

Special Specification 4188

FRP Encapsulation System



1. DESCRIPTION

Prepare pile caps, tie beam and footings and encapsulate with a translucent, Fiberglass Reinforced Polymer (FRP) encapsulation system (forms) as shown in the plans or as directed after installation of distributed galvanic anodes. Install grout or concrete mix compatible with distributed galvanic anodes and approved by the anode manufacturer.

2. MATERIALS

- 2.1. **FRP Encapsulation System:** Use one of the pre-approved systems listed in Table 1. Furnish the system's materials and equipment including the following.
- FRP outer encapsulation form of a minimum 1/8 in. thickness and annulus of at least 2 5/8 in. between the FRP encapsulation and the concrete surfaces to accommodate cathodic protection conduits and wires
 - Fill the annulus between the existing concrete surface and the FRP encapsulation form with grout compatible with galvanic anodes and approved by the anode manufacturer as per Special Specification Item 4189 for Cathodic Protection System. If concrete is used in lieu of grout, provide concrete mixture of sufficient consistency to encapsulate the anodes without voids or segregation. Provide a minimum compressive strength of 5,000 psi at 28 days and a slump of 7 to 10 inches. Pozzolanic mineral additives such as fly ash, slag or silica fume and chlorides or other salts corrosive to metals are not permitted. Submit the design mix to the Engineer for approval before placing any grout material. Use equipment expressly designed for proportioning, mixing, and pumping grout into the encapsulation forms.

Table 1
Pre-approved Encapsulation Systems

Name	Producer	Contact Information
FX-70 Structural Repair and Protection System	Simpson Strong-Tie Company Inc.	www.strongtie.com/products/rps/fx70 714-448-9143
SeaShield Series 500 Pile Encapsulation	Denso North America Inc.	www.densona.com 888-821-2300;

3. CONSTRUCTION

- 3.1. **Submittals.** Before work begins, submit the following for approval.
- Grout or concrete design mix. Provide the design mix to the Engineer for approval before placing any concrete or grout material.
 - The make and model of epoxy grout equipment for use in proportioning, pumping, and mixing. Include the manufacturer's equipment manuals.
 - Locations of typical longitudinal and transverse joints in the outer encapsulation forms including a description of the joint sealing methods, details of the typical bottom seal, temporary bracing, and support required during placement of the encapsulation forms and injection and curing of epoxy grout.
 - Details of fixed or adjustable stand-offs and their locations on the outer encapsulation forms.

- Details of injection ports and the sequence to be used to place the grout
 - Details of final finishing of grout at the top of the encapsulation, permanent closure of the injection ports, and repair method for defects.
 - Manufacturer's Material Safety Data Sheets for each material to be used.
- 3.2. **Construction Sequencing:** Install FRP encapsulation forms after cathodic protection electrical work is completed. Cathodic protection electrical work includes electrical continuity testing; installation of negative wires; installation of bulk anodes, distributed anode assemblies, and anode wiring; installation of conduits; and wire routing to junction boxes.
- 3.3. **Substrate Surface Preparation.** Remove all spalled, cracked, and delaminated concrete until solid concrete is encountered. If reinforcing steel is exposed, excavate concrete to a depth of 3/4 to 1 in. behind the exposed reinforcement. Thoroughly clean all concrete surfaces per SSPC-SP13 by abrasive blasting, water blasting or similar approved methods to remove all oil, grease, dirt, loose concrete, marine growth, and all other material that would prevent proper bonding. The final concrete surface shall have a roughness and finish recommended by the FRP encapsulation system manufacturer. Abrasive blast all exposed reinforcing steel surfaces to SSPC-SP10 Near White Metal. Notify the Engineer of all reinforcing steel that has greater than 25% section loss to evaluate the need for supplemental reinforcing.
- 3.4. **Encapsulation.** Prepare and install the FRP forms using temporary bracing and support following the manufacturer's recommendations. Pump the grout or concrete to fill the annulus between the existing concrete surfaces and the FRP encapsulation in accordance with approved procedures, the submitted injection sequence, and the manufacturer's recommendations. Finish all seams and edges with thickened epoxy.
- 3.5. **Final Finishing and Inspection of the Completed Encapsulation.** Remove the temporary supports after the grouting process is completed and the grout is sufficiently cured as recommended by the manufacturer. Inspect the completed encapsulation for voids or other defects. Repair voids in the grout in accordance with the manufacturer's recommended procedures.

4. MEASUREMENT

This Item will be measured by the Lump Sum.

5. PAYMENT

The work performed and the materials furnished in accordance with this Item and measured under "Measurement" will be paid for at the unit price bid for "FRP Encapsulation System". This price is full compensation for cleaning and preparing the concrete surfaces, designing the jacket system and preparing submittals, furnishing the materials for the installation and placement, installing the encapsulation system, and for tools, labor, equipment, and incidentals.