



# PDA Testing Services- Dynamic Pile Monitoring

## BENEFITS OF PDA TESTING

- Dynamic Pile Monitoring helps achieve a safe and economical driven pile installation by assessing pile capacity, driving stresses, integrity, and hammer performance in real time
- Dynamic testing provides a fast, reliable and cost effective method for evaluation of driven pile capacity
- Time dependent changes in capacity (soil setup, relaxation) can be evaluated by dynamic testing during initial driving and restrike

## WHAT IS DYNAMIC PILE MONITORING

GRL Engineers use the Pile Driving Analyzer® (PDA) to perform Dynamic Pile Monitoring or “PDA” testing services. During driving, the PDA equipment processes dynamic measurements from strain transducers and accelerometers bolted to a pile. GRL engineers perform Dynamic Pile Monitoring to obtain and evaluate driving system performance, driving stresses, pile integrity, as well as the soil resistance magnitude and resistance distribution.

GRL innovatively and efficiently performs PDA testing services in accordance with the applicable codes and time and cost pressures. In preconstruction test programs, Dynamic Pile Monitoring with restrike testing helps formulate production pile driving criteria. During production pile installation, Dynamic Pile Monitoring checks that driving meets the established criterion.

## TEST PROCEDURE

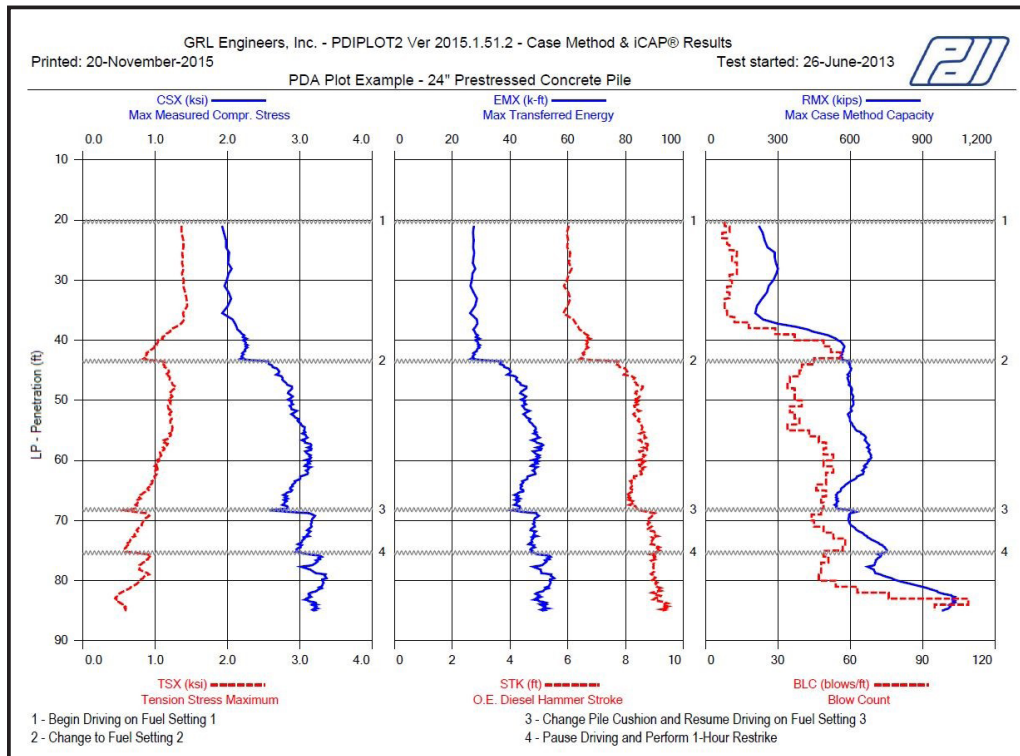
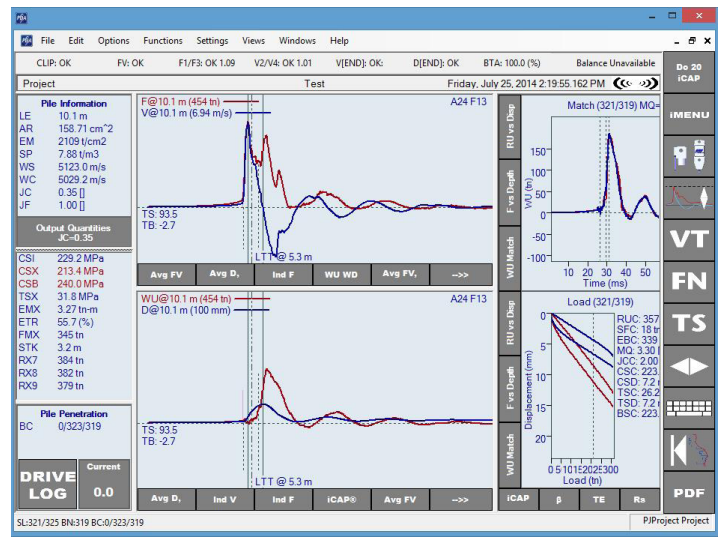
In Dynamic Pile Monitoring, strain transducers and accelerometers are bolted to the pile. The attached gages are connected to a Pile Driving Analyzer (PDA) either wirelessly or by a main cable. With each hammer impact, the PDA processes the strain and acceleration measurements in real time, providing both graphical data displays and numerical results. The GRL engineer evaluates the graphical and numerical results during the test. Driving system performance is assessed for unusual characteristics and the energy transfer magnitude is compared to historical norms for the hammer and pile type. Driving stresses are compared to both the pile material and project specification limits. If driving stresses are high or if a significant potential for pile damage is indicated, driving can be stopped and an alternative installation procedure assessed. The soil resistance magnitude and its distribution can be evaluated during driving with iCAP®, or after data collection with the more rigorous CAPWAP® program. To assess time-dependent soil strength changes, the gages are reattached to the pile an appropriate time after initial driving, the hammer positioned atop the pile, and a restrike test performed. The GRL engineer then provides recommendations for pile installation.





