

DLT

Dynamic Load Testing

The purpose of Dynamic Load Testing

Dynamic Load Testing (DLT) is a quick method to evaluate the bearing capacity of a pile for loads similar to the design load. It can be used for prefabricated piles, cast-in-place concrete piles, steel piles and wooden piles. DLT is considerably faster than static tests and at a fraction of the cost.



Dynamic load testing in the field

Conducting a Dynamic Load Test

Adequate time should be allowed for soil stabilization before testing. To prepare for a Dynamic Load Test sensors are connected to the pile near the pile head. These sensors have a combined function: to measure strain and acceleration.

On 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 also available. All sensors may be recovered after testing. Once the sensors have been connected to the PDA/DLT monitoring system, this system can be used to direct the test controls.

To apply a load an impact ram or a heavy block (drop hammer) is dropped onto the specially prepared pile head. The generated compression wave travels down the pile and reflects from the pile toe upward. This reflected wave contains information about the shaft friction, toe resistance and pile defects. The measured signals are processed and automatically stored by the PDA/DLT monitoring system. The data can be

retrieved easily for further review, graphical presentations or reporting.

DLT is most suitable for driven piles. For cast-in-place piles, it may be impossible to generate the required loads, or the stresses can become too high, thus damaging the pile. In such cases, Statnamic Load Testing is more appropriate.

The PDA/DLT equipment

The PDA/DLT system, which is used both for PDA and DLT, operates under a Windows environment and consists of a monitoring system with a hard disk, signal conditioning, combined sensors for strain and acceleration and cables. The PDA/DLT software for monitoring and reporting includes many features to further facilitate signal processing and interpretation.



PDA/DLT monitoring system

The PDA/DLT monitoring system has been designed for the harsh construction site environment. The reliability of our monitoring system is demonstrated daily by hundreds of users all over the world.

Information obtained from DLT

To assess the static performance of a foundation pile with DLT, the dynamic pile resistance and the relationship between static and dynamic pile performance must be determined. If adequate load testing has been conducted on similar piles, it is possible to obtain satisfactory results without a comparative static test. In this case, the following procedure is normally used.

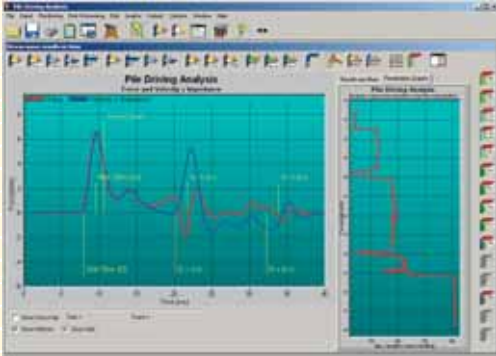
During each impact loading, the following information is collected: compression and tension stress

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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.



PDA/DLT software

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 traveling waves
- Upward traveling waves
- Driving resistance
- Estimate of static resistance

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

Interpretation of test results using Signal Matching

After a Dynamic Load Test, the data are analyzed using the DLTWAVE wave equation module of TNOWAVE. Pile and soil data are modeled and a calculation is carried out using the wave equation. The soil models describe the behavior in terms of displacement, velocity and acceleration functions, using empirical parameters which depend on known soil properties.

Using automatic iterative methods, in which the results of each DLTWAVE analysis are compared to the actual measured pile behavior, appropriate dynamic parameters are refined and the shaft resistance, toe resistance and static load displacement behavior are established.

This procedure can be performed automatically and is called "Automatic Signal Matching".

Advantages of PDA/DLT system 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 transducer

Signal conditioning PDA/DLT

- Designed and built for maximum reliability and durability under harsh site conditions
- Full digital signal processing
- Automatic Signal Conditioning
- Lightweight and small for easy handling
- Battery and AC powered
- Number of files with digitized signals only limited by hard disk capacity
- Test box to test system functions

Software environment PDA/DLT

- Programmed under Windows environment and designed for use by geo-technical engineers
- Easy installation of software
- Higher sample rate allowing higher quality signal processing
- Reporting software available

Profound services

Annual maintenance contracts are available for PDA/DLT systems that cover regular calibration of sensors, minor repairs, cleaning and special discount on loan systems.

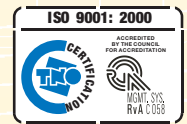
Profound or their representatives may carry out DLT services on request and users may send signals causing difficulties by fax or e-mail for expert interpretation. Dynamic Load Testing is backed by 30 years of pile testing experience for clients all over the world, onshore and offshore. DLT is recognized as an accepted standard for high strain dynamic testing.

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