

GRL Services

by the Foundation Testing Experts

GRL performs Dynamic Monitoring and Load Testing of Deep Foundations innovatively and efficiently, responding to construction control codes and time and cost pressures. Using the Pile Driving Analyzer® (PDA) and CAPWAP®, GRL develops pile installation criteria, simulates the load-set curve and assesses bearing capacity, soil resistance distribution, integrity and pile stresses along the length of the foundation.

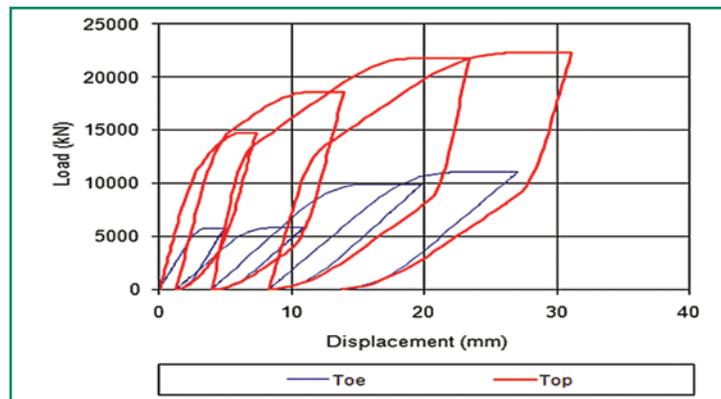
The theory behind Dynamic Monitoring and Load Testing of Deep Foundations is well documented in the geotechnical engineering literature, accepted throughout the world, and conforms to ASTM D4945 Standard Test Method for High-Strain Dynamic Testing of Piles.

DYNAMIC LOAD TESTING

Assesses the Bearing Capacity of drilled shafts, augered cast-in-place and driven piles, micropiles and helical piles.

DYNAMIC LOAD TESTING RESULTS

GRL analyzes dynamic load testing data to provide **Bearing Capacity** and **Resistance Distribution** including shaft resistance and end bearing components, as well as a **Simulated Static Load Test**. Years of correlating static load test capacities to capacities obtained with CAPWAP support the reliability of Dynamic Load Testing.



CAPWAP-simulated Load-Set Curve.

TESTING PROCEDURE

Dynamic Load Testing requires either a pile driving hammer or a special ram to impact the foundation. The weight of the ram is typically between 1 and 2% of the test load. Force and velocity records are acquired from strain and acceleration sensors installed near the top of the foundation, which is cushioned by several thin plywood sheets.

Dynamic Monitoring & Load Testing of Deep Foundations



Dynamic Load Test with APPLE (red ram) on a steel H pile.

The soil resistance, the condition of the foundation and the stresses it is experiencing during the test are monitored with each impact of the ram. The ram drop height (energy) is increased from blow to blow, striking a balance between foundation stresses and soil resistance activation until the test capacity has been activated. A CAPWAP analysis follows.

For driven piles, GRL usually performs Dynamic Load Tests after a sufficient waiting time following pile installation, when soil resistance is closer to its long term condition.

APPLE

When a suitable ram is not immediately available at the testing location, GRL chooses from its family of APPLE load testing systems that can be configured for a wide range of weights. APPLE systems may be delivered to projects anywhere in the continental USA.

APPLE systems include a guide frame, a modular ram and a release mechanism. The rams of some APPLE systems may be instrumented, or a load cell may be used to simplify measurements of force.

A contractor assembles the APPLE in a relatively short time, and can easily move it from shaft to shaft. The APPLE guide frame not only facilitates a well-aligned ram impact, but also serves to support the ram weight prior to impact. In this way the crane is not subjected to a sudden load release. The guide frame is positioned over the foundation and evenly supported on the ground. After the drop weight is raised to the desired drop height, a hydraulic clamp first transfers the load to the frame and then releases it, causing a free ram fall. The ram impacts the top of the foundation, generating the forces and velocities required for the Dynamic Load Test.

GRL Dynamic Measurements and Analyses
engineers, inc.

*Quick response . . .
results you can trust*

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PILE DRIVING MONITORING

Evaluates the bearing capacity, driving stresses and integrity of driven piles, as well as driving hammer performance.

Pile Driving Monitoring, or Dynamic Pile Monitoring, is performed during pre-construction test programs, and/or during the installation of production piles.

PILE DRIVING MONITORING RESULTS

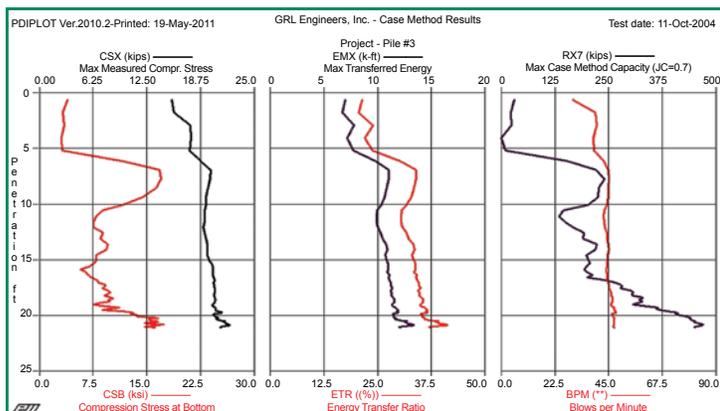
GRL obtains and interprets these important Case Method quantities in real time, that is, between hammer blows:

Soil Resistance at the time of monitoring, including an assessment of shaft resistance and end bearing along with the corresponding driving resistance (blow count). This information may be used to establish or check a driving criterion. In addition to bearing capacity calculated by the Case Method, GRL may opt to perform signal matching in real time with iCAP®, an automated analysis based on CAPWAP®.

Dynamic Axial Stresses, both tensile and compressive, at the sensor location and below. With this information GRL can alert the responsible parties to the potential of damage.

Pile Integrity based on stress wave reflections from damage below the location of the sensors.

Hammer Performance, including the energy transferred to the pile, the hammer speed in blows per minute and the stroke of open-ended diesel hammers.



Selected Pile Driving Monitoring results versus depth.

Dynamic Monitoring & Load Testing of Deep Foundations



GRL Engineer monitoring the installation of driven concrete piles.

SiteLink®

SiteLink technology enables GRL engineers to conduct Dynamic Foundation Testing from their offices. In an era of shrinking budgets and fast track construction, SiteLink eliminates scheduling conflicts and the travel of an engineer to the field to conduct the test, reducing the time until report submittal. The office computer screen displays all parameters seen in the field.

A Pile Driving Analyzer® is sent to the job site. The construction crew is trained to set up the instrumentation and initiate SiteLink. A GRL engineer monitors the job remotely, using software that tracks and controls the pile test. Communication between job and office is maintained during the test.



Dynamic Foundation Testing with SiteLink.

Shortly after GRL concludes a High Strain Dynamic Foundation Test, it furnishes project reports that include test details, results, summary tables and recommendations.



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