Method Statement

PILE INTEGRITY TEST
(SEISMIC TEST)

BY

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METHOD STATEMENT

PILE INTEGRITY TEST (SEISMIC TEST)

General
The echo or seismic method of assessing the integrity of piles has been used since the 1970's to check the integrity of piled foundations. The system measures the velocity response of a pile to a force input generated by a small hammer. The system is rapid in operation and can be used to check the depth of both pre-cast and cast-in-situ piles. The possible causes of intermediate responses can also be assessed.

Objective of test
The Seismic echo method of assessing piles is able to analyse acoustic anomalies corresponding to the following:

- Pile Toe Level
- Shaft restraints
- Overbreak
- Cracks
- Reductions in section
- Zones of poor quality concrete

Literature review
When a pile top is struck with a hammer a longitudinal wave travels down the shaft – it can be likened to a snake swallowing an egg. When the wave reaches the base of the pile it is reflected back up to the top. By assuming a wave speed velocity it is possible to calculate the pile length. Reflections can also be obtained from acoustic anomalies within the pile shaft.
Length measurements are calculated from the distance between resonating peaks, produced by the pile toe or acoustic anomalies along the shaft. Lateral soil restraints, Overbreak, changes in shaft section, cracks and zones of poor quality concrete can all produce various types of acoustic anomaly which can be detected.

Length, \( L = C \times \frac{T}{2} \)
Where:
\( C = \) velocity of longitudinal waves in concrete
\( T = \) Time for signal to travel to and from measured feature.

The system

The TECO system comprises two main elements, the data acquisition hardware and sophisticated windows based software package, purpose designed for ease of interpretation and reporting. The software, known as TEAC (Testconsult Echo Analysis Programme) is used to transfer data from the TECO to a pc, carry out basic analysis of results and produce reports. A simulation module is also included for more detailed further analysis of more complex results and is a useful aid to correct data interpretation.
Pile head preparation

In order to obtain the very best data possible when testing a pile, it is essential that the pile head is prepared properly prior to testing. Without good data any interpretation carried out will be meaningless. It is essential that the measurement transducers are mounted in the correct position and on sound concrete. The essentials of pile head preparation for integrity testing are given below:

1. Piles should if possible be tested at the cut-off level and trimmed to sound concrete. Any weak, broken concrete that sounds hollow should be removed and the pile top left roughly horizontal over the complete cross section.

2. Reinforcing bars should be bent slightly away if practicable and the helical removed to allow for a good swing of the test hammer.

3. Two areas should be prepared for the transducers, one for the hammer in the centre of the pile and the other for the geophone close to the pile perimeter. The areas should be approximately 100 mm in diameter and prepared as flat and level as possible using a scabbler, scutch hammer or even a hammer and chisel, then brushed free of debris.

See the diagram below:
It is not possible to test piles if they are under water, however, if the pile top is damp this is OK. If at first you are unable to obtain a valid result, it is always advisable to re-prepare the pile and carry out a re-test, as cracking in the pile head is not always apparent but can affect the test result significantly.
THE SYSTEM

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The TECO system comprises two main elements, the data acquisition hardware and a sophisticated windows based software package, purpose designed for ease of interpretation and reporting. The software, known as TEAC (Testconsult Echo Analysis Programme) is used to transfer data from the TECO to a pc, carry out basic analysis of results and produce reports. A simulation module is also included for more detailed further analysis of more complex results and is a useful aid to correct data interpretation.

The main advantages of the system are:
♦ Rapid operation
♦ Low cost
♦ Reporting and interpretation software for quick analysis.
TECO Pile Integrity Test System

Hardware and Software Specification

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HARDWARE

Enclosure : Simulated ABS, waterproof, dimensions 218mm x 187mm x 55mm, weight 1.35 Kg.
Display : Transflective LCD for easy daylight viewing with back light.
Keypad : Tactile response, wipe clean waterproof surface, full alpha-numeric functions.
Acquisition : 16 bit acquisition at 25khz sample rate with pre-trigger on both channels.
Connectors : Waterproof Lemo connectors with interchangeable configuration.
Battery : 8 hours continual use, 12vdc emergency boost charge, 110/240vac trickle charge.
Storage : Up to 700 results can be stored.
Navigation : Menu system which prompts the operator.
Processing : Functions include :
- Viewing of time domain velocity plot, length measurement.
- Scale changing to suit, automatic best blow selection.
Data transfer : Transfer of data from TECO is via the computer serial port, controlled by software.
Calibration : The TECO unit and accelerometer come with a calibration certificate.
Accelerometer : Range 1-10,000Hz, with military type IP65 connector and cable
Hammer : Supplied with readily available replaceable tips.
Carry case : The kit is supplied in a rugged, orange, waterproof hand luggage size plastic case.
Upgrades : The TECO system is upgradable to a full TDR-2 frequency response system. Contact your supplier for details.
Overview : The TECO has been purposed designed and built by a company having over 20 years experience in all aspects of pile integrity assessment. It has also been designed with great care to be user friendly to the operator. Only top quality components have been used throughout and the equipment represents very good value for money.

TEAP SOFTWARE

The software supplied with the TECO system is windows based and allows management and transfer of files in the TECO and rapid interpretation of data. The software is very user friendly and allows the user to produce and configure report outputs to suit their requirements. The final output is a table of results and response curves, on which the clients logo can be incorporated. Also included is a signal simulation module to aid interpretation of results. A demonstration disk is available on request.