Foundation Pile Diagnostic System-3

Quality assurance in piling

Sonic Integrity Testing

A quick and inexpensive method to check the continuity of installed foundation piles. The method will detect pile defects including: cracks, soil inclusions, variations in pile diameter and pile length.
It may be used for cast-in-situ piles and for precast concrete piles.

Requirements: FPDS-3 option A
Included: FPDS-3 Base System with ERCAS Module (Enhanced Resolution Conditioner and Splitter); Accelerometer; Signal Pre-conditioner; Cable Reel @120 m; Hammer; Petoplast Contact Material.
Software: Sonic Integrity Testing; REPORT; SNR (Diagnostics for cables and amplifiers); TNOWAVE-ITS (Integrity Testing Simulation and Signal Matching).
Recommended but not included:
Spare accelerometer; Signal Preconditioner and Cable Reel; HPGL-compatible Plotter or HPGL-compatible Laserprinter; Portable 2-way Radio's.

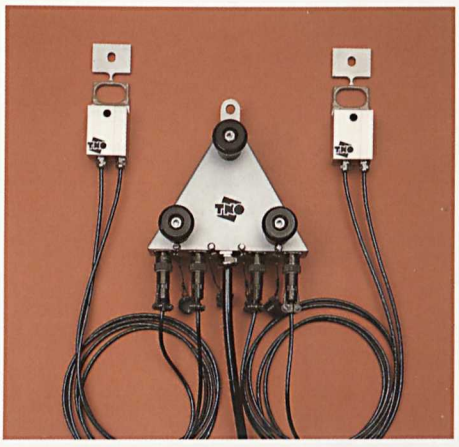
Pile Driving Analysis

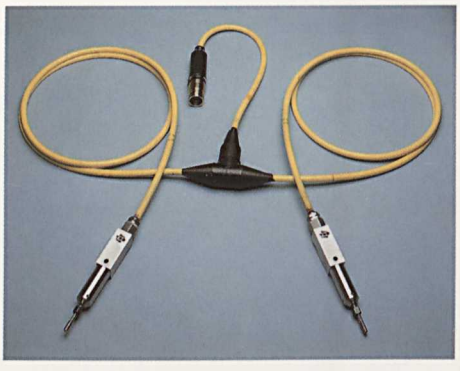
A powerful diagnostic tool to assist in the control and trouble shooting of the pile driving process. During driving a complete installation record of the pile is obtained, including: blow count, pile stress levels, delivered hammer energy and driving resistance of the soil. Immediately available driving records assist in optimizing foundation installation through accurate selection of final driving depth.

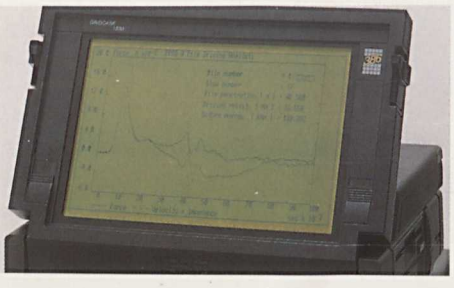
Dynamic Load Testing

A widely accepted method for the determination of the load bearing capacity of an installed foundation pile. A drop mass or conventional pile driving hammer may be used to introduce a blow. Information is obtained about the contribution of the shaft friction and the toe resistance to the load bearing capacity. The static load-displacement behaviour can be obtained by TNOWAVE Signal Matching.
The method also gives information on the integrity of the pile shaft under high strain.
The method can be used for prefabricated piles, cast-in-place piles, steel piles and timber piles.

Requirements: FDPS-3 option B
Included: FPDS-3 Base System with COSEC Board (Computer-Operated SEnsor Conditioner) and MATRIX Selector Board; 2 combined Sensors for Acceleration and Strain; Umbilical Cable .
Software: Pile Driving Analysis; TNOWAVE-SM (Signal Matching).
Recommended but not included:
Spare Strain Sensors; Spare Acceleration Sensor; Spare Umbilical Cable Reel; HPGL-compatible Plotter or HPGL-compatible Laserprinter; Epson or HP Compatible Printer; Hilti or Bosch Electro-Pneumatic Concrete Drill.
Special sensors for underwater use are available.







