SONIC INTEGRITY TESTING

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The sonic integrity test (SIT) is a non-destructive test for quickly and economically checking the integrity or continuity of an installed pile foundation. The method is referred to as a low-strain test and is routinely used for quality control purposes in piling projects.

SIT can be applied to cast-in-situ piles and pre-formed driven piles (concrete, steel, timber). The test will detect pile defects like cracks, voids and soil inclusions, changes in the pile diameter (e.g. “necking”), and major variations in the consistency of the pile material. The method does not provide any information on the load bearing capacity of the pile.

The equipment used for SIT is robust and portable and comprises a light-weight field computer, transducer, connecting cables and a plastic mallet. Thus, any accessible pile can be tested by a single operator. An experienced operator can test up to 100 piles per day in ideal conditions. In most cases, the experienced operator can provide immediate on-site interpretation of the test result.

PHENOMENA DETECTABLE

* Reflections from the toe, (in most cases).
* Reflections from significant inclusions (5-10% or more of the pile diameter).
* Reflections from horizontal cracks.
* Reflections from joints, (as for precast concrete piles).
* Reflections from increases and decreases in cross-section.
* Reflections from changes in soil layers.
* Reflections from significant changes in material properties (e.g. variation in concrete consistency).

PHENOMENA NOT DETECTABLE

* Gradual increases or decreases in cross-section.
* Curved forms.
* Small inclusions of foreign materials.
* Local loss of cover.
* Debris at the toe of the pile.
* Cracks parallel to the pile axis.

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HOW DOES IT WORK?

1. The pile head is struck with a hand-held hammer, which sends a low strain stress wave down the pile shaft.
2. The induced stress wave is reflected off the pile toe and any discontinuities in the pile.
3. The reflections cause movements of the pile head, which are registered by a hand-held accelerometer sensor that is pressed against the top of the pile.
4. The recorded signal is converted into a velocity-time trace and presented on-screen as velocity versus pile depth.
5. Once satisfactory signals have been obtained, they are stored in the internal memory of the field computer.
6. The stored signals are downloaded onto a PC for signal enhancement and reporting at a later stage.

The shape of the recorded sonic signals ("reflectograms") provides a qualitative indication of the pile integrity. However, interpretation of SIT signals must give due regard to the soil profile in which the pile is founded and the method of pile construction. Shaft friction plays a major role in damping the signal and reflections of stress waves also occur at the boundary of soil layers. For this reason it is essential that the operator is provided with available soil profile details, together with the pile construction records.

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