



**DYNAMIC LOAD**

**STATIC LOAD**

**SONIC INTEGRITY**



**ROGER BULLIVANT**

# DYNAMIC LOAD

## APPLICATION

Dynamic load testing is suitable for all types of pile, but is most frequently employed on RB pre-cast concrete or tubular steel driven piles. This method is also ideally suited to small contracts, e.g. mini-piles or underpinning, which cannot justify the relatively large investment of static load testing. The technique determines the load bearing characteristics of the pile including skin friction and end bearing. There are numerous other parameters which can be determined including pile hammer energy transfer, pile integrity, pile stresses, driving and load displacement behaviour.

## DESCRIPTION

In order to dynamically test a pile, the pile must be restruck using a pile hammer.

Two strain transducers and accelerometers are firmly attached to the face of the pile near to the head. As the pile is restruck the equipment measures the force and the acceleration of the pile. This information is relayed to the pile driving analyser, which gives information on the CASE method pile capacity to an experienced test operator. As the test only takes a matter of minutes per pile, a large number can be tested in one site visit. Once a series of blows have been struck on the test pile, the data is digitally stored and relayed back to our offices for further analysis.

A stress wave analysis is conducted on the data in the RB test department. This includes computer generation of a theoretical pile and soil model, which is compared with the recorded data. The aim of the method is to produce a model that resembles as closely as possible that which would be required to replicate the recorded data. To this end, the model is continually updated and altered until the measured data is matched. Once this has been achieved, the model gives shaft friction distribution, bearing capacity and load settlement behaviour, together with additional information as required.

## EQUIPMENT

In order to carry out this technique, pile driving analyser hardware from Pile Dynamics Incorporated and the modelling programme CAPWAP provided by GRL Inc are used. Both organisations are responsible for the theories behind this technique and are acknowledged as market standard, reliable and accurate procedures.

Pile prepared for testing on site



Pile driving analyser for collection and analysis of test data





# STATIC LOAD

## APPLICATION

Static load testing is the method by which the load displacement characteristics of a pile can be determined. All piles are suited to testing in this way.

The RB in-house designed and purpose-built static load testing frames can accommodate loads of up to 4000 kN.

Additionally, specialist equipment for low headroom or restricted access locations is available.

## DESCRIPTION

In order to apply a known load to the test pile some form of reaction is necessary. The most commonly used methods are kentledge or tension pile reaction, dependent upon ground conditions. Other methodologies can be adopted according to site requirements e.g. in areas of restricted access or headroom.

Once adequate reaction has been provided, the testing is carried out using a hydraulic jack and calibrated digital load cell to a previously agreed procedure. Time, load, temperature and displacement data are usually recorded.

The data is stored electronically for transmission via mobile phone, to RB's test department for processing. The information is then presented in conventional graphical and tabular format.

## EQUIPMENT

Reaction loading frames and kentledge assemblies allow tests of up to 4000kN to be carried out. Measurement of pile response to load is measured by digital load cells and electronic linear variable displacement transducers.

Larger capacity tests can be accommodated on request.



Pilehead measurement at Abingdon, Oxford



Kentledge test-frame on site at Belvedere, South London

# SONIC INTEGRITY

## APPLICATION

Integrity testing is primarily used on continuous flight auger (CFA) or RB continuous helical displacement (CHD) and other wet bored piling techniques.

The method is fast and reliable, allowing a large number of piles to be tested in a single site visit. The technique is used to determine the reliability, morphology and quality of construction of the piling method.

## DESCRIPTION

The pile to be tested must be sufficiently cured, free of laitance and trimmed to sound concrete, preferably to final cut-off level. Using a small hand-held hammer, a series of low strain acoustic shock waves are passed down the pile. As it does so, the wave rebounds where changes in impedance occur. This rebound or echo is then recorded by a small accelerometer, held against the pile head. The response is stored digitally and a graphical representation displayed and plotted, usually against time, for immediate inspection.

## EQUIPMENT

The sonic testing equipment is supplied by both Pile Dynamics (USA) and TNO-Profound (Holland). They are battery powered and can be operated by one engineer to give an indication of integrity on site.



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