



FIVE STAR PRODUCTS, INC.

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DESIGN-A-SPEC™ GUIDELINES

PILEFORM™ F PILE JACKET

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This document is provided as a general guideline for consideration by contractors and engineers. While every reasonable effort has been made to ensure that this information is accurate and authoritative, Five Star Products, Inc. does not warrant the accuracy or completeness of this information or for its appropriateness for any particular purpose. The user of this document remains solely responsible for the specification of all methods, materials and practices.

PART A - GENERAL CONDITIONS

1.01 SCOPE

The work covered by this document consists of furnishing all materials and performing all operations required for pile repair / encapsulation using fiberglass pile jackets.

These repairs can include, but are not limited to, chipping out loose concrete, exposing rebar, cleaning rebar, replacing or adding rebar and filling the repaired area with grout.

1.02 QUALITY ASSURANCE

The manufacturer shall have a 10-year history of use in the manufacture of fiberglass pile jackets. The manufacturer shall provide on site technical service at no cost to the engineer or contractor.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the jobsite in their original, unopened packages, clearly labeled with the product identification, printed instructions and batch code.
- B. Store the fiberglass jackets at 60°F to 80°F (16°C to 27°C) for at least 24 hours prior to use. Refer to the product data sheet for more information.
- C. For handling instructions, refer to the Installation Guide.

1.04 PROJECT / SITE CONDITIONS

- A. Refer to Part C – PREPARATION or contact the manufacturer directly for any physical or environmental limitations required by the product.

PART B - MATERIAL SPECIFICATIONS

2.01 MATERIALS (FIBERGLASS PILE JACKET)

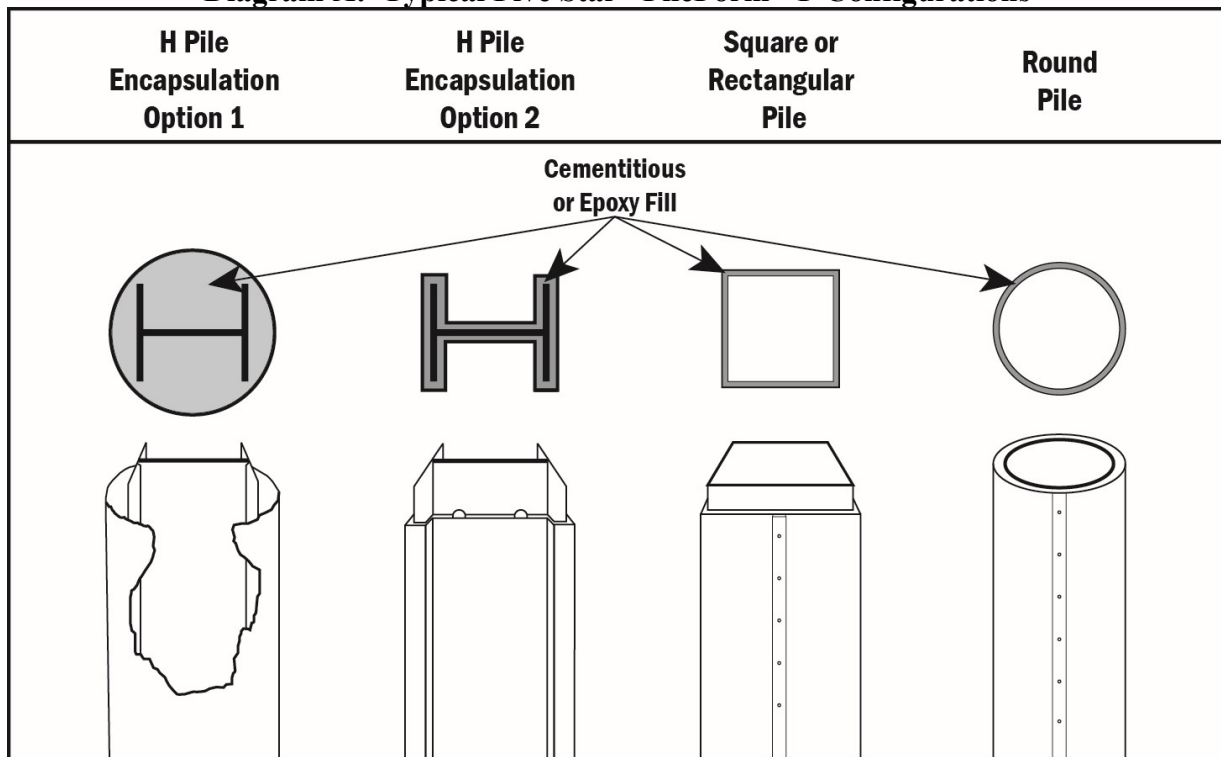
- A. The pile jacket shall consist of a fiberglass mat woven in a polyester resin matrix. Wall thickness of jacket shall be 1/8-inch (0.32 cm) nominal (+/- manufacturing tolerances) unless otherwise specified. Jacket closures shall be tongue and groove. The manufacturer shall have at least 10 years experience in the manufacture of fiberglass jackets. The manufacturer shall offer technical services and provide a representative at the job site for product training prior to product installation.

