



### PREPARATION

#### 1.01 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.
- B. All cracks shall be brought to the attention of the engineer and a determination made of whether the cracks are subject to movement. The cracks shall be repaired as directed prior to installation of fiberglass jacket and epoxy grout.
- C. For more detailed information, refer to the following publication: "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion", Guideline No. 03730, prepared by the Technical Guidelines Committee of ICRI, March 1995.

#### 1.02 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  $\frac{3}{4}$  inch (19 mm).

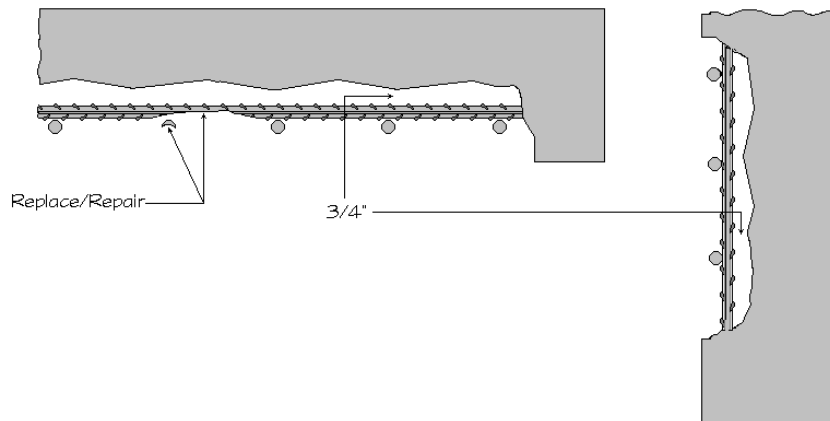


Diagram: Reinforcement Profile Example



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- 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. Blast steel to an SSPC – SP6 commercial finish or better. Exposed reinforcing steel may be sealed or primed if a delay occurs between surface preparation and epoxy grout placement.

### 1.03 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/stand offs 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 use a fast-setting epoxy adhesive suitable for exposure to water such as Five Star® Underwater Epoxy Gel.
- B. For pumping applications, secure suitable pump ports to jacket. Mount port approximately 12 inches (300 mm) from the bottom of the pile. Additional ports may be needed for jacket lengths over 5 feet (1.5 m). Where necessary, place an additional port approximately 3 feet (1 m) above the first port and 180 degrees opposite the first port. If additional ports are needed alternate the placement 180 degrees from the previous port and 3 feet (1 m) above.
- C. Piles should be cleaned with a high-pressure water jet blast to remove all loose material and marine growth.
- D. Use a sealing compound to fill the groove side of the opening. Five Star® Underwater Epoxy Gel is an excellent rapid setting epoxy gel adhesive that can be used to seal the tongue and groove joint. Five Star® Underwater Epoxy Gel is packaged in a dual cartridge system with a static mixing tip. Insert the mixer tube into the groove and inject a generous amount of epoxy in 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.



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- E. Wooden braces, battens, or strong backs should be placed on the outside of the jacket to prevent bulging. Use 2 x 4 or 2 x 6 that is about the same length as the jacket and attach one with screws to the middle of each jacket face. Using an EnsureFIT™ guide that shows you placement of ratchet straps and screws, place straps 12 to 18 inches (300 – 450 mm) apart vertically and around the braces to ensure that the jacket is secure.
- F. When the jacket is in position and the straps tight, use stainless steel self-drilling/tapping screws to secure the tongue and groove joint. Locate the screws so that 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 3 to 6 inches (75 – 150 mm) apart for the entire length of the jacket.

### 1.04 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. Foam strips 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 3 to 5 inches (75 – 125 mm) in height. Be sure that 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. Oakum is placed after the jacket is in place and secured to the pile. Oakum can be used alone or with an expanding resin. The oakum alone or with the resin should be packed up into the jacket annular space to insure a full seal. The resin will expand upon contact with water and completely fill the annular space at the bottom of the jacket. Working time of the oakum-resin is about five minutes.
- D. 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.



