DID YOU KNOW?

When being onsite is not possible or cost effective, GRL Engineers can offer remote testing and analysis services.

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Cloud-Based Remote Thermal Integrity Profiling

By Danny Belardo and Jim Zammataro

No industry is immune to the impact and challenges of the COVID-19 pandemic. Globally, companies are being forced to rethink daily operations and adapt business models to align with new social distancing guidelines. The construction industry is no exception. The Occupational Safety and Health Administration (OSHA), a federal agency of the United States responsible for workplace safety, has issued guidance for construction operations to mitigate risk exposure by implementing engineering controls.

PDI's remote testing technologies for the deep foundation industry help keep projects moving safely during the pandemic. When a project requires a non-destructive testing of drilled shafts, augered cast-in-place (ACIP), and diaphragm walls, the Thermal Integrity Profiling (TIP) system can be used as a tool to further help mitigate COVID-19 and other risks. The TIP system utilizes heat generated by curing concrete to assess shaft integrity and reinforcing cage alignment. PDI's data loggers, Thermal Aggregator (TAG) collect TIP data from multiple Thermal Acquisition Port (TAP-EDGE) boxes attached to a foundation element. Automatically, the TAP-Edge boxes transmit all data to the secure PDI-Cloud portal.

Compared to other state-of-practice non-destructive testing methods, the use of cloud-based TIP data acquisition helps minimize risk exposure by eliminating most onsite contact between the TIP consultant and the project team. From March through July 2020, the number of shafts monitored remotely quadrupled as compared to the same time in 2019. In response, GRL Engineers has shifted TIP integrity testing services to nearly 100% cloud-based.

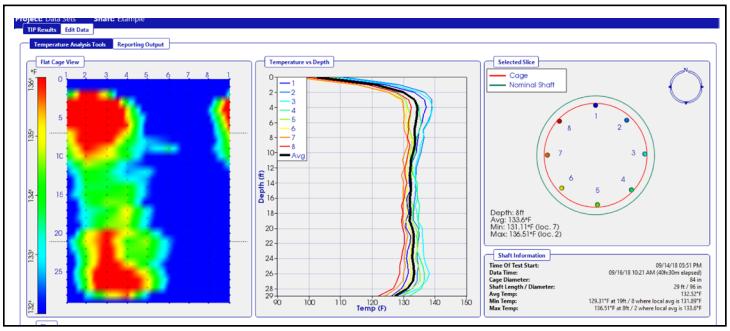
Signature Bridge, Miami, FL

To date, the largest construction project to use 100% TIP testing is the ongoing I-395/ SR-836/I-95 Signature Bridge project in Miami, Florida. This ground-breaking design build project with construction by Archer Western de Moya JV is a complete reconfiguration of this key transportation corridor in downtown Miami and will incorporate thousands of 30 in (760 mm) and 36 in (910 mm) CFA piles ranging in length from 85 ft (26 m) to 135 ft (41 m).

Image courtesy of http://www.i395-miami.com

This project's pile type, as well as the need to maintain a rapid construction pace, made the TIP system an opportunistic testing method. As a result, all piles are instrumented with Thermal Wire cables and use PDI's cellular based TAG/TAP-Edge system to push collected data to a secure cloud-based server. After each pile installation, one TAG and three TAP-Edges are attached to the Thermal cables on each pile. Then the temperature vs. depth data is collected every 15 minutes and pushed to the cloud-based server every hour. This allows the engineers at Universal Engineering Services' Jacksonville office to remotely access the data for analysis as well as view the preliminary results being reported in near real time.

"We are using Thermal Integrity Profiling to evaluate the integrity of auger-cast piles for support of the I-395 Signature Bridge project in Miami. PDI has been very responsive and helpful," stated Joshua Adams, Universal Engineering Sciences, Inc.



TIP *Temperature vs depth results*

A fleet of TAGs and TAP-Edges are rotated regularly to handle the pace of construction which involves numerous piles per day spread across a large site footprint. With peak temperatures occurring anywhere from 24 to 36 hours, the TAG system greatly reduces the need for onsite testing personnel working at each pile. Analysis can be far more efficient because results are available quicker than alternative test methods.

Implementing Thermal Monitoring with Integrity Testing

The Circle Interchange reconstruction project is in the heart of downtown Chicago, IL. This nearly $800 million dollar Illinois Department of Transportation (IDOT) project began in 2013 and is expected to conclude in 2022. During this time, portions of the current phase were converted from Crosshole Sonic Logging (CSL) to TIP. The scope of this project phase includes integrity testing of approximately 100 drilled shafts 6 ft (2 m) in diameter and 80 ft (24 m) in length. Each shaft is instrumented along the longitudinal rebar with Thermal Wire cables installed equidistantly around the reinforcing cage. After concrete placement via tremie method, a TAG and TAP-Edges are connected to the cables to begin remote data collection.

