

Thermal Integrity Profiling



Abe Construction Services, Inc. offers Thermal Integrity Profiling (TIP) for deep foundation testing. TIP can be used for a number of different foundation types including Cast-In-Depth Holes (CIDH), Auger-Cast piles, Drilled Displacement piles, Slurry Walls, Barrettes, and Jet Grouted Columns.

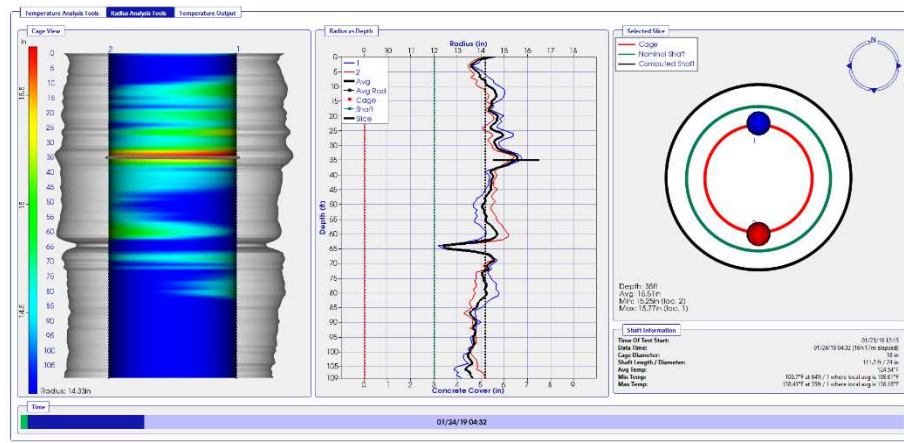
What is Thermal Integrity Profiling?

Thermal Integrity Profiling (TIP) is an innovative method of combining thermal data with known concrete volumes to analyze a pile's integrity. TIP utilizes the idea that curing concrete emits a large amount of heat, and that the temperatures generated should remain relatively constant throughout the concrete structure. Sensors are imbedded in the pile to record average temperatures during the curing process. This collected data is compared with the actual concrete volume poured to calculate the diameter of the pile and the cover of the reinforcing cage. An examination of the TIP results could show areas that are colder than average, indicating a neck or inclusion, or poor concrete quality, while warmer than average areas indicate a bulge in the pile.

Thermal Integrity Profiling (TIP) is performed in accordance with ASTM D7949

Benefits of TIP

TIP offers a number of benefits over other pile testing methods. TIP data can usually be analyzed 12 to 24 hours after a pile is poured, a much shorter time than is typically required before Cross-hole Sonic Logging (CSL). Another advantage is that the personnel time required on site for the collection of the data is much less than other types of testing. The installation process of the Thermal Sensor Cables is similar to that of the metal or PVC tubes needed for CSL or GGL testing, however the collection of the data after the concrete has set only takes a matter of minutes. The TIP cables also do not need to be grouted after testing, unlike PVC and metal tubes.



TIP Analysis Results

Thermal Integrity Profiling

Procedure

The TIP procedure is composed of a few simple steps to ensure that all relevant data is collected. The first step is attaching the Thermal Sensor Cables to the pile cage before it is placed in the holes. Common practice for TIP cable placement for CIDH piles calls for one cable per foot of pile diameter spaced evenly around the inside of the cage. For small diameter auger-Cast and Drilled Displacement piles a single cable can be attached to the center bar of the pile. Each cable has thermocouple sensors spaced at one-foot increments along its entire length.



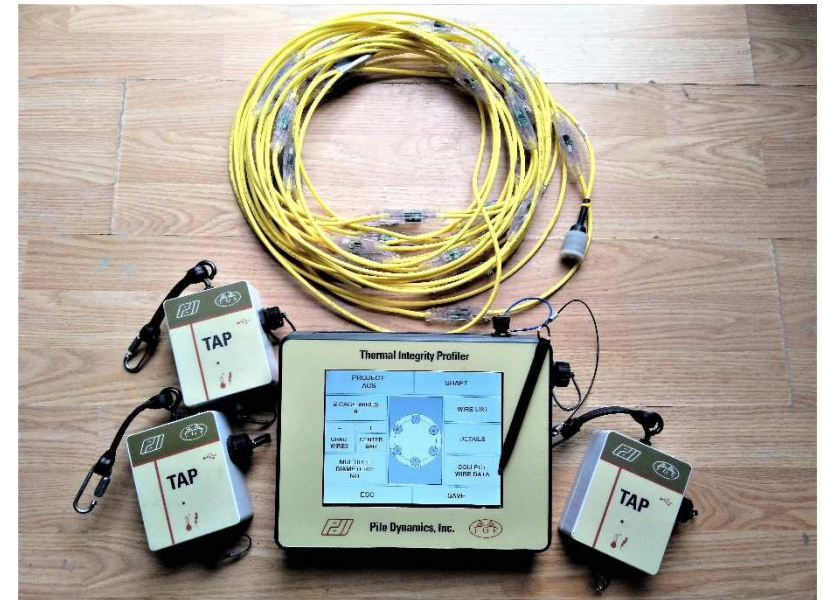
Thermal Sensor Cable attached to rebar

Data collected by the sensor cables is recorded by Thermal Acquisition Ports (TAP) which are attached to the end of each cable. TAPs are normally attached after pouring is finished and recording starts immediately. The TAPs can also be attached before the pouring starts to gain additional information during the pour. After the data is recorded, it is downloaded from the ports to be utilized for data analysis.

The analysis of the TIP results involves relation of the thermal data to the actual volume of concrete poured for the pile. This comparison can output plots of pile radius vs depth as well as pile cross sections in order to help accurately pinpoint the location of anomalies or voids.

Logging and Rentals

ACS offers a number of different options for renting and purchasing of the equipment necessary for TIP. Sensor cables can be purchased either through ACS, or directly from the manufacturer, and ACS will be on-site to explain their installation and maintenance. For the recording of the data, clients can choose to have ACS personnel on site to attach the TAPs for each pile and to personally collect the data. Clients can also decide to attach the TAPs and forward the data themselves to ACS for analysis. Whatever the choice, ACS personnel are trained and certified to perform Thermal Integrity Profiling analysis.



TIP Equipment