CELEBRATING

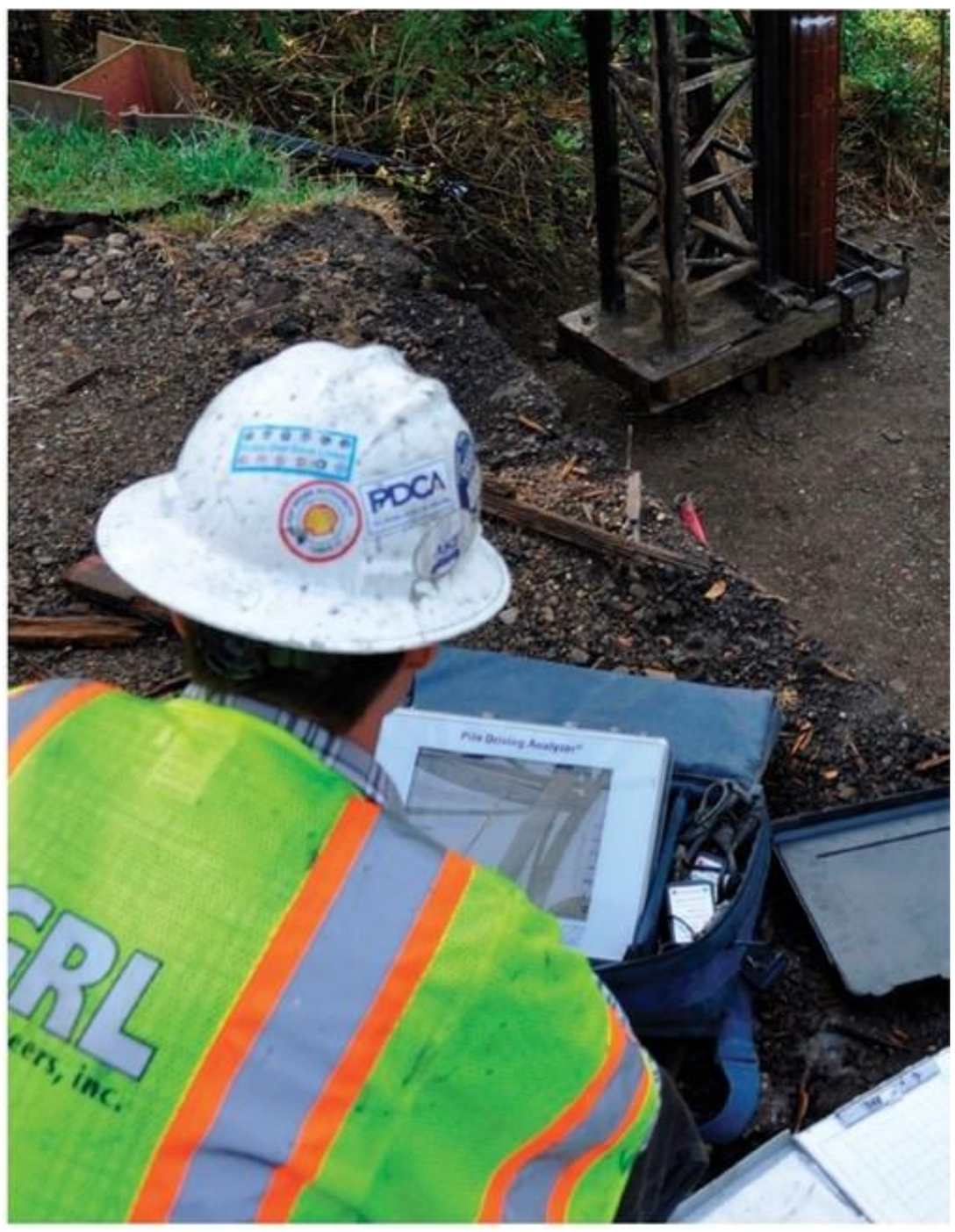
YEARS OF GRL ENGINEERS

Looking back and looking forward

By Frank Rausche, Ph.D., P.E.

