

Ultra-Seismic



Figure 1: Testing using the Ultraseismic method

Introduction

Ultraseismic (US) investigations are performed to determine the length and evaluate the integrity of shallow and deep foundation elements. This investigation technique is suitable for a variety of structures, from shallow wall-shaped substructures, to deep drilled shafts. US investigations are the ideal method when access to the top surface of a foundation element is not possible. Many structures can be analyzed provided that there is 1 – 1.8m of exposed structure for mounting the instrument. This makes US 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 since multiple receivers are used. US promises greater clarity results at times where alternate investigation methods are inconclusive.

Applications

The applications for Ultra-seismic are varied:

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

How it works

Ultraseismic 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 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.

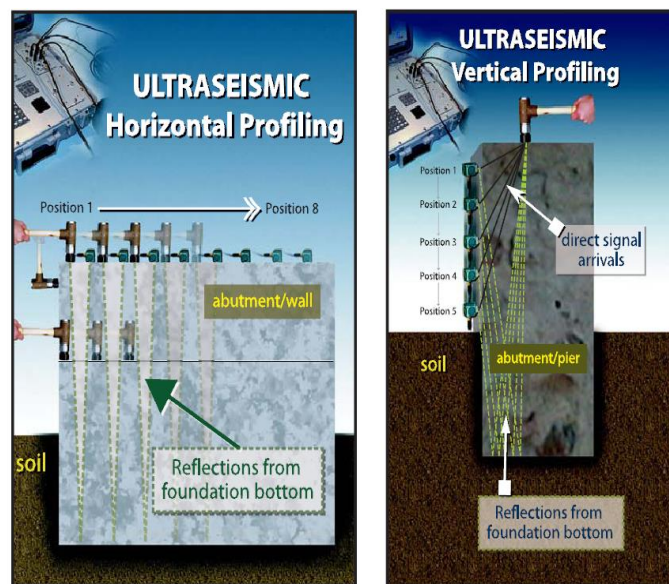


Figure 2: Horizontal and Vertical profiling

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 re-performed. After several tests the data is merged to provide a highly detailed response profile. A typical result is shown in figure 3.



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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.

Platforms Available

We offer two devices available for the Ultraseismic 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.

Effectiveness

Ultraseismic 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.

Accuracy

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

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 SE and IR configurations are available separately or combined and are compatible with both the Freedom DataPC and NDE360.

About PCTE

PCTE have over 30 years experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing the issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.

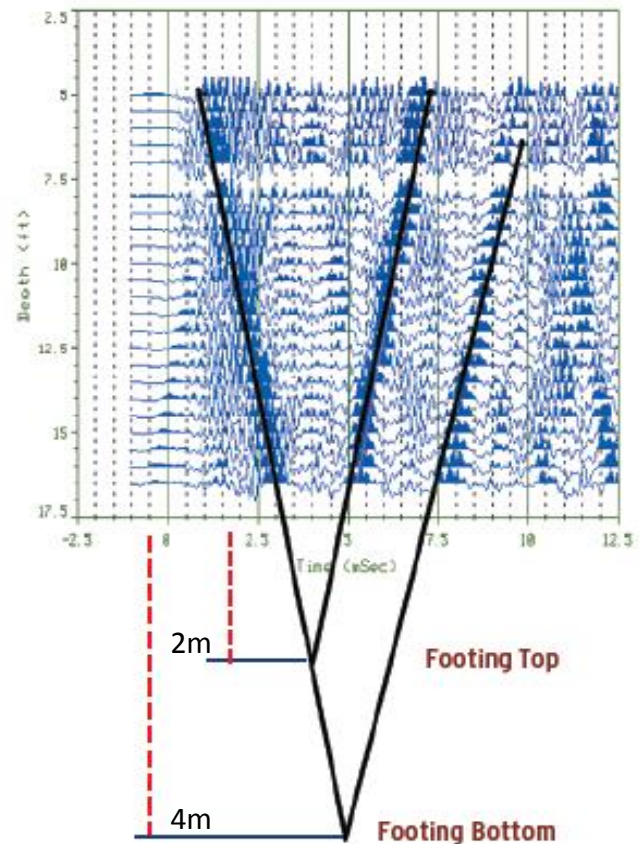


Figure 3: Stacked data series

Other Equipment

The Olson Instrument range includes the CTG, NDE360 Freedom Data PC and DAS as well as the resonance tester. The full Proceq range of equipment is available for insitu non destructive concrete measurement, including Schmidt Hammers, Covermeters, Half Potentials, Resistivity, Ultrasonic's and Permeability. We also supply Intelli-Rock maturity, temp and humidity logging systems, corrosion rate monitoring equipment, Ground Penetrating Radar. Our newest piece of equipment is the MIRA Ultrasonic Pulse Echo imaging system.