Replacement Bridge Over Harbor River

Beaufort County, South Carolina

Lowering rebar cage into shaft for Bi-Directional Static Load Testing

Project Information
Owner: South Carolina Department of Transportation
Client: United Infrastructure Group, Inc.
Project Name: US-21 (Sea Island Parkway) Replacement Bridge over Harbor River
Testing Completion Date: March 21, 2019

GRL Services Provided
▪ Bi-Directional Static Load Testing (BDSLT) ▪ Shaft Base Cleanliness Evaluation (SQUID) ▪ Drilled Shaft Profile and Verticality Evaluation (SHAPE) ▪ Thermal Integrity Profiling (TIP)
GRL OFFICE: Central

Proposed in 2014, the Harbor Bridge replacement project has begun construction with quality assurance testing. The known vacation destination, Harbor Island, is accessed through this drawbridge, located on US-21 in South Carolina. This sea island was originally hunting land that had little need for incoming and outgoing traffic, which was sufficient for the bridge's original capacity. Now that the narrow lanes present potential hazards to drivers, the county of Beaufort decided to take action and proposed a new design. The new bridge will consist of 12-foot-wide lanes with 10-foot-wide shoulders, and will reach heights of 65 feet, allowing clearance for shrimp boats and fishing charters without disrupting traffic.

The testing was performed on a sacrificial test shaft as was required by the South Carolina Department of Transportation. GRL used the Shaft Area Profile Evaluator (SHAPE) in the slurry-filled hole for verticality and profile analyses. With a visual representation of the shaft, they were able to assess an offset verticality of 0.22 ft. An evaluation of shaft base cleanliness was performed with the Shaft Quantitative Inspection Device (SQUID). Using penetrometers with embedded strain gages and displacements plates, the resulting force and penetration distance into the bearing material formed a resistance vs displacement plot for real-time quantitative assessment of the debris thickness at the shaft base. The average debris thickness prior to concrete placement was approximately 0.20 inches.

To assess concrete quality and concrete shaft geometry along the instrumented length of the shaft, the engineers performed Thermal Integrity Profiling using Thermal Wire® cables. Eight cables were attached along the reinforcing cage during testing. Prior to concrete placement, the TAP-Edge and TAG (Thermal Acquisition Port data loggers) were connected to the Thermal Wires for on-site data collection in the Cloud. An automatic reading was taken every 15 minutes and sent to the cloud for remote analysis. Based on the thermal results, the Effective Average Radius was generally consistent with the reported as-built shaft diameter of 96.75 inches from the top of the shaft to a depth of 62.88 feet and 94 inches from 62.88 to the bottom of the shaft.

On March 21st, 8 days after the shaft construction, GRL Engineers used Bi-Directional Static Load Testing to evaluate load bearing and capacity. The Bi-Directional Static Load Test was conducted using a jack assembly containing three 1,500-kip GRL-Cells. An equivalent top loading ("ETL") curve was constructed using the load-transfer method. This method indicated that the equivalent maximum top load would be 7,863 kips.

With the bearing and load capacity determined by this test pile, the project's engineers will be able to make informed decisions based on quantitative data gathered by GRL Engineers. The new bridge is predicted to be completed by the end of 2021.

For additional information, please contact: info@grlengineers.com
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