GRL NEWSLETTER

No. 16

INFORMATION GATHERED BY THE ENGINEERS OF
GOBLE RAUSCHE LIKINS AND ASSOCIATES, INC.

APRIL 1991

1991 GRL ENGINEERS MEETING

The only major snowstorm this winter did not prevent GRL engineers from convening at Cleveland headquarters in February to review the newest developments in dynamic measurements and analyses of piles. The seminar also included presentations on Pile Dynamics, Inc. (PDI) **Pile Driving Analyzer™**, **Saximeter™**, and **P.I.T.™** (Pile Integrity Tester) hardware improvements.

G.G. Goble (GRL and University of Colorado) started the two day session with a summary of **Centrifuge Modeling** and **Testing** of pile driving, including dynamic measurements on model piles during installation and immediately followed by "static tests" while still in flight. PDI's *Dave Peterman* described modern digital signal processing techniques, *Dean Cotton* reviewed data transfer and demonstrated the GCPC diagnostic program **CKGCPC**, and *George Piscsalko* instructed the GRL staff on the new **Memory Saximeter.** (Each GRL engineer then received a unit which they proudly carried on their belts!) The related software was explained by *Paul Brinkerhoff*.

Garland Likins (PDI) presented a new method for pile testing under **vibratory hammers**, demonstrating encouraging correlations of the vibratory analysis with capacity predictions from subsequent impact tests. *Bert Miner* (GRL Seattle) discussed new advances in frequency analyses of transient records while *Jay Berger* (GRL Colorado) explained the load factor approach for pile design. *Beth Richardson* and *Frank Rausche* (both GRL Cleveland) discussed the 1991 software updates.

C. Michael Morgano (GRL Cleveland) had spent the past 18 months at the University of Akron where he was graduated with a Masters of Science degree in Geotechnical Engineering. As his final project, Michael had investigated the energy transfer in SPT operations and presented these results. Case studies and correlations were presented by *Steve Abe* (GRL Cleveland), *Mohamad Hussein* (GRL Florida), and *Wondem Teferra* (GRL Philadelphia).

GCPC NOW STANDARD FOR GRL

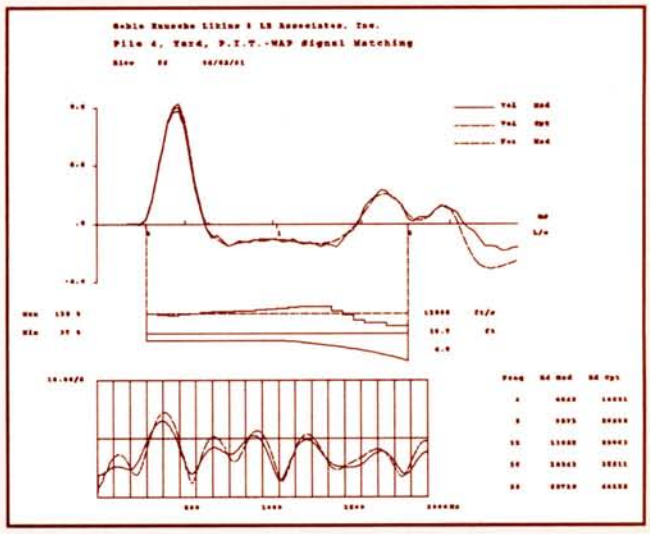
The Memory Saximeter was not the only new equipment which GRL engineers acquired from PDI at the 1991 GRL Engineers' Meeting. All offices now work with the GCPC Pile Driving Analyzer (PDA). This unit has had rapid acceptance because of its convenience, speed, and user friendliness. As far as the calculated results are concerned, both the GCPC and the older model GCXS are equivalent and satisfy ASTM specification D4945-89.

NEWS FROM PDI

The Memory Saximeter, enjoying widespread acceptance, is capable of storing user input comments, penetration, blow count, and stroke or blows per minute data of several days' driving activity. The data can be easily sent from the unit at the users convenience directly to a serial printer or to a PC where it can either be printed or plotted. A special spreadsheet-type program (SAXPRINT) is now available for easy data manipulations and professional quality data summary and presentation output.

P.I.T.™ - P.I.T.WAP™ NEWS

The 1991 version of P.I.T.WAP (CAPWAP for P.I.T. data) is nearly ready for release. It now allows for signal matching in either time or frequency domain. A final plot of velocity match in time and frequency domain is shown below with pile profile and amplification function.



GRLWEAP™ NEWS

The 1991 version of GRLWEAP is currently undergoing acceptance tests. The new features include the following:

- The Blow Count *vs.* Depth option will offer additional features.
- New soil resistance models will be available as recommended by various researchers.
- A file (FILE21.DAT) problem and a numerical calculation problem (instability for diesels and small segment lengths) were corrected.
- An external combustion hammer now may be analyzed without a helmet mass.
- If refusal at a specified input capacity has been reached, then GRLWEAP will automatically reanalyze a somewhat smaller capacity to produce output at a **near-refusal** capacity.

Some of the above improvements are GRL's response to user comments which we highly value. User suggestions received soon still may be considered for the scheduled June program release to those clients with 1991 program support.

