

Offshore Dynamic Foundation Testing

High Strain Dynamic Pile Testing consists of obtaining strain and acceleration measurements during pile driving and analyzing these measurements to evaluate driving stresses, hammer performance, and bearing capacity. Pile driving is a major task in the construction of offshore oil platforms and offshore wind farms. Often times, these foundations are installed in challenging construction environments where reliability of the test measurements are essential. Timeliness and flawless installation are directly linked to significant economic savings.

Test Procedure

GRL generally starts with a pile driveability study. Using the Offshore Wave version of the GRLWEAP wave equation analysis of piles software program, GRL evaluates if the proposed hammer and cushion system is suitable for the project and anticipates installation conditions that may require special precautions.

Once pile driving starts, GRL monitors driving stresses and the actual efficiency of the hammer (energy transferred to the pile) with a Pile Driving Analyzer® (PDA). GRL may also provide equipment and expertise to assess hammer performance (stroke, potential and kinetic energy), an important concern on an offshore platform. Pile driving monitoring requires strain transducers and accelerometers attached to the pile to supply the data required for analysis with a PDA. If necessary, special underwater strain transducers and accelerometers are used.

Underwater Dynamic Testing

The foundations of many offshore oil platforms and wind turbines are designed for driving by underwater hammers. GRL has the equipment to perform underwater dynamic testing in these situations. Underwater strain transducers are coated with polyurethane and the internal components of the accelerometers are protected with a waterproof sealer and O-rings to prevent water intrusion.

Benefits of Offshore Dynamic Foundation Testing

- Pre-construction driveability studies predict driving stress levels which can be used to reduce the risk of pile damage
- Dynamic Pile Monitoring
- Evaluation of static pile capacity
- Underwater dynamic testing

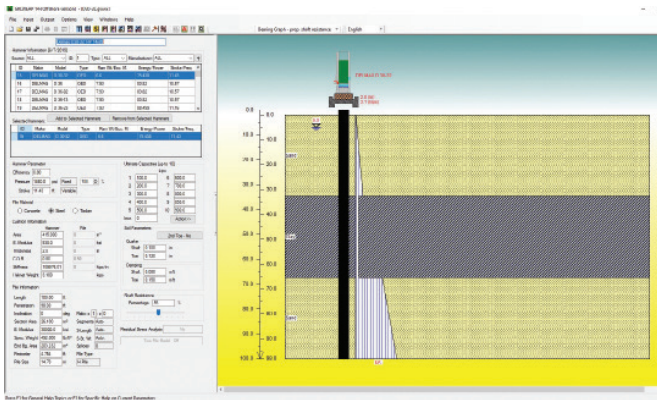
GRL Engineers, Inc.

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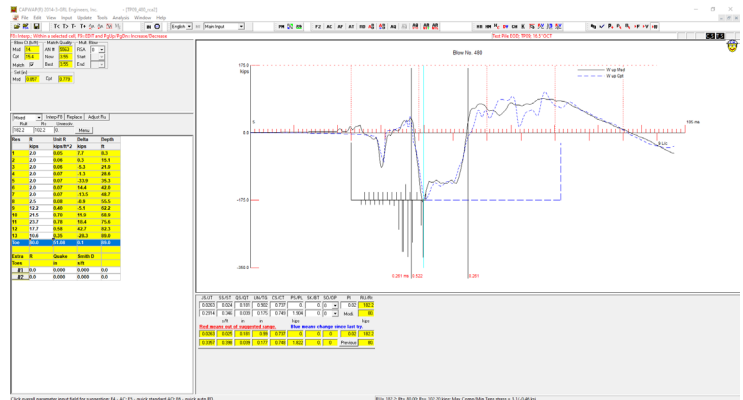
Office Locations

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| California | Georgia | Pennsylvania | Louisiana |
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Results of GRLWEAP analysis



Results of CAPWAP analysis

Data Collection and Analysis

Immediately following pile driving, GRL uses the measurements collected during pile monitoring to complete the dynamic load test by performing CAPWAP® Signal Matching analyses. This provides an assessment of shaft resistance and end bearing at the time of testing. GRL often repeats the dynamic load tests during a pile re-strike. To ensure continuity of offshore operations GRL provides backup equipment and personnel to the site.

CAPWAP utilizes an algorithm that is very accurate for long and non-uniform piles that are common in offshore installations. It calculates wave equation parameters including soil damping, quake, shaft resistance and end bearing for discrete points along the shaft of the pile.

GRL Engineers often use site-specific parameters, calculated by CAPWAP to repeat the GRLWEAP Wave Equation analysis. This refined wave equation analysis may resolve discrepancies between predicted and observed blow counts, serve as a basis of pile acceptance in case of early refusal, and improve installation criteria of other piles in similar soils.



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