Radius Dilworth Overlook in Charlotte, NC

Challenge:

The Radius Dilworth Overlook is an apartment complex in Dilworth, a Charlotte neighborhood, that broke ground in May 2022. With construction to be completed by late 2024, the complex will house 352 apartment units and contain 26 floors. The complex will be the tallest building in Dilworth to date. GRL Engineers were brought onto the project to perform integrity testing for 14 production piles, equating to 10 percent of the project's drilled shafts.

Method:

Thermal Integrity Profiling (TIP) testing was performed by means of Thermal Wire® cables and Thermal Acquisition Ports (TAPs). The TIP system measures concrete temperatures during curing using cables embedded in the concrete.

The Thermal Wire cables consist of temperature sensors spaced every 12 inches along the length of a cable. The project's drilled excavations ranged from large (72-inch diameters) to small (34-inch diameters). Three to six Thermal Wire cables were secured along the entire length of each shaft's rebar cage. The drilled shaft length varied from 10.2 ft – 43.7 ft. After the concrete placement was complete, one TAG and two to five TAP-Edge data loggers were attached to the Thermal Wires, and data acquisition began. The TIP system collected temperature readings every 15 minutes during concrete curing. The data was pushed to the Cloud throughout the testing sequence. Once the concrete reached peak temperature, the data was downloaded and assessed by the engineer for further analysis.

Results:

Based on the thermal results and Effective Average Radius, the production shafts were categorized as "Satisfactory", meaning 0-6% Effective Diameter Reduction and Cover Criteria were met. One drilled shaft revealed an anomaly and required additional analysis. A concrete volume of 20.5 cubic yards was used to model the shaft using TIP-Reporter software (**Figure 1.**). This equates to approximately 150.25% of the theoretical volume. Thermal results indicated the Effective Average Radius was generally larger than the planned diameter of 36-inches over the upper 32 feet of the shaft. From a depth of 18.8 to 29.8 feet, a significant bulge was indicated as higher than average temperatures were recorded. From approximately 32 to 37 feet the TIP model indicates the Effective Average Radius is generally at the nominal radius. However, below 37 feet, a reduction in the Effective Average Radius below nominal is indicated. All cable locations recorded lower than average temperatures in this region.

After further review, it was evident that there was minimal temperature generation from placement to peak temperature by the concrete near the shaft base. While other areas in the shaft experienced increases on the order of 45 degrees or more, the bottom of the shaft experienced temperature increases of 16.5 degrees or less. Based on the thermal results and the Effective Average Radius component of the criteria noted above, this shaft categorizes as

Project Details

Client: Keller North America

Owner: Spandrel Development Partners

Location: Charlotte, NC

GRL Office: North Carolina

GRL Services

- Thermal Integrity Profiling (TIP)

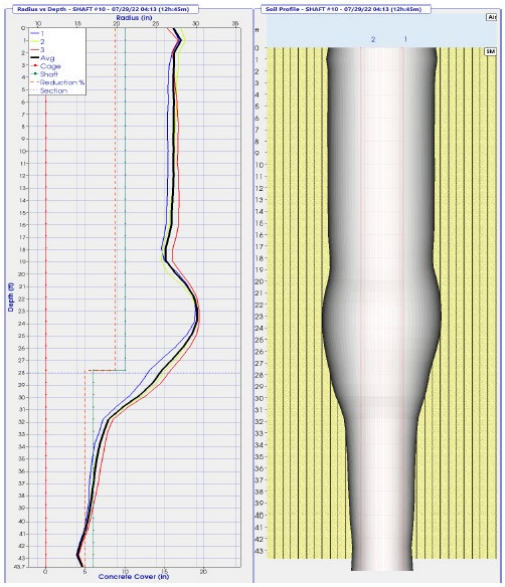

Figure 1: 3D Profile of Drilled Shaft with Anomaly

Anomaly (A) as the Effective Average Radius exceeds a 6% reduction near the shaft base. With exception to the shaft base, no other significant local reductions in temperature indicative of major anomalies were observed. Utilizing thermal integrity profiling allowed for quick identification of an anomaly in the concrete, which allowed the contractor affordable remediation, without incurring costly corrections.

Upon further inspection, it was discovered that the anomaly discovered by TIP was due to the cement being washed out, leaving only aggregate at the base of the shaft. To remediate this issue, micropiles were installed through the shaft, past the shaft bottom and into the underlying rock.

To learn more about GRL Engineers, visit www.grlengineers.com or email us at info@grlengineers.com.