Thermal monitoring for mass concrete is also specified on this project. In addition to the perimeter cables for integrity testing, a single node Thermal Wire cable is also installed approximately 15 ft (4 m) below the top of the concrete close to the shaft center. Throughout the hydration process, the temperature differentials are monitored between center sensor and a sensor located on a perimeter cable at the same elevation. Furthermore, peak concrete temperatures near the core are monitored and real time data is transmitted to the

project team. Throughout summer 2020, the thermal monitoring data has been used to adjust the thermal control plans to help keep the curing concrete within project specifications. The shafts peak in approximately 30 hours after placement which is when GRL Engineers view the data and issue preliminary results. The transmission of data to the cloud-based server has streamlined the data acquisition to report operation.

The most critical time for recording TIP data occurs during the hydration curing process until peak concrete temperature is reached. PDI's TAG device is used to collect TIP data from multiple TAP-Edge boxes attached to a foundation. The data needed for analysis occurs during very early hydration time. For this reason, PDI's TAG and TAP-Edge system starts transmitting real-time data through the PDI-Cloud to allow engineers, designers and the contractor to view all data at once, from any location, without additional field visits.

As with these projects, and various others, TIP supports accelerated construction because shaft acceptance can be accomplished long before other integrity evaluation methods can be deployed for testing. Often, TIP saves the project time and money.

For additional information on TIP or cloud-based remote testing, visit pile.com or send an inquiry to info@pile.com.

GRL Welcomes New Engineers

GRL Engineers, Inc. proudly announces the addition of four engineers to its team.

Dennis Kiptoo

Dennis Kiptoo received his undergraduate from Jomo Kenyatta University of Agriculture and Technology in 2010 and proceeded to obtain two Master's degrees; the first M.S.C.E. was from the University of Cape Town in 2016 and the second was from Virginia Tech in 2020. Dennis joins GRL-PA.

Stephanie Gomez

Stephanie Gomez graduated with her B.S.C.E. from Georgia Southern University in 2020. There, she was a member of the International Ambassador's Executive Team and was Vice President-elect of the A.S.C.E. Student Chapter. Stephanie also joins GRL-PA.

Saphal Phuyal

Saphal Phuyal graduated from Clemson University in 2020 with his M.S.C.E. There he studied geotechnical engineering and gained experience in performing site investigations in structural design. Saphal joins GRL-IL.

Matthew Perrella

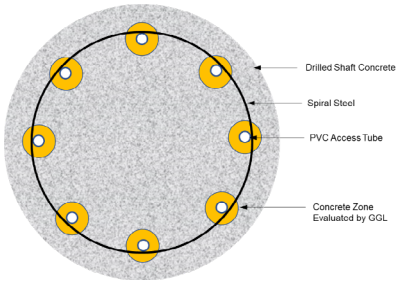
Matthew Perrella graduated with his MS Petroleum and Natural Gas Engineering from West Virginia University in 2018, where he also received his B.S. in Mining Engineering. He is experienced in MWD/LWD field engineering programs, as a dust technician and safety inspector, as well as an educator in K-12 and at the university level. Matthew joined GRL-OH.

Follow Us On Social Media

New Gamma Gamma Logging Service Offered

GRL Engineers is now offering Gamma Gamma Logging Service (GGL) in the United States. GGL is a non-destructive test method used to assess the concrete integrity of drilled shafts through gamma-density correlation. GGL is a relatively quick test with no depth restrictions. It provides highly repeatable test results, while objectively evaluating integrity and relative concrete quality inside and outside of the reinforcing cage.

Before the cage is placed in the excavation and concrete poured, 2 in (50mm) diameter PVC access tubes are attached to the steel reinforcing cage. If testing was not initially planned, an engineer can perform GGL by using core holes drilled through the concrete.



The GGL test probe has a low-level radioactive source (Cesium-137) at its tip and a shielded detector located 15 in (38 cm) away to assess the concrete density surrounding the access tubes or core holes. The 4 ft (1.2 m) long GGL probe is lowered into each access tube using an electric winch. Gamma radiation counts, in counts per second (CPS), are logged as the probe is raised at a typical rate of 10 ft (3 m) per minute. GGL assesses the bulk density of the concrete from the center of the access tube outward for a radial distance of about 3 in to 4 in (76 mm to 101 mm) using the low-level energy source. Based on the calibration data, engineers can present profiles of the average bulk density in pounds per cubic foot versus depth.

For additional information on GGL visit *www.grlengineers.com/services/ggl.*

Upcoming Events

September

23-24: **PDCA DICEP:** Virtual Conference (piledrivers.org)

October

13-16: **DFI Annual:** Virtual Conference (dfi.org)

November

11: **Deep Foundations Integrity Testing and Wave Equation Analysis:** Orlando, FL (Register)

12-13: **High Strain Dynamic Foundation Testing Workshop and Proficiency Test:** Orlando, FL (Register)

Due to COVID-19, all events are subject to cancellation or postponement. Periodically check websites for updates.

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