

Ultra-Seismic

Ultra-seismic (US) investigations are performed to determine the length and evaluate the integrity of shallow and deep pile or foundation elements. This investigation technique is suitable for a variety of structures, from shallow wall-shaped substructures, to deep drilled piles. US investigations are the ideal method when access to the top surface of a foundation element is not possible. Many structures can be analysed provided that there is 1 – 1.8m of exposed structure for mounting the instrument. This makes US pile testing particularly useful for testing abutments and wall piers of bridges due to the large exposed areas. US is a more sophisticated approach to the Sonic Echo/Impulse Response (SE/IR) method (also called Pile Integrity Testing) since multiple receivers are used. US pile or foundation testing promises greater clarity results at times where alternate investigation methods are inconclusive.

How it works

Ultra-seismic works on similar principles as SE/IR. In an SE/IR test, the foundation top is struck by the hammer and the response of the foundation is monitored by a single receiver. The distinguishing factor of US is that the receiver is repositioned between each impact, giving multiple perspectives. The receiver is typically moved along the exposed surface in increments of 150 – 300mm. The receiver can be moved either vertically or horizontally depending on the geometry of the element. The receiver is triaxial which monitors movements in three dimensions allowing for both compressional and flexural wave analysis. The results of this for geotechnical assessment can be used to determine the depth of elements or the presence of structural abnormalities. An Olson Instruments Freedom Data PC system records the hammer input and the receiver output.

Platforms Available

We offer two devices available for the Ultra-seismic technique. These include the NDE360 and DataPC. These offer differing levels of mobility and on-site analysis. Please see the individual brochures for more in depth specifications for the platforms.

Accuracy

US tests are accurate to within 5% in the determination of the depth of the foundation.

Applications

- Structural investigations of structures where foundation depth is unknown
- Assessing the condition of foundations for geotechnical assessment
- Investigation of damage to foundations
- Investigation of bulbs in foundations



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Vertical Profiling

Vertical profiling is suitable for deep foundation elements such as piers, without the need for excavation. The structure is struck near the top surface with the hammer and the response of the echo is recorded by the receiver. As figure 2 shows, the receiver is repositioned vertically along the longitudinal axis of the structure and the test is reperformed. After several tests the data is merged to provide a highly detailed response profile. A typical result is shown in figure 3.

Horizontal Profiling

Incrementally moving the receiver horizontally along the foundation element means that less of the structure needs to be exposed. This is suitable for wide and shallow elements such as abutments.

Effectiveness

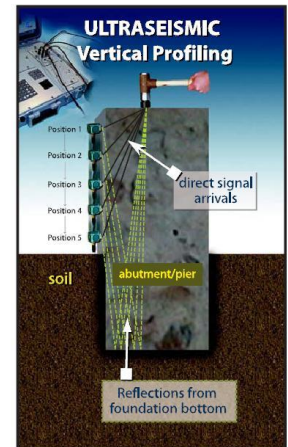
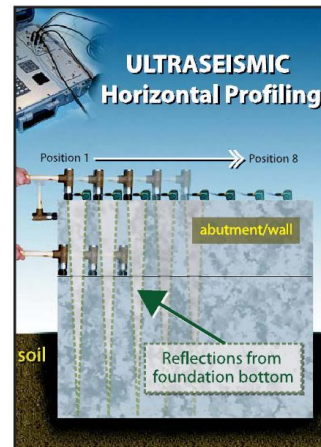
Ultra-seismic pile testing can be used when other tests such as the SE/IR method deliver inconclusive results. The US method can obtain functional results even when many reflecting boundaries are present. The ability to perform tests in either a vertical or horizontal manner increases the applicability and effectiveness of this method.

Data Processing

Processing and analysis is performed by IX Foundation software on a complete data series rather than individual records. This stacking process allows for strong tracking ability of reflected waves. The slope of coherent events in the stacked records can be used to determine the velocity of the direct and reflected waves. These velocities are used to determine accurate depth calculations. Echoes can be enhanced with automatic gains and digital filters. Separation of negative and positive polarised events enhances weak echoes caused by the reflection from the bottom of deep foundations.

NDE360 and Freedom Data PC Configurations

The US configurations are available separately or combined with SE/IR (also called Pile Integrity Testing) and are compatible with both the Freedom DataPC and NDE360.



About PCTE

PCTE have over 30 years' experience in the measurement and testing of construction materials. PCTE can provide more than just the equipment, they can provide expert training. PCTE have a service centre in Sydney in which they can provide calibration, repairs and warranty repairs.

Other Equipment

PCTE supply three main ranges: NDT, Lab and Geotech Instrumentation.

NDT includes: Rebound Hammers, Covermeters, Ultrasonics, GPR, Corrosion Testing, Coating Testing and Foundation Testing

Lab includes equipment for: Concrete, Cement, Aggregate, Soil, Asphalt and Metal

Geotech Instrumentation includes: Strain Gauges, Piezometers, Inclometers, Extensometers, Tiltmeters, Load Cells and Dataloggers