

Seattle, Washington, USA

Deepening of Pier 36



Owner:
United States Coast Guard

Designer:
BERGER/ABAM Engineers Inc.

Contractor:
M.A. Segale Inc.

Sheet piles:
HZ 975 D - 24/AZ 19

Length of HZ king piles:
36.3 m

Length of AZ sheet piles:
30.2 m

Steel grade:
ASTM A572 Grade 60

Total quantity of sheet piles:
1,315 metric tons

The Port of Seattle's Pier 36 belongs to the United States Coast Guard (USCG). The deepening project called for demolition of the old pier, a deck-on-pile structure. Underneath the existing pier the ground sloped down to the bottom of the harbour. The top part of the slope was faced with riprap (sand, gravel and crushed rock) with a concrete cover. Concrete and timber bulkheads had been installed to stabilise the old pier. The lower part of the slope was mud. In order to accommodate the new Coast Guard's vessels, it was decided to develop a new, deeper quay by 2003.

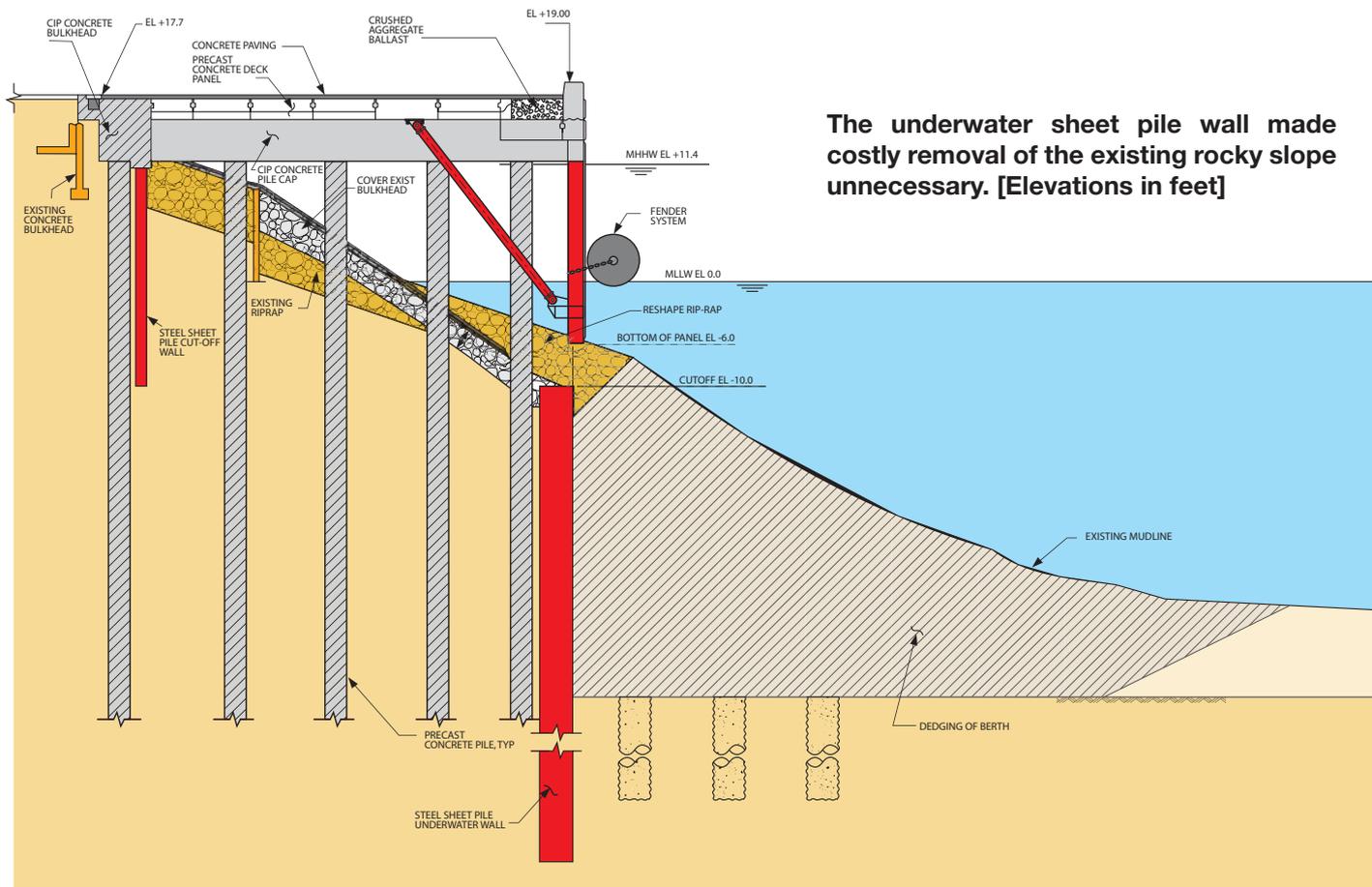
The cross-section shows the existing mud layer reaching up to a level of approximately -3 m (equivalent to -10 feet). Removing the stone

