



With any construction project, there are many potential sources of risk. It is imperative to minimize these various risks to achieve a successful project. For cast-in-place foundations (e.g. drilled shafts, bored piles, augercast piles, CFA piles, micropiles, barrettes, etc.) these risks include:

- Time and schedule delays
- Cost
- Quality
- Safety

Foundation performance over time

Time and Schedule Delays:

Many quality control methods for cast-in-place foundations require waiting 3 to 7 days after casting before the testing can occur. These time delays negatively impact the construction schedule which increases the overall project cost. Thermal Integrity Profiler ("TIP") testing uses the heat created from the hydration process which begins immediately after the foundation is cast and continues past the peak concrete temperature reached. Definitive results are available within typically 12 – 24 hours after casting. The thermal data for each foundation element can be sent directly to the cloud where test results can be viewed immediately. With results being available so quickly after casting is complete, construction schedules can be accelerated, with real time shaft acceptance. If integrity issues are discovered, the foundation can be remediated and construction procedures corrected early on, allowing construction to continue on schedule.

Cost:

Cost uncertainties include scheduling delays due to unforeseen circumstances, including resolving potential foundation quality issues. Common testing methods to determine foundation quality might detect issues that result in time lost while these issues are resolved, negatively affecting the construction schedule. These false positives can cause major delays and add significant cost to a



project due to unnecessary coring and time delays while the apparent problems are resolved. With TIP, false positive are eliminated as these conditions that affect other testing methods have no effect on the TIP results. This will eliminate unnecessary time delays and reduce cost overrun risks. By sending data in real-time to the cloud, on-site testing costs are eliminated.

Quality:

Defects in any foundation are generally unacceptable, and potentially result in total foundation failure. TIP is currently the only method that evaluates the entire cross section of the foundation element. The concrete cover outside the reinforcing cage and the eccentricity of the cage are evaluated. TIP is not susceptible to false positive issues that plague other methods. Most other methods often rely on testing only a random percentage of foundation elements. The relatively inexpensive cost to

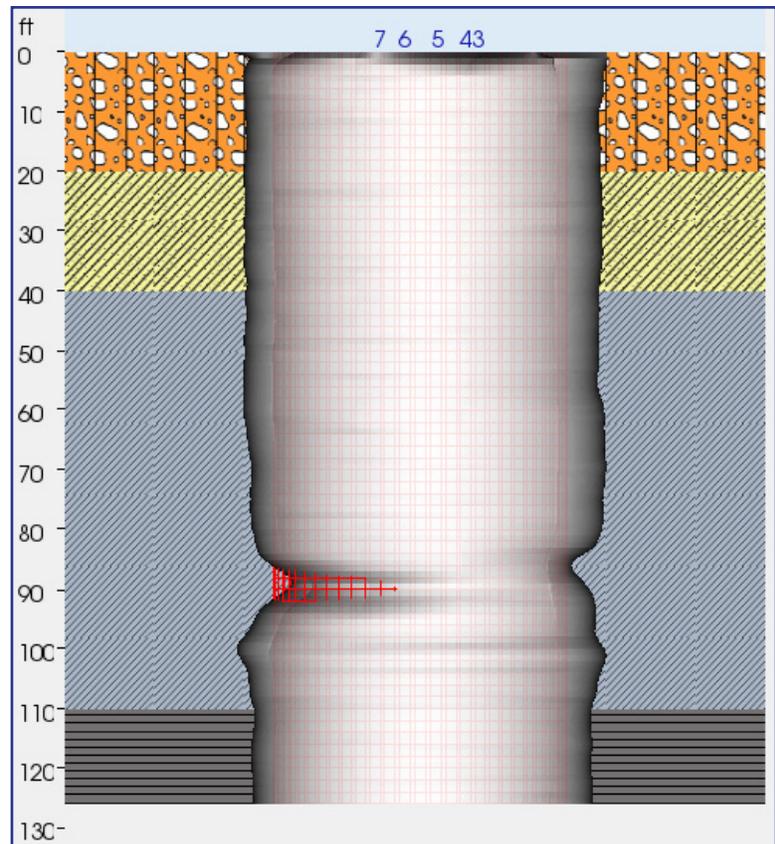
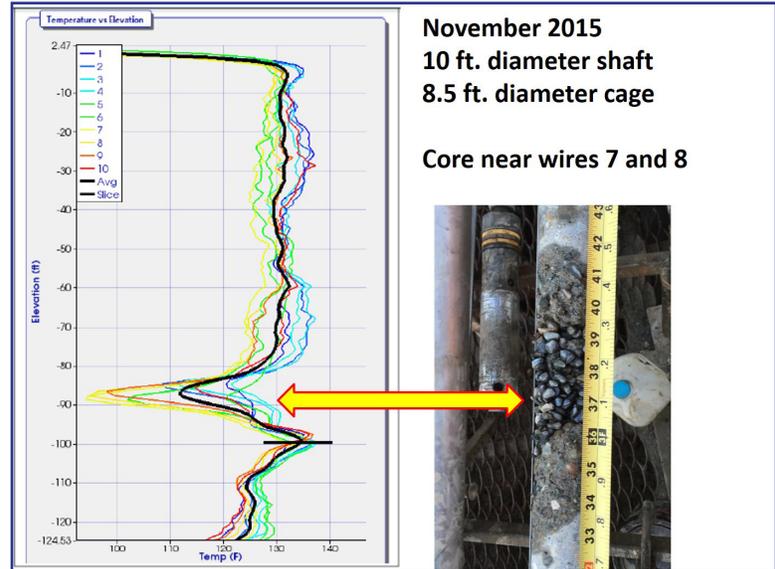
install Thermal Wire® cables and minimal cost of reviewing TIP data stored in the cloud allows all instrumented foundation elements to be evaluated. If integrity issues are detected, construction procedures can be modified early in the project to eliminate the need of expensive remediation in subsequently installed foundation elements.

Safety:

Minimizing safety risks is imperative to a successful project. TIP testing can minimize safety risk for spliced cage sections by the use of quick splice TIP cable connectors done outside the reinforcing cage. Other quality control methods require splicing access tubes within the reinforcing cage. This method often requires site personnel to work with their hands and arms inside the reinforcing cage for extended periods of time, increasing the possibility for injury. TIP data is sent from the jobsite via the cloud to the testing engineer at a remote location, thus removing testing personnel from working near open excavations, eliminating the risk of potential injury.

Foundation Performance Over Time:

Significant quality issues during the foundation installation can lead to project delays, expensive remediation including replacement shafts, and foundation failure. Foundations installed with issues that are not detected can lead to very expensive repair costs and potentially catastrophic failure to the superstructure, including loss of life. Serviceability of drilled foundations is dependent upon no integrity issues, proper long-term concrete strength, and proper concrete cover to provide the needed protection for the reinforcing cage from caustic soil conditions. TIP technology is the only method that can evaluate the concrete cover to assess whether the as-built shaft meets the design intent.



Pile Dynamics, Inc. (PDI) is the world leader in developing, manufacturing and supplying state of the art QA/QC products and systems for the deep foundations industry. The company is headquartered in Cleveland, Ohio, USA, with offices and representatives worldwide. For additional information visit us at www.pile.com or contact info@pile.com.