled holes, and attain high early strength.

Splash Zone™
Underwater Epoxy Putty Compound

Five Star® Splash Zone™ is a 100% solids, two-component epoxy putty compound recommended for the top sealing of pile jacket repairs at, above or below the waterline in fresh or salt water splash zones. It forms an excellent bond to concrete, steel, wood, fiberglass and aluminum.
Erosion Control Products

PileForm™ ABM – Articulating Block Mat

Five Star® PileForm™ ABMs are 100% nylon articulating block mat forms for casting in place heavy-duty, rectangular concrete blocks in a staggered joint pattern for the purpose of erosion control in severely hostile marine environments. These ABM revetment forms flex (articulate) with changing soil and water conditions, are easy to install, UV resistant, and exhibit very low water absorption. These PileForm™ ABM mats are useful for underpinning and providing scour protection.

PileForm™ SPB – Scour Protection Bags

Five Star® PileForm™ SPBs are high-strength spun bond polyester weave bags that can be filled with grout and used as underwater forms for void repair, rip rap undermining prevention, armor plating of river or streambeds, and scour protection. They are easy to install, UV resistant, and exhibit very low water absorption. PileForm™ SPBs have excellent solvent and chemical resistance, along with high abrasion and impact resistance.

Pile Repair Accessories

- Soffit Assemblies
- Upset Cavities
- Brackets for External Bracing
- High Pressure Concrete/Epoxy Hose
- FNTT Ports
- Foam Seal
- Standoffs
- Friction Clamps
- Mesh/Rebar
- Stainless Steel Screws
- Nylon Ratchet Straps
- Overfill Troughs
Five Star Products, Inc. is an industry leader in the development of systems and products designed for the rehabilitation and stabilization of marine facilities and underwater structures. All of our products are designed and field-tested by experienced commercial divers and engineers with an emphasis on ease of installation, reliability, safety and consistency.

From preventative measures to full structural rehabilitation, Five Star’s comprehensive range of products and services offers the solution you need for today’s harsh marine environments. With an outstanding track record of customer satisfaction, our staff of committed, experienced personnel is available for job site assistance whenever needed.

Five Star Products, Inc. has been a top-tier supplier of high-performance cement and epoxy-based products for the petrochemical, power/utility, heavy industrial manufacturing, infrastructure, and marine markets since 1955.

For worldwide availability, additional product information and technical support, contact our local Five Star sales representative, or call Five Star Products’ Engineering and Technical Service Center at 1-800-243-2260.

**Custom is Our Standard**

Specializing in Custom Fiberglass Jackets & Forms

**EXCLUSIVE WARRANTY; DISCLAIMER OF LIABILITY:** “FIVE STAR MARINE, INC. (FSM) WARRANTS THAT FSM PRODUCTS ARE MANUFACTURED TO (i) BE FREE OF MANUFACTURING DEFECTS AND (ii) MEET FSM’S CURRENTLY PUBLISHED SPECIFICATIONS FOR PHYSICAL PROPERTIES. PROVIDED THAT THE FSM PRODUCTS ARE APPLIED IN ACCORDANCE WITH FSM’S DIRECTIONS AND TESTED IN ACCORDANCE WITH ASTM INTERNATIONAL AND FSM STANDARDS. IN THE EVENT THAT A FSM PRODUCT FAILS TO SATISFY THE FOREGOING WARRANTY, FSM WILL REPLACE THE DEFECTIVE FSM PRODUCT; PROVIDED, HOWEVER, PRIOR TO PROVIDING SUCH REPLACEMENT, FSM MAY REQUIRE THE RETURN TO FSM OF ANY UNUSED, DEFECTIVE OR ALLEGEDLY DEFECTIVE FSM PRODUCT, FREIGHT PREPAID, AND FSM SHALL HAVE THE RIGHT TO INSPECT ANY PROJECT IN WHICH ALLEGEDLY DEFECTIVE FSM PRODUCT HAS BEEN APPLIED AND TO INTERVIEW PERSONNEL AND REVIEW ASSOCIATED RECORDS RELATING TO THE USE OR APPLICATION OF ALLEGEDLY DEFECTIVE FSM PRODUCTS. EXCEPT AS SET FORTH ABOVE, WITH RESPECT TO THE FSM PRODUCTS, FSM MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY NATURE WHATSOEVER, EITHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. FOR THE AVOIDANCE OF DOUBT, THE FOREGOING IS INTENDED AS A SOLE AND EXCLUSIVE REMEDY FOR ANY FSM PRODUCT DEFECT, AND FSM SHALL NOT BE LIABLE FOR DAMAGES OF ANY SORT ARISING FROM THE USE OF FSM PRODUCTS, INCLUDING PUNITIVE, ACTUAL, REMOTE, OR CONSEQUENTIAL DAMAGES, AND WHETHER RESULTING FROM CLAIMS OF BREACH OF CONTRACT, BREACH OF ANY WARRANTY (WHETHER EXPRESS OR IMPLIED) OR FROM ANY OTHER CAUSE WHATSOEVER. WITHOUT LIMITING THE FOREGOING, FSM SHALL NOT BE LIABLE IN THE EVENT THAT THE USE OF FSM PRODUCTS INFRINGES ANY PATENT OR OTHER INTELLECTUAL PROPERTY OR PROPRIETARY RIGHT OF ANY THIRD PARTY.