

Fidalgo Marina Owners Association, Emergency Breakwater Repairs

Project Narrative

Emergency repairs will take place waterward of the OHW at a depth of approximately -18 ft MLLW. The site will be accessed from Fidalgo Bay but work will be within the confines of the marina. No temporary fill will be used. The proposed repair work will not require pile driving. Piles will be replaced in situ (no removing piles).

All piles are steel and measure 12.75 inches diameter by 40 feet long.

These piles will be repaired using an internal pile repair system. Repair system will be CarboSleeve (sleeve) or CarboShield (also referred to as a temporary jacket or formwork herein) or approved equivalent. The temporary jackets or equivalent will be applied to the perforated portions of the pile to prevent grout from entering marine waters (Figure 3). Temporary formwork will be applied to the perforated portions of the pile to prevent grout from entering marine waters. Temporary formwork, to be provided by the contractor, could be fabricated from steel/timber or other acceptable materials. The sleeves will be inserted into the existing batter piles and grout pumped into the sleeve to reinforce and strengthen the batter pile (Figure 4). Work will be performed from a barge; utilizing divers as required.

Based on the emergency situation definition above, the severely damaged batter piles of the East and North Breakwaters pose a significant loss of property if not repaired immediately and prior to the next major storm that could cause the breakwaters to fail.

Fidalgo Marina is protected by three breakwaters. Two of the breakwaters, North and East breakwater, are owned by the Marina. The breakwaters are supported by steel batter piles that have sustained severe corrosive damage with some damage to the point of perforation (Figure 1).

An inspection found 22 batter piles in the North Breakwater and East Breakwater to have sustained severe corrosion (Figure 2) (Echelon 2021). In addition, the remaining three of the North Breakwater batter piles have moderate damage requiring repair. Severe Damage was defined as protective coating or wrap damaged and loss of wall thickness exceeding 50 percent of nominal at any location. Moderate damage is defined as protective coating or wrap damaged and loss of thickness 15 to 30 percent of nominal; over 50 percent of perimeter or circumference affected by corrosion at any elevation or cross section; loss of thickness 15 to 30 percent of nominal.



Figure 1 Fidalgo Marina Breakwaters

Fidalgo Marina will repair the remaining piles under a Nationwide Permit Application. This emergency application is for the Severely and Major Damaged piles.

Schedule is contingent upon availability of materials including barge. It is anticipated that the repairs would be



Figure 2 Figure 2 Example of batter pile with corrosion to point of perforation (Echelon 2021).

completed in October or November over a 2-3 week period (2-3 piles per day).

Reference: 2021. Echelon Engineering. Underwater Inspection & Assessment of Piles & Floats Fidalgo Marina. Anacortes, WA.
Prepared for PND Engineers, Inc.



Figure 3 CarboShield™ (jacket or equivalent to be applied to perforations prior to grout injection).

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The anticipated sequence for repair follows:

1. Install temporary formwork at locations of pile perforations.
2. Cut access hole near the top of the pile.
3. Clean internal walls of pile by pressure blasting. Debris from cleaning will be contained and remain inside the pile cavity.
4. Install fiber reinforced sleeves inside the pile cavity through the access hole.
5. Epoxy grout is pumped into sleeves from the bottom of pile so it displaces the water upward as the grout fills the void. This keeps the grout from mixing with the water
6. Once grout has cured, temporary formwork is removed.

Anticipated Schedule:

Start Date: February 5, 2022

End Date: February 15, 2022