



GRL NEWSLETTER

No. 28

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

MAY 1996

THE GRL UPDATED FHWA PILE DESIGN MANUAL by Pat Hannigan

The Federal Highway Administration in 1993 contracted with GRL to update their Manual on **Design and Construction of Driven Pile Foundations** and to teach its contents to transportation engineers across the country. The original Manual had been written by Mr. Suneel Vanikar of FHWA and released for the first time in 1985. The abstract of the Manual is as follows:

This manual is intended to serve a dual purpose, first as a participant's manual for the FHWA's National Highway Institute courses on driven pile foundations and secondly as FHWA's primary reference of recommended practice for driven pile foundations.

The Design and Construction of the Driven Pile Foundations manual is directed to geotechnical, structural, and construction engineers involved in the design and construction of pile supported structures. The manual is intended to serve as a practical reference on driven pile foundations. Volume I of the Manual addresses design aspects including subsurface exploration, laboratory testing, static analyses, as well as specification and foundation report preparation. Volume II covers construction aspects including dynamic formulas, wave equation analyses, dynamic testing, static load testing, Statnamic testing, the Osterberg cell, as well as pile driving equipment, pile accessories, and pile installation inspection. Step by step procedures, workshop problems and solutions are provided to demonstrate use of the manual material.

The FHWA's Technical Manager was Mr. Jerry DiMaggio. GRL's team that modified major sections of the manual included Mr. Pat Hannigan (GRL Chicago), Dr. George Gable (GRL Boulder) and Messrs. Gabriel Thendean, Garland Likins and Frank Rausche (all GRL Cleveland). GRL's team also included Dr. Joe Caliando (Utah State University), Dr. Michael Holloway (InSituTech), and Mr. Robert Lukas (Ground Engineering Consultants) who reviewed selected chapters of the manual. External review was also provided by a technical working group comprised of 11 FHWA or State geotechnical engineers.

The introduction to the manual explains that document was needed in order to assemble the vast array of available information in a single source and to avoid unnecessary expenditures from overly conservative design methods. The economic impact of using overly conservative methods is significant since Federal and State governments spend nearly one billion US Dollars per year for bridge foundations alone.

In the preparation of the 1300 page manual, great care was taken to give the reader the big picture before starting very detailed descriptions of available methods and design tools. The reader and workshop participant will therefore receive information not only for solving specific design problems but for understanding why certain steps are taken and what alternatives would be available, considering economic aspects.

The first volume presents an overview of subsurface exploration and analysis and then explains the steps necessary before a pile foundation can be justified. The first volume contains static analysis methods for the design of single piles and pile groups under compression, uplift and lateral loading. Special design events discussed in the chapter include downdrag, scour, lateral soil squeeze, and soil and pile heave. Other topics covered include time effects on pile capacity and pile driveability.

The design chapter of Volume I closes with a discussion of how construction issues impact on design such as jetting, predrilling, dewatering, densification, vibrations, etc. The first volume ends with chapters summarizing the pile design process through an example problem, contract documents and specifications, and recommendations for the preparation of a foundation design report. *(Continued on Page 2)*

NEWS FROM PILE DYNAMICS, INC. (PDI)

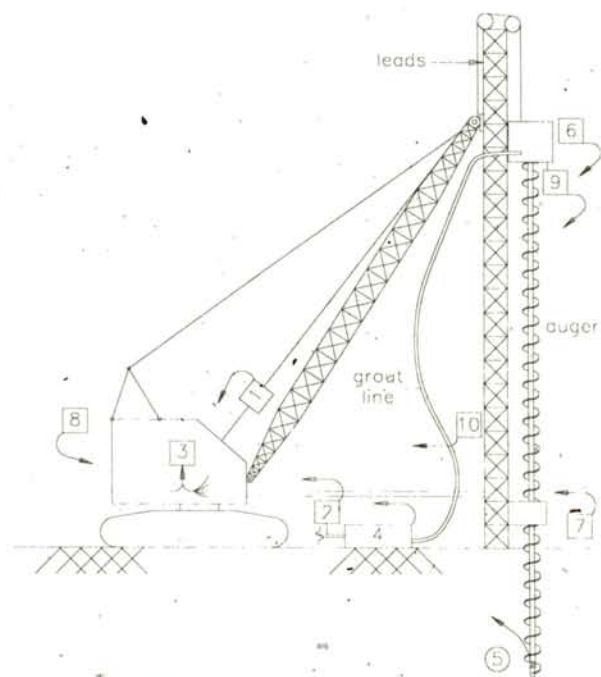
PILE INSTALLATION RECORDER FOR CFA-AUGER CAST PILES (CFA-PIR)

World-wide the requirement to document the quality of manufactured products has led to the need for automatic recording systems even for pile installations. Construction sites are particularly adverse for complex monitoring systems. Pile Dynamics, Inc. has therefore used its expertise with rugged and complex systems to design and build Pile Installation Recorders (PIR) for both driven and auger cast piles.

Pile Dynamics' CFA-PIR is now available to the industry either on a trial basis to gain experience or for permanent QA use. The system measures important parameters during the installation of Continuous-Flight-Auger (CFA), also called Auger Cast Piles, recording all or a selected number of the following quantities (numbers refer to devices in figure):

- Depth of auger bottom (1 on crane line or 6, 7 radar)
- Grout Volume (4, from pump volume or magnetic flow)
- Grout Pressure in the grout line (2)
- Grout Pressure at the bottom of the auger (5)
- Hydraulic Drive Pressure (8)
- Number of auger rotations (9)
- Auger inclination (10)

(Continued on Page 2)



Schematic of PIR-CFA