B. The fiberglass jacket shall meet all the following typical performance criteria:

- | | |
|--|--|
| 1. Flexural Strength, ASTM D 790 | 34,000 psi (230 MPa) |
| 2. Flexural Modulus, ASTM D 790 | 1.0 x 10 ⁶ psi (6.9 GPa or 6,900 MPa) |
| 3. Ultimate Tensile Strength, ASTM D 638 | 20,000 psi (137.9 MPa) |
| 4. Tensile Modulus, ASTM D 638 | 1.5 x 10 ⁶ psi (10,342.1 MPa) |
| 5. Elongation, ASTM D 638 | 1.6% |
| 6. Barcol Hardness, ASTM D 2583 | 40-50 |
| 7. UV Resistance, Carbon Arc Weathering
ASTM G 153, 500 hours | Pass (No Detrimental Effect) |

C. An acceptable product that meets this criterion is: **Five Star® PileForm™ F Pile Jacket** as manufactured by Five Star Products, Inc., Shelton, CT 06484.

Diagram A: Typical Five Star® PileForm™ F Configurations



PART C – PREPARATION

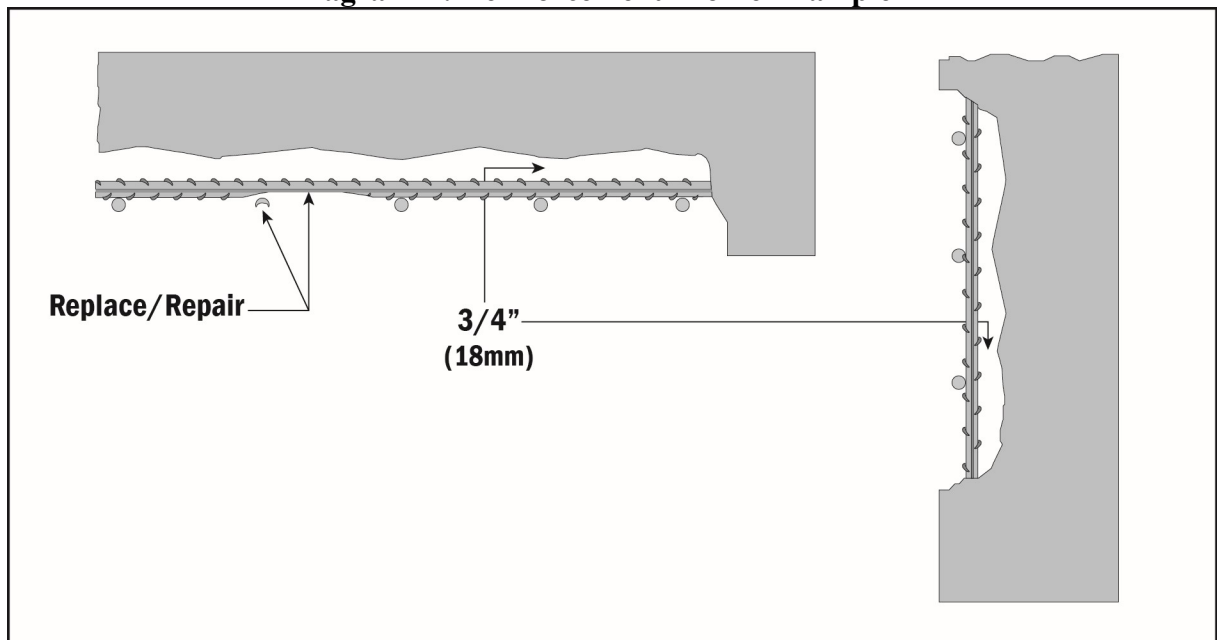
3.01 CONCRETE SURFACES

- A. Completely remove all loose, delaminated and weak concrete, oil, grease, laitance, marine growth and other contaminants. Prepare concrete using acceptable mechanical means and concrete cleaners and degreasers as necessary to obtain clean, sound and rough surfaces. Coarse aggregate shall be exposed, and all marine growth removed. High pressure water blasting is a minimum recommendation for conditioning surfaces.
- B. All cracks shall be brought to the attention of the engineer and a determination made if the cracks are subject to movement. The cracks shall be repaired as directed prior to installation of fiberglass jacket and grout.
- C. For more detailed information, refer to the following publication: “Selecting and Specifying Concrete Surface Preparation for Coating Polymers and Concrete Repair, ICRI Technical Guideline 310.2R.”