revetment beneath the old pier would have implied high costs. It was therefore decided to dredge the mud down to the depth of 12 m necessary for the docking of the Coast Guard's vessels. An underwater cantilever sheet pile wall was chosen to hold back the rocky top part of the slope. A new deck on piles was constructed behind the sheet pile wall. The deck is made of precast concrete panels resting on precast concrete piles. The inclination of the rock slope was slightly changed to incorporate the timber bulkhead. Since Seattle is situated in an active seismic zone, earthquake loads were considered for the design of the new facility at Pier 36.

The first step in the construction of the new quay was the driving of



Seattle's Pier 36 had to be deepened to accommodate the US Coast Guard's new vessels



The underwater sheet pile wall made costly removal of the existing rocky slope unnecessary. [Elevations in feet]

the underwater steel sheet pile wall at the end of the rocky slope. The contractor, M.A. Segale Inc., fabricated his own template for the installation of the HZ 975 D - 24 / AZ 19 combined-wall system. A total of 1,315 t of sheet piles in a high steel grade were delivered to the site.

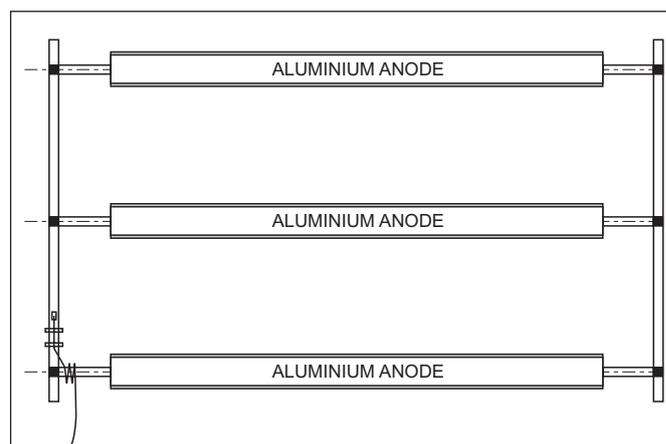
The steel sheet piles were equipped with a cathodic protection system with sacrificial anodes. Cathodic protection is a means of protecting steel structures by preventing the corrosion process. The sacrificial anodes were fixed to Pier 36's underwater steel sheet piles. The more electrically negative metal of the anodes corrodes first; it is therefore necessary to supervise the anode from time to time, depending on the

site conditions and the lifetime of the structure. A steel anode sled with three sacrificial aluminium-zinc-indium anodes designed for use in seawater and saline mud was installed on the USCG pier, together with test stations with corrosion monitoring equipment. A number of tests that measured base potential, electrical continuity, and anode potentials ensured proper functioning of the system.

Cathodic protection is effective for sheet piles in permanent contact with an electrolyte e.g. water. When properly designed and maintained, cathodic protection is a highly effective means of providing protection, leading to negligible corrosion rates in the order of 0.01 mm/year. ■



The steel sheet pile wall that stabilised the structure was installed from a barge



The pier's cathodic protection system prevents corrosion problems