# DATA ANALYSIS AND REPORTING

Following data collection, GRL typically processes the Dynamic Pile Monitoring results versus pile penetration depth or blow number. Selected test data is also analyzed with the CAPWAP software to provide the mobilized capacity, as well as the shaft and toe resistances, the shaft resistance distribution, and the dynamic soil properties. CAPWAP output also includes a simulated load-set curve for the pile head and pile toe. The dynamic monitoring and CAPWAP results provide insight into input parameter selection for refined GRLWEAP analyses that are often used to establish driving criterion. The GRL engineer prepares a final report summarizing the dynamic pile monitoring test details, test results, and recommendations.



Dynamic Monitoring Results vs. Depth

## SITELINK TECHNOLOGY

SiteLink® technology enables GRL engineers to conduct Dynamic Pile Monitoring from a remote location. It provides the same dynamic test results as conventional on-site testing at a reduced testing cost since travel time and travel expenses are eliminated. Pile preparation and gage attachment are performed by the contractor, inspection agency, or another party on-site who connects the field PDA unit with the remote engineer via broadband service. SiteLink® technology provides an easy solution to scheduling a dynamic test or solving an unanticipated pile installation problem. Data analysis and reporting can begin quicker as no travel time is needed to return to the office.

For additional information on **PDA Testing Services Dynamic Pile Monitoring** or any other GRL Engineers services please contact [info@GRLengineers.com](mailto:info@GRLengineers.com) or visit us at [www.GRLengineers.com](http://www.GRLengineers.com).



## ASTM STANDARD

GRL Engineers perform Dynamic Load Tests and Dynamic Pile Monitoring in general accordance with ASTM D4945-12 Standard Test Method for High-Strain Dynamic Testing of Piles.

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