Secant Pile Shoring

New Irvington Tunnel
Vargas Shaft
Fremont, CA

MALCOLM
Retention Systems

CONSTRUCTION PERIOD
November 2010 – January 2011

CLIENT
Owner: San Francisco Public Utility Commission (SFPUC)
Construction Manager: Hatch Mott MacDonald

SERVICES
41 FT diameter access shaft
39 IN DIA Unreinforced Secant Piles to 115 FT depth forming a compression ring.

Benefits of Secant Pile Shoring System

- Stable excavation support and ground water control in granular soils with high groundwater elevations.
- Fully cased drilling methods allow for a strict verticality tolerance in large depths.
- Powerful Rotary Drilling Equipment enables the wall to be keyed in hard bedrock materials.

Project Overview

The 3.5 mile long New Irvington Tunnel will provide a seismically sound alternate to the existing conveyance tunnel connecting the San Francisco Public Utility Commission's water sources in the Sierra Nevada and Alameda County to the Bay Area's water supply systems. The project includes one 41 foot inside diameter, 115 foot deep temporary shaft to create access for 13 foot diameter tunnel drives in two directions. Secant Piles were advance through approximately 30 feet of water bearing alluvium into extremely weathered to decomposed Fransiscan shale and sandstone. Harder rock conditions, with sheared water bearing zones were encountered below 90 foot depth. The shaft is adjacent to the I-680 freeway at Vargas Road in Fremont, California.

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**

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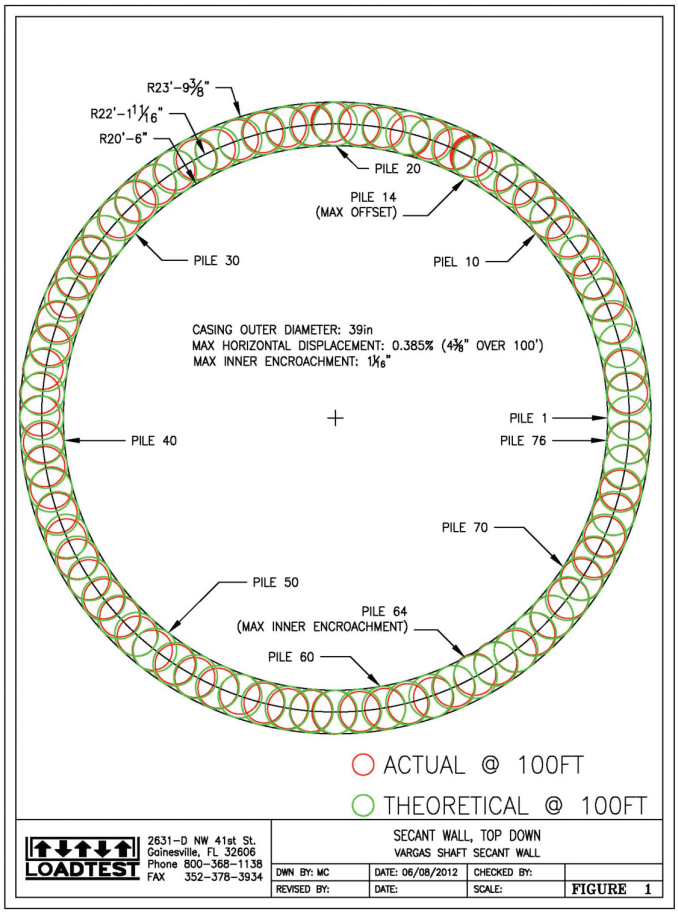
Construction Details

The original shaft design comprised a secant pile support ring extending through alluvial overburden to rock with rock-bolt and shotcrete support below rock surface. The first secant pile was extended to tunnel invert elevation in order to evaluate the rock quality. Based on conditions observed, shaft support was revised to comprise full depth secant piles to 115 FT below grade. The 39 IN diameter secant piles were installed using a Bauer BG40 hydraulic drilling rig. Piles were unreinforced and employed compression hoop stress for shaft support.

Ground Conditions

The soil profile at the shaft location consists of 20 to 35 feet of fill and colluvium (sand with gravel and cobbles and medium stiff clay) overlying bedrock. The groundwater



level was anticipated around 14 feet below the top of shaft elevation. Bedrock consisted of intensely to moderately fractured, weak to moderately strong Sandstone of the Franciscan Complex with Unconfined Compressive Strength (UCS) values of up to 5,000 psi.

Quality Control

Malcolm used Loadtest's Sonic Caliper technology to verify the verticality of every pile during installation. The Sonic Caliper technology utilizes sonar signals to provide a full 360 degree profile of each pile. Combined they generate a complete three-dimensional model of the internal shaft dimension. The combination of stiff sectional drilling casing, powerful oscillators and rotary drilling machines enable the installation of very deep secant pile walls with unmatched accuracy. The access shaft was installed with verticality tolerances ranging from less than 0.2% to maximum 0.5%. Water seepage into the shaft was successfully minimized by advancing all shafts through the shear zones and seating them into the fractured bedrock. No additional grouting work at the tunnel interface was required.

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