3.02 REINFORCEMENT

- A. All reinforcing steel that has lost bond with the concrete or has more than one-half of its circumference exposed shall be undercut by at least 3/4 inch (18 mm) or two times the maximum aggregate size.

Diagram B: Reinforcement Profile Example



- B. If more than 20% of the diameter of a reinforcing bar has been deteriorated, the bar may require replacement or will need to be spliced as directed by the engineer.

- C. All reinforcement shall be rigidly secured and supported.
- D. All exposed reinforcing steel shall be free of all loose scale, rust, oxidation and other contaminants. Exposed reinforcing steel may be sealed or primed if a delay occurs between surface preparation and epoxy grout placement.

3.03 JACKET PLACEMENT

- A. One-piece jackets are typically full circle and will fully cover the pile. Two-piece jackets are typically used on square or H piles. Spacers / standoffs inside jackets are placed at regular intervals to provide the maximum support and maintain the annular space between the jacket and the pile. Spacers / standoffs may be pre-molded into jackets or applied at job site. Spacers can be made of wood, plastic or metal. When placing spacers in the field, use a fast setting epoxy adhesive suitable for exposure to water.
- B. For pumping applications, secure suitable pump ports to jacket. Mount port approximately 12 inches from the bottom of the pile. Additional ports may be needed for jacket lengths over 5 feet. Where necessary, place an additional port approximately three feet above the first port and 180° opposite the first port. If additional ports are needed alternate the placement 180° from the previous port and three feet above.
- C. Use an epoxy adhesive such as Five Star[®] Underwater Epoxy Gel, or equivalent, to fill the groove side of the opening. The epoxy adhesive will come packaged in a dual cartridge system with a static mixer tip. Insert the mixer tube into the groove and inject a generous amount of epoxy into the entire length of the groove. Hold the jacket up right next to the pile. Pull open the jacket and slip it around the pile. Allow the tongue to slip into the groove. Position the jacket to cover the area desired. Press the jacket closed and the tongue into the groove as far as it will go. Use ratcheting straps around the jacket to secure it.
- D. Wooden braces, battens or strong backs should be placed on the outside of the jacket to prevent bulging during filling. Use a 2x4 or 2x6 that is about the same length as the jacket and attach one with screws to the middle of each jacket face. Place straps 12 to 18 inches apart vertically and around the braces to ensure that the jacket is secure. When the jacket is in position and the straps are tight, use stainless steel self-drilling/tapping screws to secure the tongue and groove joint. Locate the screws so they go through both sides of the groove and the tongue. Use screws that are long enough to penetrate the jacket but not long enough to extend to the pile itself. Place screws three to six inches apart for the entire length of the jacket.

3.04 JACKET SEALING

- A. Pile jackets need a seal at the bottom of the jacket to prevent the grout from leaking out of the bottom of the jacket. The choice of bottom seal can be determined by environmental restrictions, owner preference or contractor experience. The most common types include closed foam strips, oakum and resin, nylon retainers and epoxy packing. Depending on the type used it will be put in place before or after the positioning of the jacket around the pile.
- B. High density foam should be placed around the interior bottom of the jacket before the jacket is placed around the pile. The foam should be of sufficient height and thickness to form a tight seal. Foam should be three to four times the thickness of the annular space and three to five inches in height. Be sure the ends of the strips overlap when in place to prevent leaks. Secure the bottom seal with stainless steel strapping or nylon ratchet straps.
- C. Jackets can also be sealed with an integral nylon sleeve. This sleeve is molded into the bottom of the jacket at the time of manufacture of the jacket. It has a watertight zipper closure and is attached to the pile below the jacket with stainless steel straps or nylon zip strapping.

3.05 FILL MATERIAL

- A. Mix and place cementitious or epoxy fill material in accordance with manufacturer's guidelines.
- B. Check jacket seams, joints, ports and bottom seal for leaks during filler material installation. Seal all leaks immediately.

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