PAPWORTHS CONSTRUCTION TESTING EQUIPMENT

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Parallel Seismic (PS)

Introduction

The Parallel Seismic (PS) method is applied to determine the lengths of deep foundations where foundation tops are not accessible, or when the piles are too long and slender (such as H piles or driven piles) to be tested by Impact Echo techniques. In addition, the PS method can provide information about the soil below the foundation bottom.

Applications

The PS investigation can be performed on foundations made of

- Concrete
- Wood
- Masonry
- Steel

Soil quality below the foundation can also be determined by the PS test.

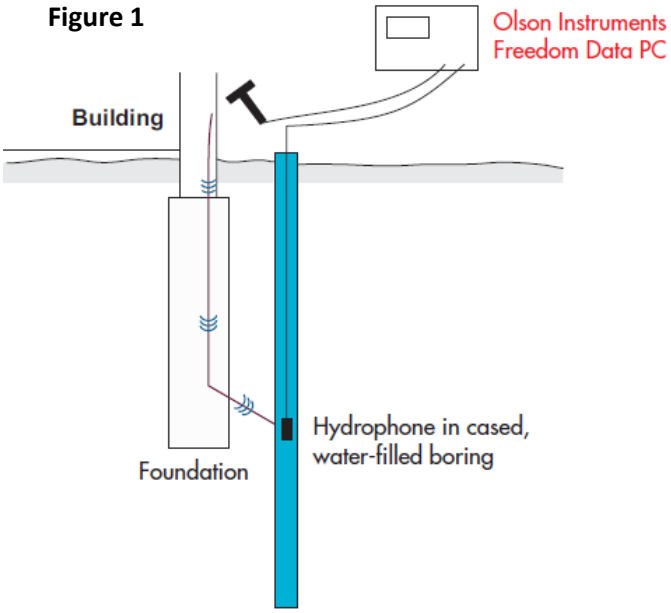
How it works

Parallel Seismic involves hitting any part of the structure that is connected to the foundation (or hitting the foundation itself, if accessible) and receiving compressional and/or shear waves travelling down the foundation by a hydrophone or a geophone receiver.

In PS investigations, one relies on identifying direct arrival times of compressional and shear waves at the receiver locations, as well as the wave amplitudes.

The PS investigation is performed at 30-60cm vertical receiver intervals in the borehole. The field setup for PS investigations is shown in Figure 1.

Figure 1



Access

Some portion of the structure that is connected to the foundation must be exposed for the hammer impacts. A borehole is required. Typically a 5-10 centimeter diameter hole is drilled as close as possible to the foundation (within 1.5 meters preferred).

The borehole should extend at least 3 to 4.5 meters below the expected bottom of the foundation. In case of hydrophone use, the hole must be cased, capped at the bottom and the casing and hole filled with water. For geophone use, the hole must usually be cased and grouted to prevent the soil from caving in during testing.

Processing Techniques

Some geophysical processing techniques can be used to help optimise the Parallel Seismic data. These techniques include Auto Gain Control (AGC) and filtering to enhance weak events. IX Foundation, a seismic analysis and display program, allows the full range of data to be viewed at one time. This improves the ability to identify the bottom of the foundation being investigated.

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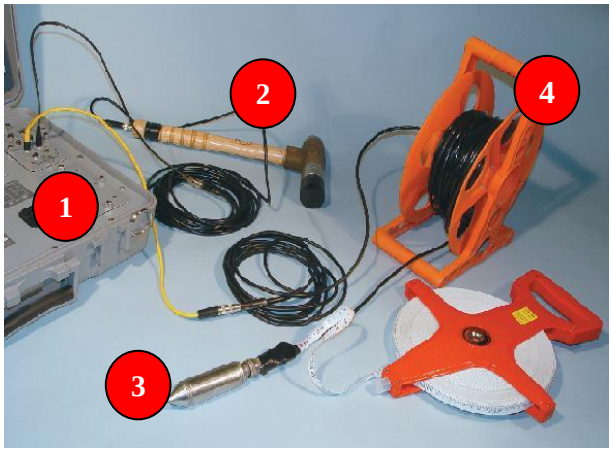

1. Olson Freedom Data PC
2. Impulse hammer
3. Hydrophone
4. Reel of cable

Interpretation of Data

The use of seismic analysis software, such as IX Foundation, allows for determination of approximate pile length easily. The diffraction, or change in slope, that occurs in the data as a result of the pile tip acting as a point diffractor and a reflector is shown in Figure 1. The software is capable of determining velocity based on the slope of the line and where the two lines of the differing slopes intersect a depth is determined.

Effectiveness

The PS method is more accurate and more versatile than other nondestructive surface techniques for determination of unknown foundation depths. The accuracy of the method depends on the variability of the velocity of the surrounding soil and the spacing between the borehole and the foundation element.

Depths are normally determined to within 5% accuracy or better. A borehole is typically needed for Parallel Seismic tests, which adds to the cost of the investigation (unless borings are also needed for other geotechnical purposes).

The borehole should be within 1.5m of the foundation, which sometimes cannot be achieved due to field constraints. Note that for very uniform soils (such as saturated sands), a successful test can be performed with up to 4.5-6m spacing between the source and the borehole.

As the borehole moves away from the foundation, interpretation of the PS data becomes more difficult and the uncertainty in the tip depth determination becomes greater.

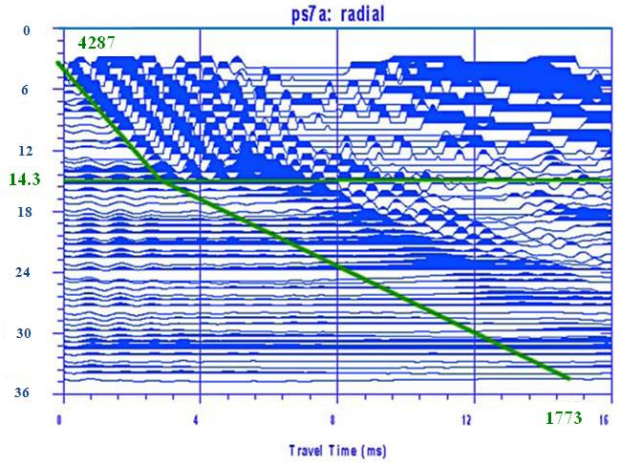

Figure 2 The figure to the left shows PS results from tests performed on a concrete pile in saturated soils. The bottom of the concrete pile is identified at 14.3m where the compressional wave velocity changes from 4287 m/sec (velocity of concrete) to a velocity of 1773 m/sec (velocity of water).

Platforms Available

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

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.

Other Equipment

The Olson Instrument range also includes the CTG, Freedom Data PC and NDE360 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.