

GRL Engineers Dynamic Pile Monitoring of Cast-In-Drilled-Hole (CIDH) Test Piles

Challenge:

Case Pacific Company in California contacted GRL Engineers to help collect high-strain dynamic measurements on two Cast-In-Drilled-Hole piles. The project in Oakland at 1100 Broadway Avenue, was initiated to update an abandoned foundation. The unknown limitations of the foundation brought the need to perform a high-strain dynamic test. GRL conducted this test, along with APPLE drop-weight testing, CAPWAP® analysis, and soil/pile set-up characterization.

Method:

A high-strain dynamic test was performed using the GRL APPLE V drop hammer system. The APPLE V ram mechanism was guided by a boxed lead configuration having approximate dimensions of 8 ft x 8 ft x 20 ft. One weight of approximately 8 tons was used for the test. A load cell was used to obtain dynamic strain measurements (fig. 1). Analog signals from gages were conditioned, digitized, stored, and processed with a Pile Driving Analyzer® (PDA-8G). Force and velocity records were evaluated to determine soil resistance and pile integrity. The ram drop-heights ranged from 2 to approximately 7.2 feet for the tested piles. The data from these drop tests was analyzed in CAPWAP (Case Pile Wave Analysis Program) to estimate static bearing capacity and shaft friction.

Results:

The transferred energy to the gage location, below pile top, ranged from 52 to 58 kip-ft for the impacts that were analyzed with CAPWAP. The maximum CAPWAP-computed compressive stress value was 4.2 ksi. Maximum computed tension stress levels were at or less than 0.9 ksi (fig. 2). The PDA measurements showed no clear indication of pile damage in the force and velocity records. The activated capacities calculated by CAPWAP analysis for the two test piles, were 1240 and 1760 kips, respectively. Additional pile resistance may have been activated with a larger energy applied to the piles.

In the case history presented, high strain dynamic testing measurements were compared to the design specifications and allowed for a comprehensive understanding of the foundation that than would have been absent without testing. The report presented to the client included in-depth analysis of the impact stresses on the test pile, along with soil resistance at the pile location. The foundation for the abandoned building was shown to meet the design requirements, allowing the project to move forward in a timely manner.

To learn more about GRL Engineers, visit www.grlengineers.com or email us at info@grlengineers.com.

Project Details

Client: Case Pacific

Location: Oakland, California

GRL Office: Washington & California

GRL Services

- Dynamic Pile Monitoring
- CAPWAP® Data Analysis
- Apple Drop-Weight Testing
- Soil/Pile Set-Up Characterization

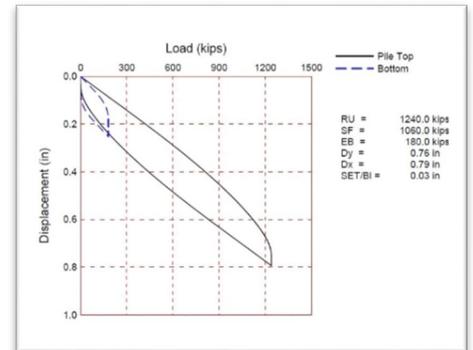


Figure 1: APPLE load test displacement vs load results

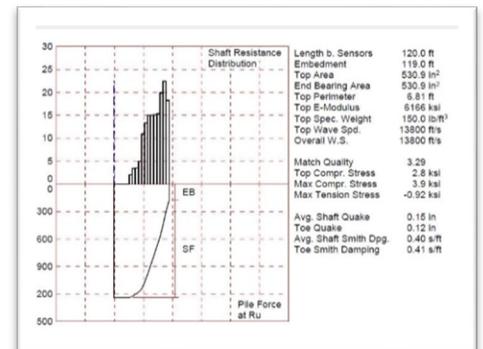


Figure 2: Shaft resistance distribution results