

Presentation Topic:

Treasure Island Former Naval Station Redevelopment Project



Abstract

Treasure Island is located in the central San Francisco Bay, immediately north of Yerba Buena Island, between the active San Andreas and Hayward faults. Treasure Island was constructed by placing hydraulic sand fill over natural shoal deposits within perimeter rock dikes. A full-scale vibro-compaction field test, using Direct Power Compaction (DPC) was performed to evaluate the improvement potential of sandy soils susceptible to liquefaction, and to develop a site-specific DPC vibro-compaction method specification for the desired level of densification. The test was performed at a location where the soil column consisted of approximately 22 to 25 feet (6.7 to 7.6 meters) of sandy, hydraulically placed fill over 23 to 25 feet (7.0 to 7.6 meters) of natural (Pleistocene-Holocene) shoal deposits. The DPC equipment used at the test site was configured with a vibratory hammer attached to four probes consisting of H-beams modified with steel flaps hinged to the web at the base of each beam. The test program included three intensities of compaction effort and compaction with and without prefabricated vertical drains (PVD). The test site was instrumented with vibrating-wire piezometers, wireless triaxial vibration monitors, surface settlement monuments, and reflectorless robotic total-station surveys. Cone penetration test probes were advanced before and after the DPC process to characterize the subsurface conditions and to evaluate time-dependent changes in the properties of sandy fill and shoal, or aging effects. The vibro-compaction field trials, demonstrated that (i) DPC can readily densify the sandy fill using low intensity compaction effort, (ii) DPC vibro-compaction with and without PVD exhibit similar increases in post-improvement penetration resistance, and no measureable changes in time-dependent penetration resistance (aging effects), and (iii) the underlying shoal deposits exhibit a different response to vibro-compaction than the sandy fill. The findings of the full-scale densification testing program were incorporated in the dynamic performance evaluation of the Treasure Island shoreline, and the geotechnical ground improvement program. The dynamic behavior of the shoal was further investigated in a separate study by ENGEO.