

Model 175 Helical and Helicast™ Piles

Project: TMH Cooling Tower Addition

Location: Tallahassee, FL

Date: March 2017

Challenge:

A \$400 million building expansion at the Tallahassee Memorial Healthcare facility included the installation of a new cooling tower on the roof of the existing utility building. The new cooling tower required six column pads located within the existing plant with column design compression and tension loads ranging from 216 to 432 kips and 136 to 272 kips, respectively. The pipe network and machinery of the existing plant limited both the overhead and lateral clearance for construction equipment. The geotechnical information from a boring located outside the building footprint generally showed medium dense clayey sand to a depth of about 38 feet underlain by loose to medium dense sandy silt to a depth of about 70 feet where a very dense clayey silt was observed. A shallow footing design was not feasible given the high column tension/compression loading and lack of space for spread footings.

Solution:

A helical pile deep foundation system was considered as the optimal solution given the ability to install high capacity piles in limited access areas. Based on the soil information, HA175 Helicast piles with 8"-10"-12" helical plates and a 7-inch diameter grout column were proposed. A special drive head frame was used to install the piles due to the limited clearance. Installation of the first three Helicast piles showed shallower than expected refusal with loss of torque due to spin off. In order to determine if additional plate area would help advance the pile to the deeper soils, a Helicast pile with an 8"-10"-12"-14" plate configuration was installed with similar results. Consideration was then given to using ungrouted HA175 piles. To verify the capacity of the previously installed Helicast piles and the proposed HA175 ungrouted pile design, two sacrificial test piles were installed; a HA175 Helicast pile with an 8"-10"-12" lead section and 7-inch grout column and a HA175 ungrouted pile with an 8"-10"-12"-14"-14" lead section. The HA175 Helicast pile refused due to spin off at a depth of 23 feet and the HA175 ungrouted pile was installed to a total depth of 15 feet to the maximum shaft torsional rating. The results of the compression load testing showed that both pile types met the 50 kip working load failure criteria with a factor of safety of 2.

The highly variable soil conditions resulted in multiple plate configuration requirements for the HA175 piles and termination depths ranging from 13 to 84 feet prior to achieving the maximum shaft torsional rating. Slight battering of some piles was required to ensure a three diameter separation of bearing plates between piles at the bearing depth. After completion of the load testing, the remaining piles were installed in less than 1 month.

Project Summary

Structural Engineer: McVeigh & Mangum Engineering, Inc.

Geotechnical Engineer: Ardaman & Associates, Inc. | Alpha Geotechnical & Testing Services, Inc.

General Contractor: Brasfield & Gorrie

Pile Installer: Alpha Foundations

Products Installed: (4) Supportworks® Model HA175 Helicast™ Piles with 7-inch grout column, 8"-10"-12" or 8"-10"-12"-14" Lead Sections, Installed Lengths of 20 to 25 feet; (34) Supportworks Model HA175 Piles with 8"-10"-12", 8"-10"-12"-14"-14" or 8"-10"-12"-14"-14"-14"-14"-14" Lead Sections, Installed Lengths of 13 to 84 feet; Design Working Compression and Tension Loads of 50 kips and 34 kips, respectively.



Interior work area showing access difficulties



Custom drive head frame



Compression load test setup



One of six pile cap excavations with HA175 helical piles installed