Hammer Monitoring

The energy delivered by the hammer may be monitored continuously by sensing the velocity of the ram at impact. The sensor is based on the Doppler-RADAR principle for above-water hammers (steam and diesel), and on position switches for hydraulic underwater hammers. Hammer monitoring is applied for the following purposes:

- Control of the pile driving process.
- Hammer energy assessment.
- Troubleshooting.
- In combination with Pile Driving Analysis, determination of the effect of anvil and cushion.

Requirements: FPDS-3 option E
Included: FPDS-3 Base System with:
- RADAR sensor and Doppler RADAR Processor Board.
or
- Position Switch Interface Board: Acceleration Sensor in Housing

Software: Hammer Monitoring
Recommended but not included:
HPGL-compatible Plotter or HPGL-compatible Laserprinter; Epson or HP Compatible Printer.

STATNAMIC

STATNAMIC® Load Testing

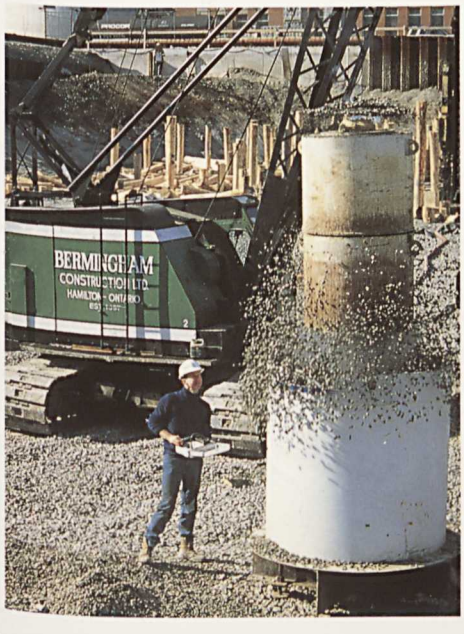
A new approach to load testing of piles. A reaction mass is placed over a pressure vessel bolted to the pile top. High pressure gasses accelerate the mass upward with a large force which acts equally downwards on the pile top. The applied force and pile displacements are measured directly using a load cell and laser beam system. The data is acquired by the FPDS-3 system and graphed as load versus displacement without further manipulation. The results are comparable to conventional static load tests.
The STATNAMIC® method offers:

- The pile undergoes peak stress conditions at the same time troughout its length, as does a pile under static loading.
- The force is introduced axially at the centre of the pile, allowing testing of battered piles.
- Compressive fores are introduced and released slowly, thus no tensile stress is induced in the pile.
- Load durations are an order of magnitude longer than conventional dynamic testing, reducing the influence of stress wave action to negligible levels.

These factors enhance the reliability of the load deflection and capacity results obtained. The method is quick and efficient, allowing several tests to be performed in a single day with virtually no risk of pile damage.
STATNAMIC® is a joint development of Berminghammer Corp. (Hamilton, Canada) and TNO.

Requirements:
- STATNAMIC device of the right capacity, and charges.
- FPDS-3 option C

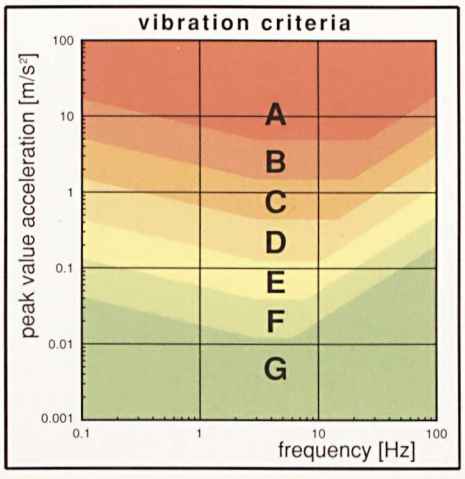
Included: FPDS-3 Base System with COSEC Board (Computer-Operated SEnsor Conditioner); STATNAMIC Board; MATRIX selector board; Ignition Device; Portable battery-powered Laser on Tripod.
Software: STATNAMIC Load Testing; TNOWAVE-SM (Signal Matching)
Recommendend but not included:
FPDS-3 option A; HPGL-compatible Plotter or HPGL-compatible Laserprinter; Epson or HP Compatible Printer; Hilti or Bosch Electro-Pneumatic Concrete Drill.