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### 1.05 MIXING: Mortar Mixer (Stationary Barrel Mixer with Moving Paddles)

#### Epoxy Grout

- A. Provide an adequate number of mortar mixers in good operating condition for uninterrupted placement. Do not exceed one-half the maximum capacity of the mortar mixer. A concrete mixer (spinning barrel mixer) is not recommended for mixing epoxy grout.
- B. Pour all Component B (hardener) into the pail containing Component A (resin). Mix thoroughly for 2 minutes by hand with paddle or slow speed mixer to avoid air entrapment. Pour mixed liquids into the mortar mixer. While mixing, slowly add Component C (aggregate) and mix until aggregate is completely wet.
- C. Do not mix more material than can be placed within the working time of the grout.
- D. Pour the mixed grout into a suitable wheelbarrow or carrier to transport it to the work site, or transport to a pump hopper as necessary.

#### Cementitious Grout

- A. Provide an adequate number of mortar mixers in good operating condition for uninterrupted placement. Do not exceed one-half the maximum capacity of the mortar mixer. A concrete mixer (spinning barrel mixer) is not recommended for mixing cementitious grout.
- B. Add water to the mixer, followed by the powder. Mix for 4-5 minutes until a uniform consistency is achieved. Adjust water as necessary to get desired flow, not exceeding maximum water as stated on the packaging.
- C. Do not mix more material than can be placed within the working time of the grout.
- D. Pour the mixed grout into a suitable wheelbarrow or carrier to transport it to the work site, or transport to a pump hopper as necessary.



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### 2.01 APPLICATION

#### Pumping Epoxy Grout

- A. A peristaltic pump is recommended for pumping epoxy grout. When using any other type of pump, consult epoxy grout manufacturer first to ensure the epoxy grout is pumpable with another type of pump.
- B. Prime pump and lines with a suitable primer that will not contaminate epoxy grout. Ensure material used for priming is discarded and not used for jacket filling.
- C. Attach the pump hose to the bottom port and commence pumping. For tremie pumping, insert hose into jacket to bottom and commence pumping. Keep pump hose submerged in epoxy grout and slowly raise pump hose as jacket fills with epoxy grout.
- D. When the grout in the jacket rises to the level of the next port stop the pump, remove the hose, and close the port with a plug. Then attach the hose to the next higher port and continue pumping. Repeat this until the jacket is full of grout.
- E. When the jacket is full to within 1 inch (25 mm) of the top, cap off any remaining voids and create a 45° bevel with Five Star® Splash Zone™ or other suitable marine mastic.
- F. Do not mix more material than can be placed within the working time of the grout.
- G. All tools and equipment may be cleaned with high pressure water and a strong detergent prior to hardening. Sand may be used as an abrasive to aid clean up.

#### Pumping Cementitious Grout

- A. A rotor stator, peristaltic, or piston pump are suitable for pumping cementitious grouts.
- B. Prime pump and lines with a suitable slurry material that will not contaminate the grout. Ensure material used for priming is discarded and not used for jacket filling.
- C. Attach the pump hose to the bottom port and commence pumping. For tremie pumping, insert hose into jacket to bottom and commence pumping. Keep pump hose submerged in grout and slowly raise pump hose as jacket fills with grout.
- D. When the grout in the jacket rises to the level of the next port stop the pump, remove the hose, and close the port with a plug. Then attach the hose to the next higher port and continue pumping. Repeat this until the jacket is full of grout.

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- E. When the jacket is full to within 1 inch (25 mm) of the top, cap off any remaining voids and create a 45° bevel with Five Star® Splash Zone™ or other suitable marine mastic.
- F. Do not mix more material than can be placed within the working time of the grout.
- G. All tools and equipment may be cleaned with high pressure water prior to hardening.

### Pouring Cementitious or Epoxy Grout

- A. Use a headbox or ramp at top of jacket opening to facilitate pouring of cementitious or epoxy grout into jacket.
- B. Mixing and pouring of grout should be a continuous process to minimize air entrapment. Headbox or ramp used for pouring may be moved or alternated from side to side to also help reduce air entrapment.
- C. Continue pouring grout until jacket is full to within 1 inch (25 mm) of the top, cap off any remaining voids and create a 45° bevel with Five Star® Splash Zone™ or other suitable marine mastic.
- D. Do not mix more material than can be placed in the working time of the grout.
- E. All tools and equipment may be cleaned with high pressure water and a strong detergent prior to hardening. Sand may be used as an abrasive to aid clean up.