Pile Integrity Tester (PIT)

Pile Integrity Tester (PIT-Q)

Low strain integrity testing by pulse echo or transient response methods

Fast. Economical. Calculated.

The Pile Integrity Tester (PIT-Q) assesses the structural integrity of drilled shafts/bored piles, ACIP/CFA and drilled displacement piles, driven concrete or timber piles and concrete filled pipes. The PIT-Q performs wave equation-based, non-destructive foundation investigations known as Low Strain Integrity Tests or Low Strain Dynamic Tests, providing assurance that a pile or shaft is free of major defects. PIT-Q conforms with ASTM D5882 and other codes, specifications and norms.

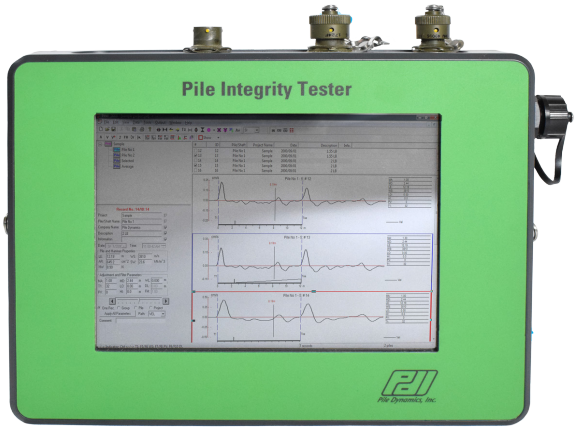
The PIT-Q is a one-person operation with data that may reveal potentially dangerous defects such as:

- Major cracks
- Necking
- Soil inclusions or voids

The PIT may also be used to test piles integral in the structure, such as those supporting existing bridges or towers, and may assess their length. With the PIT, testing is performed quickly, potentially making it possible to test every pile on a job site with no pre-planning required.

The PIT Test

The PIT test consists of attaching one or two accelerometers to a foundation and using a hand-held hammer to impact the pile top. The PIT collects the acceleration data and displays curves that reveal any significant changes in a cross section that may exist along the shaft. The impact of the hammer generates a stress wave that propagates down the foundation and reflects back up at a location of changing cross section or from the shaft/pile toe. The accelerometer collects data that reveals the pattern of wave propagation and reflection. Piles without defects typically show a reflection from the pile toe at the expected time, which corresponds to the pile length. If a defect is present along the shaft, its size and location affect the propagation and reflection time of the wave.



PIT tests may also help estimate the depth of the pile toe (the pile length) if the pile is intact with embedment less than 30 times the pile diameter. PIT data is evaluated in the field and later transferred to a computer for further analysis by the PIT-W software.

PIT-Q Data Processing Software

PIT-W Standard Version

- Reveals potential shaft or pile defects such as major cracks, necking, soil inclusions or voids
- Can be used to determine unknown pile lengths
- Available in three versions: velocity only, force and velocity, or two velocity channels
- Optional PIT-Professional reporting software allows advanced modeling and analysis
- Additional Parallel Seismic analysis feature

Parallel Seismic Testing

The Parallel Seismic test method can determine the depth of a deep foundation element for which as-built records are unavailable.

- Can be used to test driven piles without joints or splices, as well as on concrete timber, masonry and steel foundations
- Available as an add-on capability to the PIT system

PIT-Q Models for Various Applications

PIT-Q7V: one channel of data acquisition, reading data from one accelerometer and producing a graph of velocity versus time (translated to length). Real time field to office data transmission via Internet.

The PIT-Q7FV: two channels of data acquisition producing two curves on the same graph. The force of the impact of an instrumented hammer, or a second velocity integrated from an accelerometer placed further down along the shaft (usually side mounted), can be measured. The force from an instrumented hammer and received hydrophone signal can also be measured for parallel seismic tests.

A second velocity is useful to test piles under existing structures, of unknown lengths. The force signal is useful to investigate potential damage near the top of the foundation, to test large diameter shafts or short foundation elements, and to assess integrity by the Transient Response Method or parallel seismic method.

PIT-W Standard allows data to be filtered and magnified with an exponential amplification as a function of time. The analysis in the time domain helps locate the depth of a potential defect. If an instrumented hammer is used, PIT-W Standard may output a force-velocity plot and perform Surface Wave Analysis, recommended for piles of large diameters. PIT-W Standard Version outputs user customized tables and reports.

PIT-W Professional Version

PIT-W Professional Version has all the features of the Standard Version plus advanced tools to estimate the impedance (and shape) of the pile and quantify the severity of defects. In addition, it analyzes records from two accelerometers or from an instrumented hammer. Frequency Domain Analysis, through study of the dominant frequencies of the PIT signals, may aid in the detection of anomalies and in the estimate of their locations; it may also reveal the unknown length of an existing foundation.

PIT-S

PIT-S simulates the performance of low strain integrity testing with the PIT. It allows the user to enter a pile shape, realistic soil layer properties and characteristics of a hammer impact.

It then displays the signals that may result from a test performed in those circumstances. Curves simulated by PIT-S may be overlaid over measured curves for a simple signal matching process that helps investigate the cause of observed reflections. A demonstration license of the PIT-S software is supplied with all models of PIT-S and is also available as a free download from www.pile.com/pit.

Fast Fourier Transform Feature

All Pile Integrity Test models are offered with a Fast Fourier Transform (FFT) feature. FFT is a computational algorithm that calculates the various frequency components of the PIT signal. The FFT feature performs these calculations in the field, and then computes the distances that correspond to the various frequency components. This may help in detecting location and in determining the length of short foundation elements (up to 1.5 m or 5 ft).

PIT accessories include hand held hammers, instrumented or not, in a variety of weights to suit various testing situations. PIT accelerometers are available for top or side mount. PIT-Q accelerometers include a smart chip for calibration tracking.

www.pile.com/products/pit/