Rotator/Oscillator

Doyle Drive Viaduct
San Francisco, CA

MALCOLM
Deep Foundations

CONSTRUCTION PERIOD
January to June 2010

CLIENT
Owner: California Department of Transportation (CALTRANS)
General Contractor: CCMyers Inc.

SERVICES
DRILLED SHAFTS (CIDH)

228 Each 24+30 IN Dia.

6 Each 9 FT Dia. with permanent or temporary casing and 8.5 FT rock socket.

5 Each 12 FT Dia. with permanent casing to 160 FT depth and 11.5 FT rock socket.

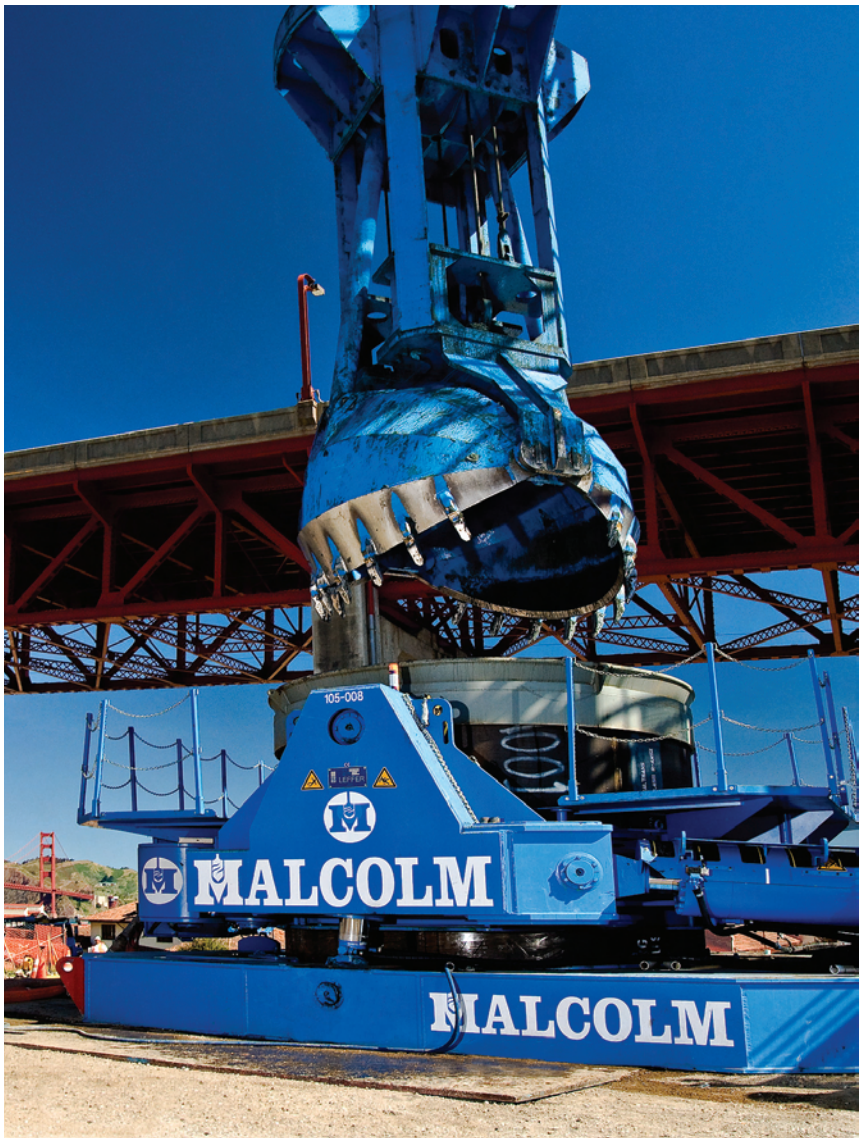
Benefits of Rotator Oscillator System

- Vibration-free installation of temporary or permanent casing.
- Enables shaft construction in very loose and unstable soil to depths exceeding 200 Ft.
- Fully-cased construction enhances shaft quality and reduces risk of non-conformities.

CONTACT MALCOLM
This job was managed by our Northern California Division in Hayward, California.
For a complete list of office locations and technologies, visit **Malcolmdrilling.com**

Project Overview

The existing south access road to San Francisco's Golden Gate Bridge, known as Doyle Drive or Route 101, is structurally and seismically unsafe and requires replacement. Built in 1936, Doyle Drive has reached the end of its serviceable life. The project is located within the Presidio, a National Park, and is part of the primary north-south highway and transit linkage through San Francisco. The foundations for the new South Viaduct Bridge were extremely challenging due to the requirement for deep, large diameter drilled shafts installed adjacent to historic landmarks. Drilled shafts with 12 ft diameter were constructed to depth of approximately 200 ft.



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Construction Details

The viaduct bents are founded on 12 ft and 8.5 ft diameter drilled shafts, while abutments and retaining walls are installed on smaller diameter drilled foundations. The bridge design required a single drilled shaft below each column. The 12 ft diameter drilled shafts required permanent steel casing to be installed up to 160 ft depth under extremely strict vibration limitations. Malcolm employed the world's largest Oscillator to advance the casing without inducing ground vibrations, while a spherical grab excavated overburden soils within the casing. A BG40 rotary drilling rig was used to bore an 11.5 ft diameter rock socket which was drilled below the permanent casing tip. The seismic loads resulted in a very dense reinforcement configuration with individual pile cages weighing up to 150 tons. A custom designed tipping frame and unique suspension systems were required to handle and splice these exceptionally long and heavy rebar cages.

Ground Conditions

Conditions at the site comprised of alluvial soils, extending to depths up to 160 ft, overlying bedrock of the Franciscan Complex. All shafts have been designed to develop their load bearing capacity both in end bearing and side friction in the bedrock only. The Franciscan Complex is composed of sandstone, shale, limestone, chert, serpentine, graywacke mixed in a seemingly chaotic manner. Engineering properties of the Franciscan vary significantly within limited vertical and horizontal intervals. Groundwater was encountered between 20 ft and 60 ft below working grade.

Quality Control

The shaft integrity was tested using Gamma-Gamma and CSL test methods, while visual inspection by the Mini SID camera ensured a clean base which was required for end bearing capacity. Malcolm Drilling employed synthetic slurry to stabilize the open rock socket to ensure compliance with the specifications through carefully controlled slurry exchange procedures. The concrete mix design was developed with a special emphasis on workability, which was needed for an extended period for the tremie concrete placement operation. The mix had the characteristics of self-consolidating concrete (SCC), with 50% of the Portland cement replaced by slag and fly ash.

Look to the Blue at Malcolmdrilling.com