1991 CALENDAR OF EVENTS
PLEASE NOTE OUR 1991 PDA USERS DAYS ANNOUNCEMENTS

Apr 7-12	DFI, 4th Intl. Conf. on Piling and Deep Foundations, Stresa, Italy
Apr 26-27	**GRL Seminar on Dynamic Testing & Analysis of Deep Foundations and Workshop on Wave Equation Analysis**, Seattle, Washington; please call Bert Miner, GRL Seattle at 206-775-5785 for information.
Jun 10-12	ASCE, Geotechnical Engineering Congress, Boulder, CO
Aug 13-14	Piletalk International '91, Hotel Equatorial, Kuala Lumpur, Malaysia; please contact J. S. Y. Tan, CI-Premier Ltd, Singapore, fax: 2353530.
Aug 22	**Workshop on Fundamentals and Applications of Wave Equation** with sessions for beginners and advanced users of GRLWEAP and PDA test results; Cleveland, OH; please call 216-831-6131 or fax 216-831-0916.
Aug 23-24	**1991 PDA Users Days - USA, Cleveland, OH**, please call 216-831-6131 or fax 216-831-0916 for information.
Sep 9-10	**1991 PDA Users Days - Europe, London, UK**, please call C.J. Grävare in Gothenburg, Sweden at 031-450260 for information.
Sep 11	**Workshop on Fundamentals and Applications of Wave Equation** with sessions for beginners and advanced users of GRLWEAP and PDA test results; please contact C.J. Grävare in Gothenburg, Sweden at 031-450260.
Oct 7-9	DFI Annual Members' Conference, Fairmont Hotel, Chicago, IL, please contact Bob Compton, P.O. Box 281, Sparta, NJ 07871 USA at 201-729-9679 or fax 201-729-0732

MIDDLE EAST

In early January, *Mohamad Hussein* was invited by Dr. M. Mukaddam to visit the United Arab Emirates (UAE) to instruct the engineers of I&M Soil Investigators and Engineering Consultants on the use of the PIT-SC system for low strain testing of piles or drilled shafts.

In Cairo, Egypt, *Mohamad* then presented a lecture on **Dynamic Testing and Analysis of Deep Foundations** at the National Housing Research Center. The lecture was organized by Dr. M. Azzouz of Engineering Services for Construction Company (ESCO) and attended by 60 engineers.

CHINA

Mssrs. Lin Qiangsheng and Shao Changrong of the Ninth Design and Research Institute, Shanghai, China, spent three weeks at GRL Cleveland for PDA, P.I.T., and CAPWAP™ training. Mr. Frank Ko of Earth Technology, Hong Kong, PDI's China Representative, assisted in both training and translating.

ST. CROIX

Mssrs. Tom Logan and Claudius Maranhao of Dames and Moore, Boca Raton, Florida coordinated preconstruction and construction control tests for a refinery on St. Croix. The tests were conducted by GRL Philadelphia's *Wondem Teferra*. Pile tension stresses, soil setup, site variability and requirements for uplift capacity were of concern. Both installation and restrike tests were conducted and correlated with static load tests.

CANADA

Prof. Bengt H. Fellenius prepared **Chapter 13: Pile Foundations** of the Foundation Engineering Handbook, 2nd Edition, H-Y Fang, Editor, Van Nostrand Reinhold Book Co. This chapter includes a very clear description of wave equation analysis, dynamic monitoring, CAPWAP and low strain integrity test methods.

INDIA

PD India's Dhanvin Mehta reports a series of P.I.T. (Pile Integrity Tester) and drilled shaft capacity tests in many cities of the subcontinent.

DEEP FOUNDATION SEMINARS, CONFERENCES ABOUND

TRB, Washington, DC

G. E. Likins presented a paper entitled **A Comparison of Pulse Echo and Transient Response Pile Integrity Methods** for co-authors *F. Rausche* and Shen Ren Gong, Nanjing Hydraulic Research Institute, at the 70th Transportation Research Board Meeting in Washington, DC, Jan. 13-17, 1991. The well attended special session, "Integrity Testing of Foundations", was chaired by Prof. Jean-Louis Briaud of Texas A&M University and sponsored by the Committee A2K03 for Foundations of Bridges and Other Structures. Other papers presented by GRL included **The Pile Driving Analyzer in Practice** by *G.G. Goble*, and **Pile Integrity Testing to Determine Storm Induced Pile Damage** co-authored by Billy Camp, Westinghouse Env. and Geo. Services and *Mohamad Hussein*, GRL Florida. The papers will be published in the TRB proceedings.

ADSC, San Antonio

On Feb. 8-10, *Jay Berger*, GRL Colorado, attended the ADSC Annual Meeting where he demonstrated the P.I.T.-SC, Self-Contained Pile Integrity Tester.

GRL Seminars and Workshops

Prof. *G.G. Goble* and *Jay Berger* participated in the seminars on Dynamic Testing and Wave Equation Workshops conducted together with Dr. D. Michael Holloway of InSituTech, and Pat Hannigan of STS, in Boulder Colorado, Los Angeles and St. Louis. **A similar seminar will be held on April 26-27 by *G.G. Goble* and *Bert Miner*, GRL Seattle (call 206-775-5785).**

ASCE, Boston

Mohamad Hussein presented the lecture **Driving Long Precast Prestressed Concrete Piles** during the ACI Annual Convention on March 20, 1991.

International Deep Foundations, Paris

Few US delegates were present at the well attended conference March 19-21. *Frank Rausche* presented **Determination of Driving Induced Pile Damage** describing four situations encountered by *Mohamad Hussein* on sites in Florida.

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