



Information gathered by the engineers of
Goble Rausche Likins and Associates, Inc. and *Pile Dynamics, Inc.*

Remote Pile Testing with Pile Driving Analyzers®

by Garland Likins, Pile Dynamics, Inc.

Foundation engineers have dynamically tested piles for nearly 40 years. Today, the method is routinely used on thousands of construction sites worldwide for quality assurance of pile foundations. As technology advances and speed of testing becomes more and more an issue, having the specialized testing engineer on site may lead to undesirable time delays, scheduling problems and delays in the reporting process. To improve PDA testing efficiency, PDI developed the PAL-R ("R" for "remote" - US patent #6,301,551) which collects dynamic data on site and sends it by cell phone to the PDA engineer's office as testing proceeds. Several PDI clients have already obtained a PAL-R to provide remote services to their clients; the following comments tell how this innovation improved their testing service.



Carl-John Gravare Managing Director of Palanalys in Sweden reports "The Swedish Road Administration code specifies that at least 3 pile tests per bridge pier or abutment be dynamically tested. The factor of safety depends on the number of piles tested, and is specified in the code. If only one pier is available for testing, the trip by car might be 700 km and 8 hours travel time for just one hour testing. A remote PDA results in a substantial saving of time and money. We have used the PAL-R for over two years and found it very useful, so far testing more than 1000 piles at more than 50 sites. Many piling crews in Sweden are familiar with attaching the transducers to the pile and need no further education. Advantages include (a) tests can be carried out when convenient on site, and (b) the test report often is sent the same day as the test was carried out."

Gary Axelsson Testing Manager of Skanska Sweden adds "We use the PAL quite often for measurements in northern Sweden where we otherwise would have to spend one day traveling. It's nice to be in the office when it is negative 20 degrees Celsius outside."

Mike Kightley, Testing Manager for Testal in England, reports "Testal was the first in the UK to embrace the PAL-R. As a UKAS accredited company, the work quality has to be of the highest level. That our highly experienced engineers are able to view live data, in the relative comfort of an office, adds to this both in terms of improved accuracy of analysis and faster output of reports."

David Klingberg, Manager of Piletest, Australia writes "We started using the PAL-R 18 months ago. The transition to PAL-R was relatively smooth. The PAL-R has been particularly valuable for construction sites several hours from our offices. We have not only saved the travel cost, but we have reduced the time

required by our testing engineers on site as there is no waiting for the next pile to be tested (which may only be required the next day or even a return visit). It has provided considerable convenience and cost savings in being able to test any pile on remote projects if the need arises, as it does not rely on having the testing engineer available on site. The PAL-R has proved valuable in accelerating the report presentation."

Jon Cannon Managing Director of Independent Geoscience, Australia notes "I have had my PAL-R now for 6 months. It has been reasonably easy for me to use and my clients have also had little difficulty. Australia is a very big country and travel expense to distant sites is significant. I now always provide the options of "classic" on-site testing or PAL-R remote testing. Clients are all showing a strong preference for the lower overall cost of remote testing. I use my PAL-R more frequently on large projects a long distance from my Melbourne home. The remote operation provides me with much more time at home rather than hours and hours of air travel and driving. This benefits my home life - the kids remember my name and what I look like!! It reduces the chance of road accidents through falling asleep at the wheel, or hitting kangaroos and sheep, which have been the subject of my previous horror stories."

Dr. George Goble of George G. Goble Consulting & Engineering LLC comments "I have been involved in remote PDA testing on two different jobs. My motivation originally was simply cost savings. That goal was certainly achieved. I have since concluded that the biggest advantage is avoiding scheduling problems. When the PDA testing capability is in the hands of the contractor, the PDA test can be performed at the contractor's convenience. The field personnel easily learned to use the equipment. The device is quite fool-proof. Codes are now available that set the factor of safety based on the level of quality control. Increasing PDA testing results in lower factors of safety, particularly in the Pile Driving Contractors Association's Design Code and in the Australian LRFD Code. With a reduction in safety factors, foundation costs can decline."

Another important point to remember: because PAL-R testing can be quoted on a "per pile basis", the PDA testing cost uncertainty to the contractor is eliminated, allowing their bids to be competitive.

Clearly the PAL-R is an important tool that will be used in the future. However, complex initial pile testing programs still may require the experienced test engineer on site. This is particularly important where pile type, pile length, appropriate hammer and attainable capacity should be assessed for an optimal foundation.

Looking back on 2001 and wishing you the best for 2002.

In the wake of the September 11 attacks, PDI and GRL received numerous expressions of support from clients worldwide. Thank you all for your thoughtfulness. While we are grateful that none of our families suffered direct losses, we grieved for those who did. Our sympathy goes to all who were directly impacted by 9/11. Our respect and admiration goes to all civil and structural engineers from various professional organizations - many of them our readers - who volunteered their time in the aftermath of the WTC collapse.

May 2002 bring peace to the world and happiness to you.

