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Continued Foundation Testing During Challenging Times - From a Safe Distance

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The COVID-19 pandemic has presented a range of challenges to industries worldwide. At least temporarily, many companies have been forced to cease work due to pandemic-related restrictions. Infrastructure construction (interstate, airport, and energy delivery projects) is considered critical and as a result has been declared “essential”. However, these projects must continue to abide by “social distancing” requirements for safety of onsite crews. Remote testing capabilities allow projects to continue at accelerated rates, with lower costs, and most importantly, allows jobsites to adhere to today’s health and safety guidelines, as well as environmental restrictions.

Remote testing capabilities are available for Dynamic Pile Testing, Thermal Integrity Profiling, Shaft Bottom Cleanliness Assessment, and Shaft Profile and Verticality Evaluation. Data is collected and viewed in real time by an engineer remotely, or saved to a Cloud server. The data is then available for immediate assessment.

Dynamic Pile Testing with SiteLink® Technology

Deep foundation testing is performed during a test program to aid in design, as well as during construction to confirm the design assumptions and meet QA/QC requirements. A common method for testing deep foundations is Dynamic Pile Testing, standardized by ASTM D4945. Available for over four decades, this method is utilized widely on both private and public construction projects around the world. Dynamic Pile Testing is embraced by the Federal Highway Administration and specified by most State Departments of Transportation.

PDI Wireless Sensors

Historically, a specialized engineer was necessary to be onsite to attach instrumentation to the pile, connect to the data acquisition system (such as the Pile Driving Analyzer®, or PDA), and save the data. Upon completion of the testing, the engineer would then return to the office to assess the data and prepare a report of the results.

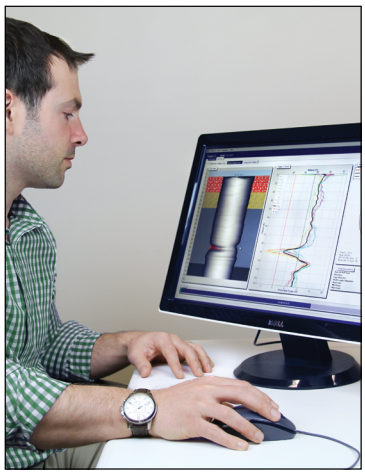
Today, SiteLink® Technology allows the engineer to remotely control the pile testing equipment through an internet connection. A complete set of the necessary dynamic testing equipment is sent to the job site. The crew then attaches the sensors. (Most construction crews have participated in, or have familiarity with, dynamic testing. While testing either during initial driving or a restrike, the engineer can easily explain the steps over the phone.) During testing, initial pile driving or restrike, the engineer controls the PDA remotely, in real-time throughout, maintaining continuous communication with the site via video, voice, or text. Upon test completion, the data is downloaded directly to the engineer’s computer, allowing them to immediately start the CAPWAP® analysis and reporting. The results are quickly submitted to the owner or responsible engineer for approval. As a result, construction can continue without delay. In addition, remote testing lowers overall costs, and eliminates COVID-19 transmission between the dynamic testing engineer and the crew.

Drilled Shaft Integrity Monitored via the Cloud

Recently, for a Thermal Integrity Profiling (TIP) project, the contractor installed Thermal Wire® cables tied to the shaft reinforcement cage prior to concrete placement. Once the concrete was placed, the cables were attached to TAG data loggers, which have cellular capabilities and connect to a password protected Cloud server. The contractor at the jobsite communicated the basic shaft information, with location and serial numbers of the installed Thermal Wire cables, to the engineer located back at the office. Temperature data was collected remotely every 15 minutes.

Remote Thermal Integrity Profiling allows the engineer to assess integrity issues based on the measured temperatures in the shaft during concrete curing. Within 24-hours of concrete placement an evaluation of the shaft’s integrity and the results are available via the dedicated Cloud server. Remote testing capabilities support continuous construction and allows engineers to assess the integrity of drilled shafts without encountering onsite personnel. *(article continues on next page)*

Attaching TAG to Thermal Wire® Cables



Assessing TIP Data Collection

Assessing Shaft Bottom Cleanliness

An ongoing Ohio Department of Transportation project, which uses drilled shafts terminated in soil, required that the thickness of debris (disturbed soil and sediment) at the base of the shaft be measured prior to casting concrete. The Shaft Quantitative Inspection Device (SQUID) was proposed to perform the measurements. This project's high production rate lead to the decision that the testing would be performed remotely with the engineer viewing and collecting the data in real time from their office.