Forty years ago, a new type of consulting firm was incorporated in Ohio – a company totally focused on providing the pile driving industry with dynamic testing and related services. Its mission was to support geotechnical firms, construction managers, pile driving contractors and owners with highly specialized testing and monitoring services. These services encompassed state-of-the-art technology originated from a late 1950s idea by Professor Harry Nara of Case Institute of Technology (Case), now Case Western Reserve University, in Cleveland, Ohio: that each hammer blow applied to the pile represents a quick loading test. Measuring force and velocity near the pile top under the hammer impacts and analyzing this dynamic data should then yield the static soil resistance and a reliable means of construction control and quality assurance. Obviously, Harry Nara's idea was and is related to PDCA's premise that "a driven pile is a tested pile."

In the mid 1960s, Professor George G. Goble became the principal investigator of a research project at Case, which was based on Nara's idea and was entitled "Dynamic Studies on the Bearing Capacity of Piles." The project was funded by the Ohio Department of Transportation and the Federal Highway Administration (FHWA). My 1970 Ph.D. dissertation developed and tested the basic sensors to measure force and motion, derived the Case Method equation for real time capacity calculations, and developed the CAPWAP® computer code for more detailed soil resistance evaluations. A field computer that analyzed sensor measurements was also developed at the time. The research clearly showed that the most successful computations involved the



Photos courtesy of GRL Engineers

Pile driving hammer manufacturers and their representatives were instrument al in the development of GRL. An intimate knowledge of the working principles of pile driving hammers is invaluable when analyzing measured data or predicting driveability.

traveling wave concept, providing a true physical representation of what happens in a pile during the hammer impact.

In the early 1970s, Goble saw the potential benefit from the Case research to the driven pile industry, and began to informally offer testing services for the private sector. In 1972, Goble founded Pile Dynamics, Inc. (PDI), a firm dedicated to building the necessary hardware to carry out dynamic load testing, mostnotably the Pile Diving Analyzer" (PDA) system.

There were quite a few early champions who supported the implementation of this then new and breakthrough technology. Ray Grover, bridge foundation engineer with the Ohio Department of Transportation, often attended demonstration tests for other state transportation departments such as Minnesota, New York, Pennsylvania, Georgia, Idaho and Florida. Ken LaFond of Twin City Testing took advantage of dynamic testing on his many foundation projects around Minnesota and the upper Midwest. News of this practical approach to construction monitoring and pile load testing spread offshore and to other countries: engineers at Chevron Oil Company specified dynamic resting on large diameter open-ended pipe piles for platform installations in the Gulf of Mexico; Ing. Carlos Molina, construction manager at the Las Truchas Steel Plant construction site, scheduled a series of dynamic load tests on the west coast of Mexico; Chris Thompson of Trow requested tests at various construction sites in Ontario.

On March 17, 1976, Gobel incorporated his consulting prac- tice as Goble and Associates, Inc. (later Goble Rausche Likins and Associates, Inc. and then GRL Engineers, Inc., or GRL) with his former graduate students, myself and Garland Likins. The inter- est in dynamic pile measurements and analyses was so great that Goble, Likins and I logged lots of then unrewarded, frequent flyer miles traveling from one end of the country to the other. It got a little easier when Wondem Teferra, later the Philadelphia GRL office manager, joined the company. Shortly thereafter, Goble accepted the position of chairman of the civil engineering depart- ment at the University of Colorado, and opened the first GRL branch office in chat state. I took over as GRL president, while Likins directed PDI, with both active in the GRL day-co-day con- sulting work. After joining the ream in 1982, Mohamad Hussein opened the Florida branch office a few years later.

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A board of directors photo from 2008

invaluable when analyzing measured data or predicting driveability. In the early '70s, a close cooperation with Al McKinnon of the Foundation Equipment Company (FEC) of Newcomerstown, Ohio helped both GRL and FEC to better comprehend and model diesel hammers. Orto Kammerer of Pileco in Houston frequently asked GRL to test new diesel hammer models on their test stand.

