

Developments in shaft quality control

As the use of drilled foundations continues to increase, innovative manufacturers look for ways to optimise these deep foundation elements. The research and development team at one such company, Pile Dynamics Inc (PDI), has developed various improved quality control methods for testing drilled shafts, two of which are briefly discussed here.

SHAFT AREA PROFILE EVALUATOR

One of the desired improvements in shaft quality control was the verticality measurement of the excavation. With no testing method or data to reassure the verticality, the performance of the structure could be compromised. Looking for a way to collect and assess data from the excavation, PDI created the Shaft Area Profile Evaluator (SHAPE). This QA technology offers measured views of the shaft, with three-dimensional visualisation. The SHAPE is lowered into the slurry-filled shaft via attachment to the Kelly bar, identifying irregularities that affect shaft performance.

Built with ultrasonic scanning capabilities, the SHAPE scans up to eight channels simultaneously, while advancing in the excavation at a rate of one foot (304.8 mm) per second. The built-in



PDI's Shaft Area Profile Evaluator (SHAPE) measures shaft profile, radius and verticality

wireless capability allows the SHAPE data to be sent to the field tablet immediately upon exiting the excavation.

SHAFT QUANTITATIVE INSPECTION DEVICE

A further improvement needed for better quality control of drilled shaft construction was cleanliness at the base of the shaft. If the base of the drilled shaft is not properly cleaned, the shaft may not perform as designed. Quantitatively verifying the condition at the base of a drilled shaft can be challenging, but the PDI design team created the Shaft Quantitative Inspection Device, also known as SQUID, to help verify these measurements.

To improve the inspection method, SQUID takes accurate measurements of force versus displacement at the base of the shaft, providing an objective, quantitative assessment. The SQUID is lowered into the excavation via attachment to the Kelly bar and provides an accurate measurement of the debris at the base, as well as resistance to penetration in the bearing material. These results are sent wirelessly from the drilled location to the SQUID tablet, which allows for quick and effective testing.

INCREASED ACCURACY AND PERFORMANCE

These innovations offer quantitative data that can improve the quality and accuracy of drilled shafts. With wired and wireless options, the SQUID and the SHAPE are rugged devices which eliminate common points of failure such as electronic cables running from the surface to the device. Both SHAPE and SQUID's wireless capabilities allow shaft integrity discussions to happen in real time, at the jobsite or remotely via PDI's SiteLink® technology.



PDI's Shaft Quantitative Inspection Device (SQUID) is used to determine toe (shaft base) cleanliness

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