

Deepening of Pier 36, Seattle, Washington, USA

Arcelor, Luxembourg

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, while the lower part of the slope consisted of 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 (Figure 1) shows the existing mud layer reaching up to a level of approximately -3m (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 12m 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.

Info Box:

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| 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: | 36.3m |
| Length of AZ sheet piles: | 30.2m |
| Steel grade: | ASTM A572 Grade 60 |
| Total quantity of sheet piles: | 1,315 metric tonnes |

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

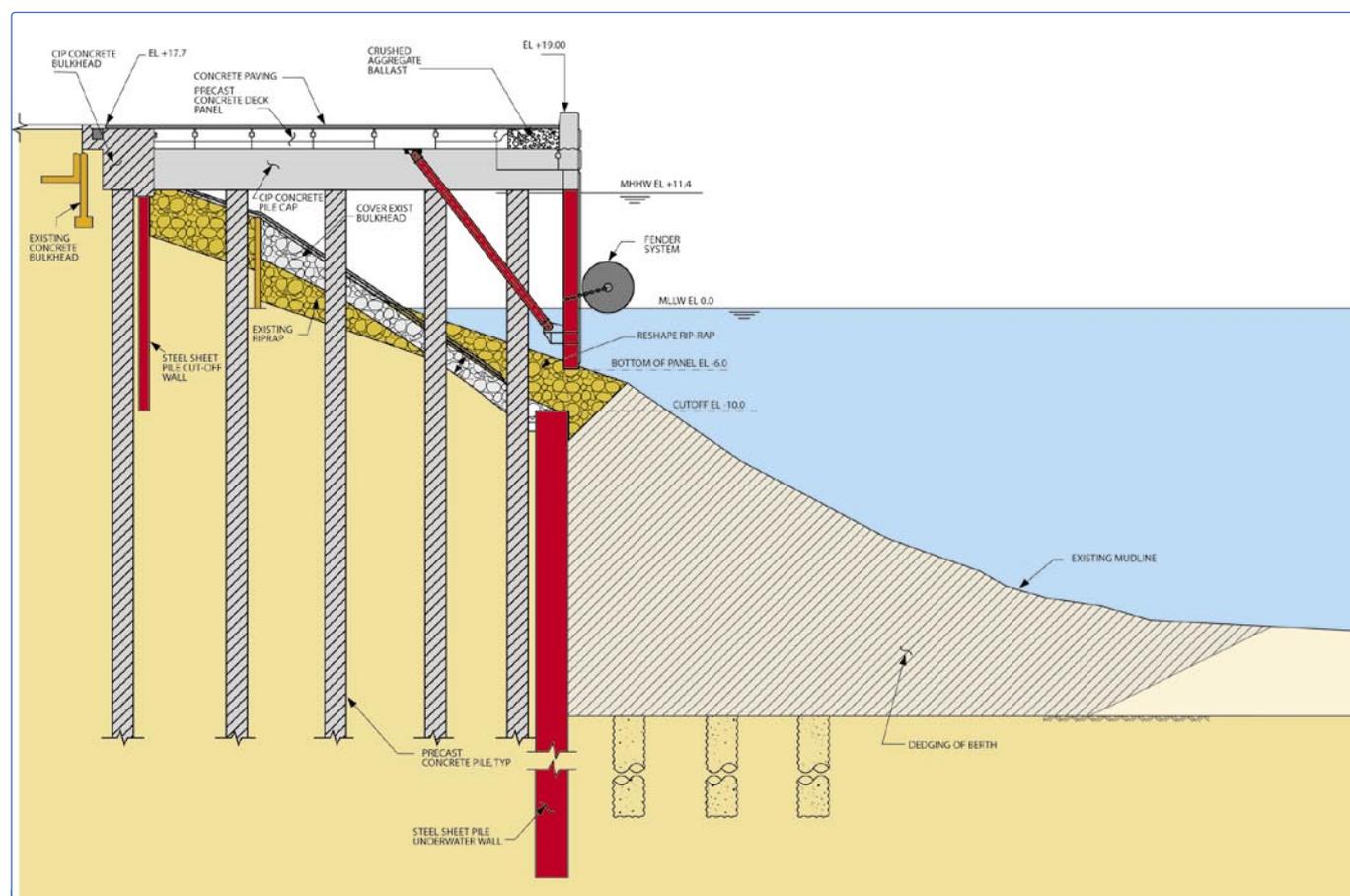


Figure 4. Technical drawing of the repair measures used for tension piles.



Figure 2. The steel sheet pile wall that stabilised the structure was installed from a barge.

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.

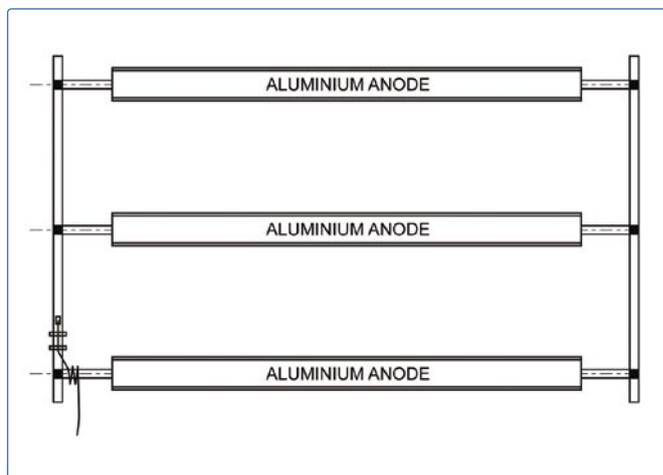


Figure 3. The pier's cathodic protection system prevents corrosion problems.

ABOUT THE COMPANY

Arcelor Mittal is the world's number one steel company, with 320,000 employees in more than 60 countries. The company, which will be incorporated in 2007 following the successful tender offer, brings together the world's leading steel companies, Mittal Steel and Arcelor.

ENQUIRIES

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