



PORT OF OAKLAND BERTHS 57/58

- A soil-cement buttress (grid) was constructed using CDSM (Cement Deep Soil Mixing) technology to improve weak and potentially liquefiable soil conditions along the Port of Oakland shoreline.
- The CDSM buttress extended for 2,400 feet and drilled to a maximum depth of 88 feet. Over 60,000 cubic yards of soil was improved for ground stabilization and liquefaction prevention during and after an earthquake.



Two Raito Soil-Mixing rigs improving ground for Berths 57/58

- The CDSM buttress construction exceeded all geometric, strength design and uniformity requirements.
- Repeat client for CDSM production.



Previous Raito Project (lower right) hosts world's largest cranes

- Project Owner: Port of Oakland, Oakland, CA
- Geotechnical Engineer: Geomatrix, Oakland, CA

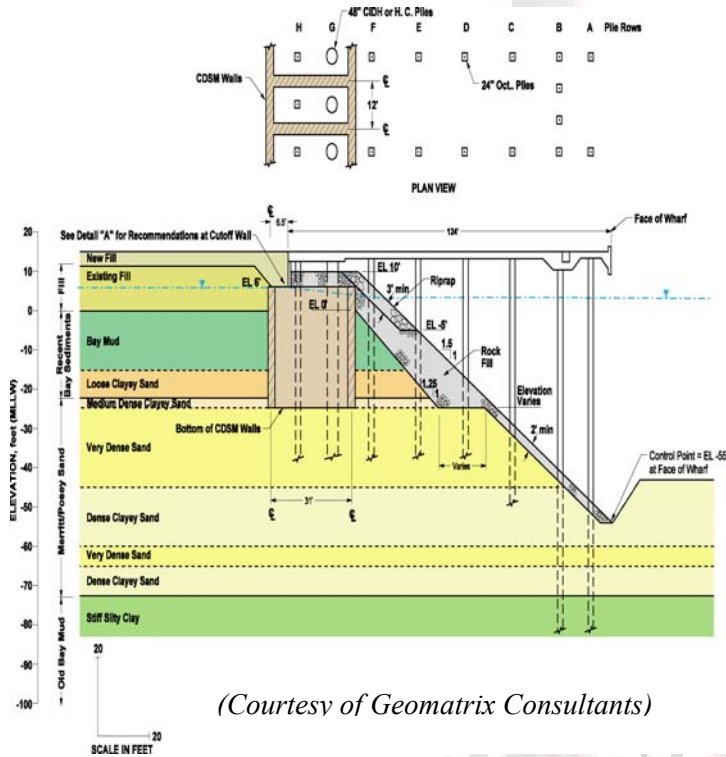


Soil Mixing on Berths 57/58 with 55/56 (cranes) in background

EXECUTIVE SUMMARY



Port of Oakland Berths 57/58



The construction of Berths 57/58 at the Port of Oakland required the stabilization of a cut slope under a proposed container wharf extending 2,400 feet. The cut slope was constructed to transition soil backlands to the design dredge depth for a maximum slope height of 65 feet.

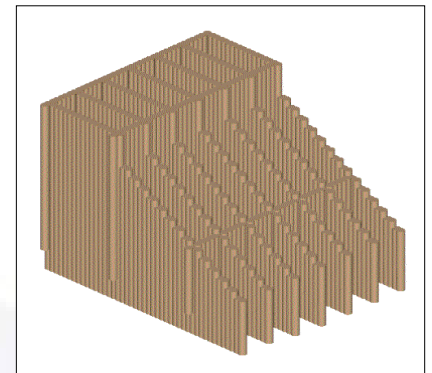
Soil conditions encountered on the project consisted of surface fill, Bay Mud and Young Bay Deposits described as soft, weak and/or susceptible to seismically induced liquefaction and lateral spreading. This condition posed a potential threat to the stability of the proposed wharf structures during and after major earthquakes. A CDSM buttress system was proposed to provide shoreline stabilization and control lateral spreading.

The soil-cement buttress consisted of a rectangular grid of Cement Deep Soil Mixing (CDSM) walls formed using 3-foot diameter columns spaced on 2-foot centers. In the shallow Bay Mud area, the grid consisted of two longitudinal walls parallel to the shoreline spaced 31 feet apart, and a series of

transverse walls perpendicular to the shoreline spaced twelve feet apart. In the deep Bay Mud area, the width of the CDSM grid was increased by extending the transverse walls in the direction of the shoreline slope. When the width of the CDSM grid was greater than 68.5 feet, a third longitudinal wall was added. The maximum treatment depth in the deep Bay Mud area was 88 feet.

Over 60,000 cubic yards of CDSM ground stabilization was constructed over a period of five months. Triple-shaft CDSM equipment with a real-time monitoring system was used for ground stabilization.

Test specimens for unconfined compressive strength were retrieved by a triple barrel coring system, and exceeded the acceptance criteria of an average of 150 psi at 28 days.



Grid in deep Bay Mud area

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