



Pile Integrity Testing

A Spotlight on Preforming PIT

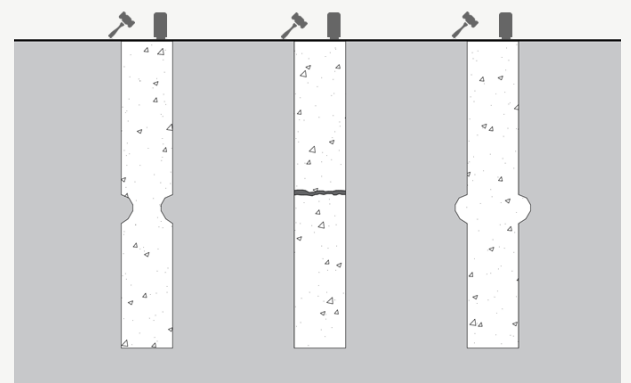
Concrete piles and drilled shafts are an important category of foundations. Despite their relatively high cost, they become necessary when we want to transfer the loads of a heavy superstructure (bridge, high rise building, etc.) to the lower layers of soil. Pile integrity test (PIT), or as ASTM D5882 refers to it as "a low strain impact integrity test," is a common non-destructive test method for the evaluation of pile integrity and/or pile length. A pile integrity test can be used for forensic evaluations on existing piles, or quality assurance in new construction. The Integrity test is applicable to driven concrete piles and cast-in-place piles.



Concrete Pile

What is Pile Integrity Testing?

Low strain impact integrity testing provides acceleration or velocity and force (optional) data on slender structural elements (ASTM D5882). Sonic Echo (SE) and Impulse Response (IR) are employed for the integrity test on deep foundation and piles. The test results can be used for the evaluation of the pile cross-sectional area and length, the pile integrity and continuity, as well as consistency of the pile material. It is noted that this evaluation practice is approximate.



The concept of PIT

What Information Does PIT Provide?

- Continuity of pile
- Defects such as cracks
- Necking
- Soil incursions
- Changes in the cross section
- Approximate pile lengths (unless the pile is very long or the skin friction is too high)

How is PIT Performed?

The pile head surface should be accessible, above water, and clean of loose concrete, soil or other foreign materials resulting from construction. Any type of contamination should be removed (using a grinder) to reach to solid and sound concrete surface. This step is vital, as the connection between the sensor and concrete should be firmly in contact. The sensor should be placed away from the edges of the pile. The integrity testing should be performed no sooner than 7 days after casting, or after concrete strength achieves at least 3/4 of its design strength, whichever occurs earlier.

A hammer (with or without force measurement unit) is used to impact the pile top; the impact should be applied axially with the pile. Motion transducers should be capable of detecting and recording the reflected echos over the pile top. The acceleration transducer should have a minimum Analog to Digital Converter with a 12 bit resolution; and a Sample Frequency of at least 25 KHz. The distance between the impact location and the sensor should be no larger than 300 mm. Several impacts are applied to the top of the pile. The reflected echos are then recorded for each individual impact. As an alternative, the average can be determined and used. An acceleration transducer can be used for the purpose of this test. In this case, the apparatus shall provide signal conditioning and integrate acceleration to obtain velocity. The apparatus shall balance the velocity signal to zero between impact events.