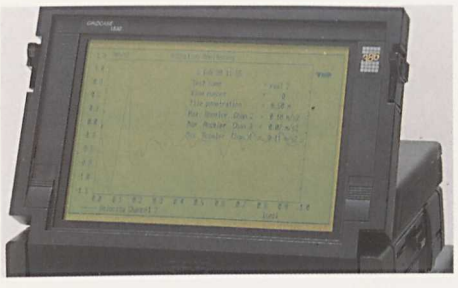


Vibration Monitoring

A comprehensive means for the monitoring and recording of vibrations caused by pile driving, traffic or machinery. Up to four vibration sensors, placed on the ground or connected to a structure, can be monitored simultaneously. Continuous recording or event triggering can be selected. Typical values of the measured vibrations are displayed on the screen for monitoring purposes. A warning is given when preset criteria are exceeded.
The measured vibration data can be plotted in a chart together with the criteria (risk of damage to structures or sensitive equipment).

Requirements: FDPS-3 option D
Included: FPDS-3 Base system with COSEC Board (Computer-Operated SEnsor Conditioner) and MATRIX Selector Board; 4 Vibration Sensors with 20 m Cable each; 1 Sensor Extension Cable; 1 Umbilical Cable 50 m on reel; 4 Mounting Blocks.
Software: Vibration Monitoring.
Recommended but not included:
HPGL-compatible Plotter or HPGL-compatible Laserprinter; Epson or HP Compatible Printer.



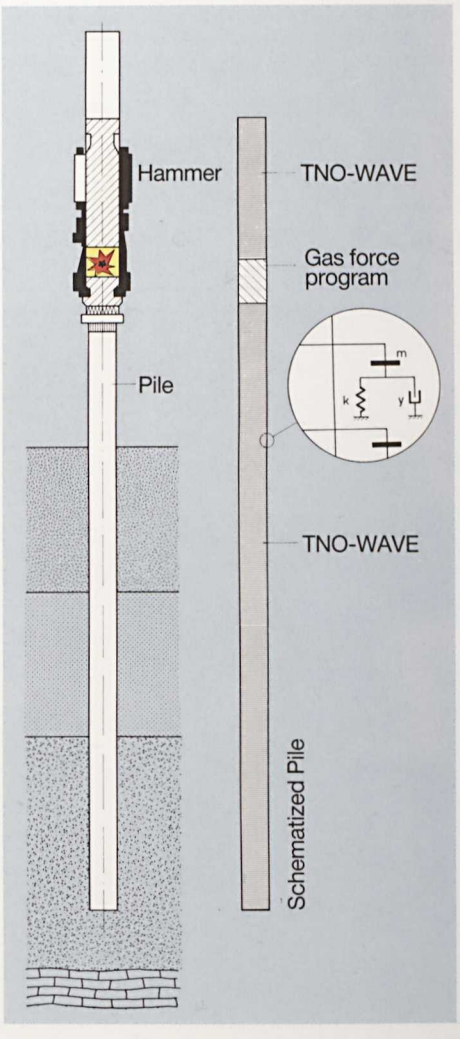


TNOWAVE Stress Wave Simulation

A program based on one-dimensional stress wave theory. It allows the modelling of all types of hammers, piles, soil types, and the interaction between reinforcement and concrete. Instead of a hammer model, also a known force-time diagram of a hammer can be used.
TNOWAVE has several applications:

- Driveability Prediction for Impact Hammers and Vibratory Hammers.
- Integrity Testing Simulation.
- Signal Matching. With this technique the load-displacement behaviour of a pile can be determined from Dynamic Load Test signals, or defects in a pile can be quantified from Sonic Integrity Test signals.

