

Helicast™ Piles

Project: Collins Hall Spectrograph

Location: Tallahassee, FL

Date: August 2016

Challenge:

The Florida State University Physics Department planned to install a spectrograph in the basement of Collins Hall, which was constructed in 1959. The spectrograph design included a 16-foot diameter by 2-foot thick concrete mat foundation, a center support pedestal, and equipment that rotates about the center pedestal. The equipment weighs 80 kips and would be supported partially at the center and partially on pairs of bearing pads on opposing sides of the circular foundation. A maximum allowable vertical deflection tolerance of 1/32 inch was specified between loaded and unloaded conditions at any given location.

The basement of Collins Hall is approximately 53 feet by 57 feet in plan dimension with a 6-inch thick, post-tensioned concrete slab-on-grade. Overhead clearance is about 15 feet. The spectrograph foundation would be constructed on top of the concrete floor slab. Additional support of the foundation was required to limit deflections to tolerable levels at the bearing pad locations; however, the reinforcement within the slab could not be compromised. The slab reinforcement was determined to be on 14-inch centers, which dictated where cuts in the floor could be made. The soil profile to a depth of about 30 feet below the basement slab generally consisted of medium dense clayey sand and sandy silt.

Solution:

Grouted helical piles were considered given the stringent deflection criteria and the limited overhead clearance. Compression load tests were performed on two Supportworks Helicast™ piles; an HA150 (1.5-inch solid square) central steel shaft with an 8"-10" lead section and 6-inch grout column, and an HA175 (1.75-inch solid square) shaft with a 10"-12" lead section and 7-inch grout column.

The HA175 Helicast configuration was selected for the final pile design after passing the deflection criteria of 1/32 inch at the 15 kip service load. A pile spring constant was determined, which also took into consideration pile group effects due to the proposed close spacings. A minimum termination torque of 5,100 ft-lb and a pile tip depth of at least 20 feet was required for verification of pile capacity during installation. Thirty-two (32) Helicast piles were installed through the cored slab locations, meeting or exceeding both the torque and depth criteria. The pile grout mixture was sampled during placement and then tested in a laboratory to verify the minimum design compressive strength of 6,000 psi at 28 days. Brackets were placed at the tops of the piles to be embedded into the concrete foundation. The Helicast pile installation was completed in five days.



Helicast pile load test



Portable installation equipment with crowd assist rig



New construction pile caps in place

Project Summary

Structural Engineer: EMO Architects

Geotechnical Engineer: Ardaman and Associates, Inc.

General Contractor: Albritton Williams, Inc.

Pile Installer: Alpha Foundation Specialists

Products Installed: (32) Supportworks® Model HA175 Helicast™ Piles with 7-inch grout column, 10"-12" Lead Section, Installed Lengths of 20 to 25 feet, Design Working Compression Load of 15 kips



Completed Helicast piles to be embedded within the concrete foundation