

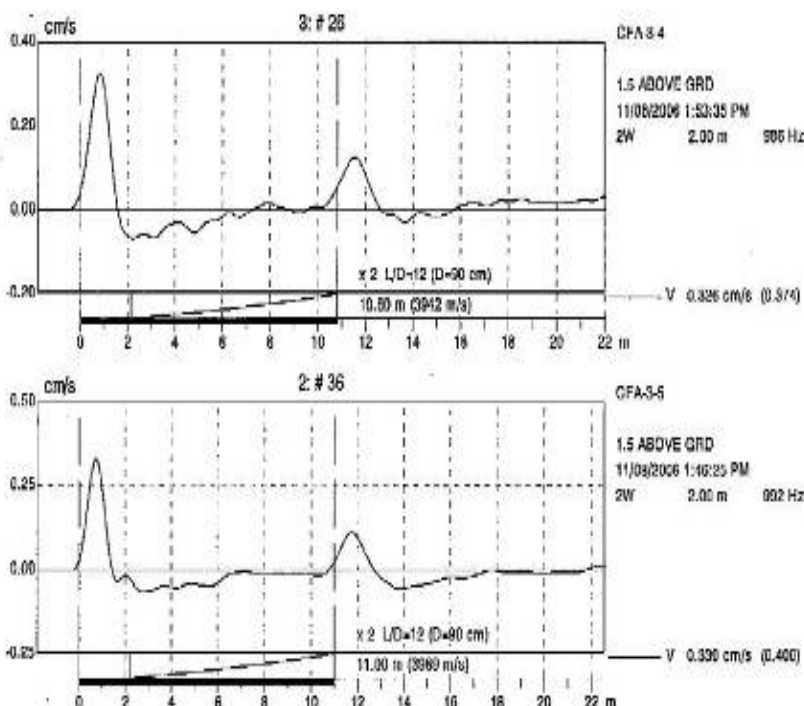
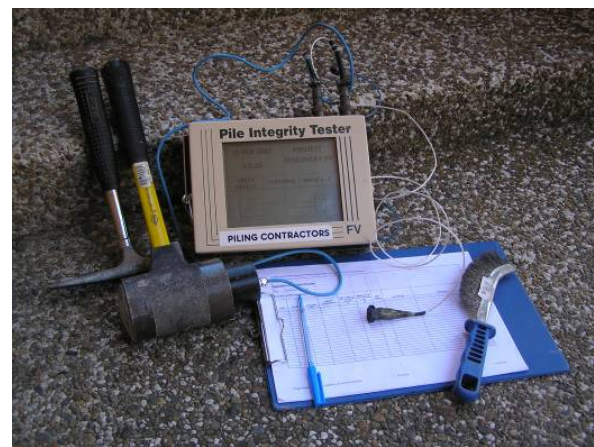
PILE TESTING

Piling Contractors offers a range of pile testing services as an integral part of our Quality Control procedures. Some of these relate to the quality of the workmanship and materials, and are generally based on verifying the integrity of the pile. Others relate to confirmation of design, and are based on measuring the performance of the pile in response to a load and comparing this with the design requirements and any prediction. Australian Standard AS2159:2009 has a strong emphasis on pile testing specifying an intrinsic test factor and a testing benefit factor both applicable when appropriate testing is carried out.

Pile testing is conducted in-house by Piling Contractors where required, using state of the art equipment and the latest technology and computer software in processing and analysis of the results, all operated by well-trained experienced personnel. Both integrity testing and load testing are carried out in accordance with the relevant Australian Standards.

Integrity Testing

Integrity testing is carried out using the PIT-Collector system manufactured by Pile Dynamics Inc of the USA. This test, variously called the sonic integrity test, the low strain test, or the seismic test, is used for checking the integrity and continuity of an installed pile foundation. It can be applied to pre-formed or cast-in-situ piles, and involves striking the top of the pile cleanly with a special hammer, and monitoring the response of the pile with an accelerometer held against the top surface. The top of the pile needs to be prepared, but each test, comprising the averaging of a number of blows, takes only a few minutes and many piles can be tested in a single site visit. The response of the pile to the stress wave which travels down to the toe and is reflected back up again, is a function of the pile impedance, and this is a function of the pile modulus and second moment of area. Weak or honeycombed concrete, which affect modulus, or bulging and necking, which affect area, as well as cracks which provide a surface from which the stress wave can reflect, are all reflected in the trace of the pile response. With skill, experience and judgement, it can be shown that no defective concrete exists within the important load carrying parts of the pile.



Another type of integrity test commonly used for cast-in-situ piles is sonic logging, a procedure which involves casting a number of tubes, usually three or four dependent on pile diameter, into the pile with the reinforcement cage. Once the concrete is set a pair of transducers, comprising an ultrasonic emitter and receiver, are lowered down a pair of tubes and then raised slowly to the surface. The travel time for the ultrasonic signal is therefore a function of the separation of the tubes, which should be roughly parallel, and the modulus of the concrete between. The output signal therefore shows the quality of the concrete "between" the tubes, and the signal is independent of depth. Piling Contractors can arrange for this testing to be carried out if required.

Static Load Testing

Static load testing involves the direct measurement of pile head displacement in response to a physically applied test load. Load is normally applied via a hydraulic jack acting against a reaction system, and this can be provided by anchor piles, ground or rock anchors or by dead weight known as kentledge. At each step the applied load is measured using a load cell, or sometimes with a calibrated gauge in the hydraulic system. Pile displacement is measured relative to a fixed reference beam, usually with dial gauges or linear variable displacement transducers (LVDTs), and checked using precision surveying equipment.



Static load testing is carried out in-house by Piling Contractors. Load tests can be carried out to assess the load displacement performance of a pile in both vertical (axial compression/tension load test) and horizontal directions (lateral load test).

Bi-directional Load Testing

An alternative method of static load which was first introduced to the USA about 20 years ago is the Osterberg Cell. This involves placing sacrificial calibrated hydraulic jacks within the pile, either one near the base, or one near the base and another higher up. The cells are fixed to the reinforcement cage and placed prior to concreting, as well as other instrumentation such as extensometers and strain gauges. At the time of testing, the jacks are expanded, forcing the upper part of the pile out of the ground against the reaction of the lower part. Analysis of the test data allows a lower bound estimate of pile capacity, and some useful performance measurements.



This type of test does not require the external reaction system, and so can have significant cost advantages, especially when working over water. Piling Contractors has experience of this type of test, having carried out four on the Gateway Upgrade project, two on preliminary piles and two on working piles.

Dynamic Load Testing

Another alternative to static load testing is the use of Dynamic Load Testing. This was developed by Pile Dynamics Inc of the USA, who manufacture the PDI-PAK system used by Piling Contractors. The system comprises two to four strain gauges & acceleration transducers, a portable field computer with signal processing electronics and a signal conditioning system, together with software for monitoring and reporting. Analysis is carried out using the signal matching computer program CAPWAP.



Dynamic load testing was introduced for driven piling, where it is carried out either using the pile driving impact hammer on piles made of concrete (prestressed or precast), steel or timber (or on composite piles). It has been developed to apply to cast-in-situ piles, where a separate drop weight is required. Piling Contractors owns an 11 tonne weight fitted inside a custom made test frame which is equipped with a hydraulic catching mechanism to hold and control the release of the weight.



In both types of test, we have the capability for real-time connection of the PDI-PAK on site with an office based computer via a mobile phone and the internet. This allows specialist expertise to control the test while trained technicians operate the equipment even where the site is in a remote area.

Please contact any of our offices to discuss your testing requirements.