

A History of Deep Foundations in San Francisco

Established in 1776, San Francisco was a small town until the California Gold Rush of 1849 created a frenzy of growth because of its strategic location as the gateway to Gold Country. This growth spurred a construction craze as the population grew from about 459 in 1847 to 25,000 by the end of 1849. With such demand for land, reclamation was performed to push out the shoreline to the north and the east, and construction extended into the marshes and to the bay margins. Even the Great 1906 San Francisco Earthquake and Fire did not deter expansion. The land was reclaimed using a variety of materials dumped into the bay: sand from nearby dunes, various soils excavated for construction in other parts of the City, bedrock rubble cut from nearby hills, sunken ships, and building debris after the 1906 earthquake. Large loads of fill placed all at once oftentimes created mud waves due to bearing capacity failure in the underlying weak marine clays, known as "Bay Mud". Construction in these poor soil conditions necessitated the use of deep foundations. Today, with a population over 800,000, construction continues on sites with poor subsurface conditions. This presentation will present a history of deep foundations in San Francisco, from driving timber piles that disappeared into a marsh in the late 1800s, to the evolution of various driven and drilled pile techniques, to drilling 300-foot-long, large-diameter drilled shafts 50 feet into bedrock. We will highlight the challenges that come with advancing deep foundations into reclaimed land, sunken ships, and variable soil and bedrock conditions.