Low Strain Integrity Testing (PIT Testing)

**What Is Low Strain Integrity Testing**

Low Strain Impact Integrity Testing is a non-destructive pile testing method for integrity assessments of augered cast-in-place piles, drilled shafts or driven concrete or timber piles. Also, known as Pile Integrity Test (PIT), it compasses the Pulse Echo Method (using a non-instrumented hand held hammer) and the Transient Response Method (a hammer instrumented with an accelerometer). Tests by either method are normally performed after foundation installation and curing and require minimal pile preparation. Length/depth ratios and soil types may limit its applicability.

**Test Procedure**

The GRL engineer attaches an accelerometer to the top of the foundation and impacts the foundation with a small hand held hammer. The impact of the hammer produces a stress wave that travels down the pile- the engineer observes the wave propagation signals on the screen of the Pile Integrity Tester. The pattern of wave propagation and reflection along the pile or shaft is directly affected by discontinuities along the shaft.

GRL is also prepared to employ more complex variations of the low strain dynamic testing method:

- GRL may place 2 accelerometers on top of the foundation when testing shafts of large diameter.
- GRL engineers may use 2 accelerometers, one placed on top and one on the side of the shaft, or 2 placed on the side, in an attempt to evaluate foundations of unknown depth. Other length evaluation options include the Parallel Seismic and Inductive methods.
- Certain situations require testing with one accelerometer plus an instrumented hand held hammer that measures the force applied to the top of the pile. In this case data is analyzed by the Transient Response Method in the frequency domain, which may help identify potential defects.
- Slabs and other non-slender structures require either PIT test with an instrumented hammer or to perform the test with an Acoustic Concrete Tester.

**Benefits of PIT Testing**

The simplicity, speed of execution and relatively low cost of Low Strain Dynamic Testing, these integrity tests may be performed on 100% of the piles on a given a job site.

- Estimate of location of major cracks, necking, soil inclusions and voids
- Estimate of severity of major defects
- Evaluation of integrity within the cross section of the pile
- Quick: dozens of piles tested on a single day
- Applicable to piles that are part of an existing structure
Data Collection and Analysis

The reflections collected by the hammer impact cause a change in the acceleration signal measured on the pile top, which is picked up and processed by the Pile Integrity Tester (PIT) equipment and interpreted by an experienced GRL engineer. Back in the office, the engineer post processes the signals with the PIT-W Software to enhance and interpret test results, and issues a test report.

PIT-W Software:

The software processes the PIT data, averages, filters and magnifies records. It analyzes records in the time domain and outputs user customized tables, plots and reports. A Pile Profile can also be developed, illustrating multiple piles in one single screen. The PIT-W software interprets wave speed calculations and frequency domain analyses.

ASTM Standard


For additional information on Low Strain Dynamic Testing (PIT Testing) or any other GRL Engineers service please contact info@GRLengineers.com or visit us at www.GRLengineers.com.