Bottom Cleanliness Evaluation with SQUID

The ability to schedule a remote test is easily achieved by sending a text message or placing a phone call. Following the notification, the engineer takes remote control of the onsite data acquisition unit. Then, the SQUID main unit is attached to the drill rig's Kelly bar adapter. The contractor quickly deploys the unit, and the engineer sends a confirmation text to the site. The data is collected, and the SQUID is removed from the shaft. Immediately upon test completion, the engineer outputs the results and transmits them to the site.

Shaft Geometry and Verticality

Often, specifications require a survey of the as-built shaft geometry and verticality of a drilled shaft. Without a testing method, the performance of the structure could be compromised. The Shaft Area Profile Evaluator (SHAPE) quickly and easily collects and assesses profile and verticality data from the excavation. The unit is attached to the Kelly bar and then lowered into the water or slurry-filled shaft to identify irregularities that affect shaft performance. The SHAPE ultrasonically scans up to eight channels (at every 45-degree orientation), while being lowered into the excavation. Immediately after exiting the excavation, the unit quickly and wirelessly sends the data to the SHAPE tablet. The tablet can be accessed remotely with SiteLink Technology, which reduces the number of personnel onsite. A SHAPE test does not require personnel to be near the open drilled shaft, and typically takes only minutes to complete. Furthermore, data analysis and automatic features quickly provide the shaft profile and verticality view.

A SHAPE Test Conducted in Slurry

Continuing Testing – At a Safe Distance

The pandemic's "social distancing" requirements has interfered with project schedules, staffing, travel, and onsite work. While the installation of foundation elements necessitates a number of personnel onsite, any reduction of persons onsite, however, leads to a minimization of person-to-person contact, which ultimately benefits the well-being of the project and those involved. Most importantly during this pandemic, remote testing provides the ability to collect quality data, with lower costs and accelerates construction timelines. Whether using SiteLink Remote Technology or the Cloud, remote testing capabilities can help deep foundation testing and assessments to continue in the safest manner possible, without interruption or adding additional personnel to the jobsite.

For additional information, please visit www.pile.com for QA products or www.grlengineers.com for testing services.

Upcoming Events

June

01:	**Webinar:** Case Histories: Cost and Time Savings Achieved through Thermal Integrity Pro iling (Register) 9:00 pm ET
02:	**Webinar:** Case Histories: Cost and Time Savings Achieved through Thermal Integrity Pro iling (Register) 11:00 am ET
03:	**Webinar:** Case Histories: Cost and Time Savings Achieved through Thermal Integrity Pro iling (Register) 8:00 am ET
17-18:	**SuperPile Virtual** (dfi.org)

September

01:	**State of Practice Seminar**: Nashville, TN (Register)
03:	**State of Practice Seminar:** Omaha, NE (Register)
16:	**Seminar on Deep Foundation Integrity Testing and Wave Equation Analysis:** Cleveland, OH (Register)
17-18:	**High Strain Dynamic Foundation Testing Workshop and Proficiency Test:** Cleveland, OH (Register)
28-30:	**ADSC Meeting:** Napa Valley, CA (adsc-iafd.com)
29:	**State of Practice Seminar:** Houston, TX (Register)

October

01:	**ADSC Meeting:** Napa Valley, CA (adsc-iafd.com)
01:	**State of Practice Seminar:** Dallas, TX (Register)
13-16:	**DFI Annual:** Washington, D.C. (dfi.org)
26:	**State of Practice Seminar:** Philadelphia, PA (Register)
28:	**State of Practice Seminar:** New York, NY (Register)
30:	**State of Practice Seminar:** Boston, MA (Register)

Due to COVID-19, any of the above events may be canceled or postponed as restrictions unfold. Please visit our websites for updates.

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