CALENDAR OF EVENTS

2002

February 13, Orlando, FL: Computer Software for Design and Analysis of Deep Foundations. Presented by Prof. Frank Townsend of University of Florida and Mohamad Hussein of GRL and Associates, Inc. For more information visit www.asce.org or call (800) 548-2723.

February 14-16, Orlando, FL: The International Deep Foundations Congress. Presented by the Geo-Institute of the American Society of Civil Engineers. For more information please visit <http://www.asce.org/conferences/deepfound2002>.

February 21-23, San Francisco, CA: PDCA 2002 Winter Roundtable. Presented by the Pile Driving Contractors Association. For more information call the PDCA at (970) 945-1231.

March 21-22, Charlotte, NC: Deep Foundations, Design Construction and Quality Control, ASCE short course. Presented by Prof. Dan Brown of Auburn University and Mohamad Hussein of GRL and Associates, Inc. For more information call (800) 548-2723.

April 11-12, Cleveland, OH: PDA/CAPWAP Workshop. Presented by Pile Dynamics, Inc. 1.4 CEU's. For more information call PDI at (216) 831-6131.

May 3, San Francisco, CA: Augered Cast in Place Piles Seminar. Presented by the Deep Foundations Institute. For more information call DFI at (201) 567-4232.

May 13-15, Hershey, PA: Central PA Section of ASCE 19th Geotechnical Seminar. Current Trends in Geotechnical Engineering. For more information go to www.towereng.com/asce-pa2002.htm.

June 3-5, Nice, France. DFI 9th International Conference. For more information call DFI at (201) 567-4232.

June 19-21, Logan, UT: Design and Construction of Driven Pile Foundations short course featuring GRLWEAP and DRIVEN software. Presented by Utah State University. 2.5 CEU's. For more information call Dr. Joe Caliendo at (435)797-2896 or joe@cc.usu.edu.

September 19-20, New Orleans, LA: The Design & Installation of Cost-Efficient Driven Piles. Presented by the Pile Driving Contractors Association. For information call (970) 945-1231.

October 9-11, San Diego, CA: The Deep Foundations Institute 27th Annual Members Conference. For information call (201) 567-4232.

Making the World a Better Place

Jay Berger (GRL Colorado) is donating 40% of his time as Executive Director of a new non-profit organization called Engineers Without Borders - USA. EWB-USA is dedicated to helping the economic development of rural areas in developing countries with their engineering needs for water, sanitation, and energy systems. Learn more about EWB-USA at www.ewb-usa.org.

GRL on the Fast Track

Mario Saavedra (GRL Cleveland, working on a job for Jay Berger, GRL Colorado) conducted 76 dynamic tests in two days, monitoring the driving of 72 piles and 4 restrrike tests. His trick?

He used two different sets of cables and gauges, to shorten the time between tests. These were H piles, and each pile was pre-drilled. Two people helped attach and remove the gauges using a drill with a socket adaptor.

Sensor Protectors

PDA operators have always been concerned with damaging their instruments during pile lifting. The solution has traditionally been to install the sensors after the pile is positioned for driving - requiring climbing up the leads. Sensor Protectors offer a better solution: Attach your accelerometers and strain transducers while your pile is still on the ground then cover them with the Sensor Protectors. Originally developed for square piles, these light and inexpensive devices are now available for any pile shape to speed up testing.



Sensor Protectors on pipe pile

PDA/CAPWAP Workshop

In response to popular demand, PDI will offer a training/retraining workshop on dynamic pile testing in Cleveland on April 11 and 12, 2002. The course will present a brief background for and extensive examples of dynamic load testing and pile monitoring. This course is strongly recommended as a refresher for those having undergone PDA training in the past, for those frequently involved in specifying dynamic pile tests, and for anyone wanting a good understanding of the principles and interpretation of the results. Continuing Education Units are available. For further information please contact Judy Fox by phone at 216 831 6131, or by email at info@pile.com or visit our web page www.pile.com.

Web Accolades

The joint website of PDI and GRL has been awarded four stars ("don't miss" category) by Emerald Abstracts Civil Engineering Coolsites, an indexed review of the best of the Web by Emerald Reviews/Abstracts from the United Kingdom. Emerald's reviewers evaluate every site on five key criteria: style, structure, ease of use, quality of information and usefulness to the practitioner. As an additional accolade, PDI has been added to Emerald Abstracts Civil Engineering Coolsites as the November 2001 Geotechnical Engineering Coolsite. The Emerald reviewer says, among other comments: "The PDI/GRL web site is well laid out and colorful.... I linked to the dynamic testing section and found a useful overview of wave propagation theory. As well as the main PDI/GRL homepage, there are individual homepages for PDI and GRL from where you can access PDI products and GRL services respectively. I've used the PDI system in the past to prove pile capacity dynamically and it's quick, inexpensive, user-friendly and reliable - just like this web site, which gets a four star assessment."

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GRL

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