



# PDA

## Pile Driving Analysis

### The purpose of Pile Driving Analysis

Pile Driving Analysis (PDA) is a powerful tool to control the pile driving process. During driving, the performance of the hammer, the condition of the cushion, the behavior of the pile, and the driving resistance of the soil can be analyzed and monitored.



*Pile monitoring with PDA.*

The extra knowledge obtained by performing Pile Driving Analysis can pay for itself many times over. The risk of damage to the pile or hammer is reduced. The risk of damage to the superstructure caused by failure of the foundation is reduced. The final depth of driving can be optimized, which may result in a shorter pile length. For future projects, prediction of pile driving and selection of the correct hammer is facilitated. A quality record of each pile can be supplied to the clients and authorities.

### Performing PDA monitoring

A pile test can be set up in less than a quarter of an hour. Two sensors are connected to the pile near the pile head. The sensors have a combined function: to measure strain and acceleration. On pre-cast concrete piles, the sensors are connected to the pile with anchor bolts. On steel piles, the sensors are bolted to the pile using threaded holes or welded mounting blocks. Special sensors for underwater use are available. All sensors may be recovered after driving. After the sensors have been connected, menu driven software directs test controls.

Pile driving may start immediately. During driving, data is stored automatically on hard disk for back-analysis and generation of field reports. The signals from the sensors are processed by the signal

conditioner, analyzed by the FPDS software, and stored in digital form on the internal hard disk. The stored signals can be retrieved and processed during the post-processing option.

### Information obtained from PDA

During driving, for each hammer blow, information is given for: blow number, blow count, blow rate, maximum compression and tension stress in the pile, transferred energy, driving resistance, shaft friction and toe resistance, bending moment, maximum acceleration, pile structural integrity, and the extent and location of any damage.

The signals and other information can be presented immediately on screen. A selection of the available graphs, all presented as a function of time and scaled in engineering units, include:

- measured signals;
- transferred energy;
- acceleration, force, velocity, and displacement at the sensor location;
- force and velocity x impedance;
- downward travelling waves;
- upward travelling waves;
- driving resistance;
- estimate of static resistance.

The results are presented in either SI or English units. A report generator program allows the presentation of a field report immediately after driving. The system gives warnings and other "expert advice".

### The PDA equipment

The FPDS-7 PDA system has been upgraded and operates under Windows. It consists of an FPDS system



*PDA monitoring equipment.*

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with hard disk, signal processing electronics, a signal conditioning subsystem, two combined sensors for strain and acceleration and cables. The PDA/DLT Windows software for monitoring and reporting has been upgraded and includes many new features to further facilitate signal processing and interpretation.

The Foundation Pile Diagnostic Systems have been designed for the building site environment. The separate PDA conditioner used with a PC allows for optimal flexibility in the field. The reliability of our FPDS systems is evidenced by hundreds of FPDS users all over the world. The PDA equipment can also be used for the purpose of Dynamic Load Testing (DLT).

To accommodate heavy users, Profound has designed a special "Heavy Duty" system. This system is specially tested for harsh field conditions. Also notebook based systems are available.

### Advantages of PDA systems

#### Transducers PDA/DLT system

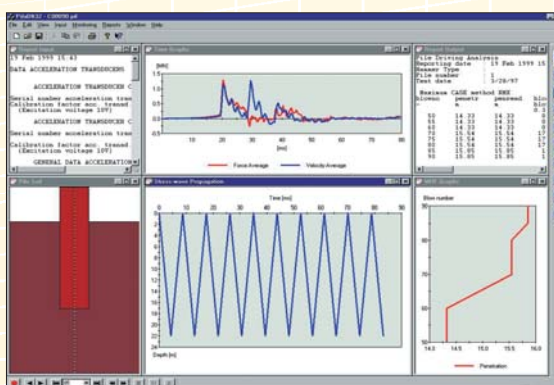
- Compact, reliable, water-resistant combined acceleration/strain transducers, cables (on reel) and connectors;
- Mounting jig to increase transducer life and for protection;
- Junction box for easy mounting and storage of transducer cables.



Combined strain acceleration and transducers.

#### Signal conditioning unit PDA/DLT

- Modular design. The signal conditioning unit can be used in combination with any available PC;
- Design of hardware is site dedicated, built for maximum reliability and durability under harsh conditions;
- Full digital signal processing;
- Automatic Signal Conditioning;



PDA signals on screen (Windows) .

- Low weight and volume allows hand carrying;
- Battery powered;
- Number of files with digitized signals only limited by hard disk capacity;
- Test box for testing system functions.

#### Software environment PDA/DLT

- Programmed under Windows environment and designed for use by geotechnical engineers;
- Easy in installation of software;
- High quality (higher sample rate) signal processing;
- Same look, same feel of software. Experience with one option makes working with other options easy;
- Report software available and simple under Windows environment;
- Extensive help options.

### Profound services

Annual maintenance contracts are available for PDA systems including regular calibration of sensors, minor repairs, cleaning, and free loan systems.

Profound may carry out PDA services on request and users may send signals causing difficulties to Profound by fax or e-mail for expert interpretation. Profound provides instruction courses and user seminars. Our local agents around the world, who speak your language and understand your needs, are also ready to assist you whenever requested.

### Further applications

Pile Driving Analysis provides information about the static capacity during pile driving for the real static capacity. Adequate time should be allowed for soil stabilization, before an instrumented re-drive is attempted. For cast-in-place piles, the concrete strength should be high enough to resist the impact loading. More information about this test method may be found in the separate leaflet on Dynamic Load Testing (DLT) and Statnamic (STN)

For further information:

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