Requirements: FPDS-3 system, any option, or any IBM-PC compatible computer (AT or faster) equipped with a Floating Point Coprocessor.
Software:
TNOWAVE-ITS (Integrity Testing Simulation & Signal Matching with Linear Soil Models)
TNOWAVE-SM (Signal Matching for PDA & DLT; Nonlinear Soil Models)
TNOWAVE-PDP (Pile Driving Prediction)
Recommended but not included:
HPGL-compatible Plotter or HPGL-compatible Laserprinter; Epson or HP Compatible Printer.



Foundation Pile Diagnostic System-3

Quality assurance in piling

Features

- Ultra-reliable computer and subsystem withstand rough handling and harsh environments.
- High-contrast display, readable under all ambient light conditions.
- Clip-on battery for 1.5 hours of power-independent use. Car battery or mains supply for stationary use.
- Low weight and volume allows hand-carrying in airplanes.
- Modular approach: one FPDS-3 subsystem may contain a combination of options.
- Choice of 80286, 80386 processor.
- Automatic signal conditioning frees operator from bridge balancing, scale selection.
- Menu-driven environment, audible and visual warnings and error messages, plus an on-line help system assist the operator.
- Instruction course included. Free technical support during 1-year warranty period.

Dynamic Load Testing

FPDS-3 BASE System

The FPDS-3 Base System consists of the GRiD® Computer and the Subsystem below the computer.

Computer

Type	: GRiDCASE® 1520,	optional	GRiDCASE® 1530
Processor	: 80C286		80386
Clock Speed	: 10 MHz		12.5 MHz
Co-processor	: 80287		80387
RAM	: 1 MB, optional 2 MB, 4 MB,		8 MB
Display	: 10" backlit reflective LCD		
Display Resolution:	CGA, optional VGA		
Disk Storage	: 3½" 1.4 MB diskette		
	20 MB, optional 40 MB hard disk		
Interfacing	: RGB Color Video Port		
	CGA Compatible Video Port		
	External Peripheral Connector		
	RS-232C Serial Port		
	Parallel Centronics Port		
	External Keyboard Port		
Modem	: optional internal V.22 Bis		
Operating System	: MS-DOS 3.3		

GRiDCASE® 1500 series laptops are designed for maximum reliability. They can withstand the rigors of day-to-day use in the field, and they are renowned for their durability.

Subsystem

The Subsystem contains the analogue-to-digital converter board, a digital interface and control board, a power supply, and a rack for three Eurocard-size boards. It may further contain the ERCAS module for Sonic Integrity Testing.
The Subsystem may accomodate any combination of options listed within the previous pages simultaneously, except a combination of STATNAMIC® and Hammer Monitoring.
Each option consists of boards, sensors, software and accessories.

The Subsystem has been designed and built for maximum reliability and durability under harsh conditions.

Specifications

Power: 100-240V AC, auto-sensing, clip-on rechargeable battery (1.5 hours), 12V DC car battery (cigarette lighter plug).
Power consumption option A: 30 Watt (non-active) 40 Watt (active)
Size: 135 x 290 x 450 mm. (display down)
Weight: 13.5 kg
Environmental:
Temperature: 0 to 45 °C operating -20 to 65 °C storage
Humidity: 20 to 80% operating 5 to 95% storage
Shock: 5g operating 80g non-operating

TNO
TNO is the Netherlands Organization for Applied Scientific Research.
TNO employs almost 5000 scientists, engineers and technicians, working in 30 different institutes.
TNO is active in a very broad area.
TNO's main fields of activity are:
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- Energy
- The Environment
- Nutrition and Food
- Health
- Defence
- Building and Infrastructure

These fields are subject to a multidisciplinary approach.

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