In the mid-1970s, GRL was entrusted by the Federal Highway Administration to write a computer program based on the approach developed in the 1950s by E.A.L. Smith of Raymond International to model pile driving behavior. The program would include a correct thermodynamic model for diesel hammers. The FHWA felt that incorporating the monitoring experiences GRL had gathered on hundreds of driven piles would make the wave

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Left to right: Dr. George Goble, Frank Rausche and Garland Likins

equation method more realistic. Indeed, the resulting code, which is now called GRLWEAP, has achieved worldwide acceptance and use by engineers and contractors. Performing driveability analyses for its clients remains an important part of GRL's work.

Occasionally, a standard pile driving hammer was either not available or the available pile driving hammer was not large enough to provide the necessary energy for full capacity mobilization. Finding a suitable loading device within a short time period was often impossible. In order to meet GRL's promise of providing immediate service when needed, the company built a fleet of nine modular drop hammers located in Cleveland, Honolulu, Houston, Los Angeles and Tampa. With ram weights between one and 80 tons, these units can mobilize pile capacities as high as 8,000 tons under favorable conditions. Obviously, these hammers are not only

suitable for testing driven piles, but can test any type of deep foundation. Like other members of the foundation industry, GRL had to diversify and not only work with the PDA, but also with various other devices to test the integrity of concrete piles, both drilled and driven.

One of the reasons for GRL's successful growth was the experience of its engineers and their dedication to providing quality work to their clients, regardless of how tough the schedule or the project requirements and conditions. Today, 35 engineers in 10 offices around the country, all fully equipped with testing

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Left to right: Garland Likins, Dr. George Goble and Frank Rausche

equipment, are managed by Pat Hannigan, GRL president, and Mohamad Hussein, chairman of the board of directors and manager of the Florida office. Other long-time senior engineers include Michael Morgano, manager of the Ohio and Pennsylvania offices, and Scott Webster, who from his North Carolina office also oversees and participates in offshore monitoring jobs. Camilo Alvarez frequently takes advantage of the SiteLink• technology, which allows him to monitor pile driving in South or Central America and the Middle East while working simultaneously on local projects from his California office. Similarly, Travis Coleman and the Illinois office engineers work on-site or remotely in nearby states and offshore. It is that kind of flexibility that makes it possible to be effectively "on-site" at short notice practically anywhere in the United States or worldwide. GRL has opened additional offices in Denver, New Orleans, Houston and Seattle to more effectively serve clients in those regions.

Today, many of GRL's senior engineers are dedicating much of their free time to professional services and activities. Likins expertly and reliably contributed to PDCA's technical committee during the development of AASHTO's LRFD code and most recently to their review of the IBC code, while also serving on ASTM committees and serving as an associate editor for both ASCE and ASTM geotechnical journals. Hussein has been co-editor ofseveral ASCE special geotechnical publications and teaches the ASCE deep foundations continuing education class; Hannigan has just completed most of the updating work for the FHWA manual, "Design and Construction of Driven Pile Foundations." Previous versions of this definitive document on driven piles have been distributed by PDCA. Most of the senior personnel, now including Brent Robinson and Ryan Allin, reach all around the world in workshops, seminars, webinars and training sessions and prepare the participants for and sometimes help administer PDCA's Dynamic Measurement and Analysis proficiency rest.

Goble retired from GRL in 2000, and Likins and I are now slowly reducing our workload. We still help with internal training, lecturing, analysis and report review and, most importantly, client support. A succession plan devised and executed by CFO Adrian Rausche has assured a seamless transition of duties and transfer of knowledge from senior to junior engineers. That assures that GRL's tradition of providing the best possible service and highest quality product to its clients continues to be fulfilled in the future as it has been in the past. GRL started out as a company focused on providing dynamic pile testing services and now continues to be dedicated to serving the deep foundations industry with specialty testing and analyses services. -Y