

Model 350 Helical Piles

Project: Equipment Foundations

Location: Auburn, WA

Challenge:

An aircraft component manufacturer in Washington planned to install two new pieces of heavy equipment in an existing 24,000 square foot building. Each piece of equipment would be supported on a mat foundation five feet thick and having approximate plan dimensions of 15 feet by 20 feet. The one test boring, completed from the top of floor slab elevation, sampled very soft to soft silt to a depth of about 20 feet over medium dense silty sand to the bottom of the boring at 34 feet. SPT blow count values within the sand were 10, 18 and 25 blows per foot, increasing with depth from 24 to 34 feet. Groundwater was noted at a depth of 7.5 feet.

A mat foundation supported on grade would exert a bearing pressure of 1,400 pounds per square foot to the weak foundation soils, resulting in estimated settlements on the order of four to eight inches. The equipment and mat foundation would therefore have to be supported on piles to transfer the load to more competent soils. Equipment access, low overhead and limited working space conditions were considered in the evaluation of pile options.

Solution:

Helical piles were ultimately selected to support the equipment foundations/pile caps. Helical piles could be installed with smaller equipment in the low overhead and limited access conditions, helical pile installation would not create spoils, low mobilization costs made helical piles a cost-effective solution compared to other deep foundation alternatives, and each phase of pile installation (12 piles per pile cap) could be completed in one day.

Each of the two pile cap designs included 12 Model 350 (3.5-inch OD by 0.340-inch wall) round shaft helical piles with 8"-10"-12" triple-helix lead sections. The general contractor saw-cut through the existing slab and excavated to the bottom of pile cap elevation before TerraFirma's crew arrived. The piles were installed to torque values of at least 11,500 ft-lbs to provide torque-correlated ultimate pile capacities of at least 80 kips (FOS=2). Pile depths for the two phases of work ranged from 28 to 32 feet below bottom of pile cap elevation (33 to 37 feet below top of floor slab elevation). The two phases of pile installation were completed approximately two weeks apart.



Advancing helical piles



Limited access and working space within existing building



Twelve helical piles installed for each pile cap

Project Summary

Design Engineer: Alkai Consulting, LLC

General Contractor: Delta Industrial

Certified Pile Installer: TerraFirma Foundation Systems

Products Installed: (24) Supportworks® Model 350 Helical Piles, 8"-10"-12" Lead Section, Installed Depths of 33 to 37 feet Below Top of Floor Slab Elevation, Design Working Load of 40 kips



One of the two foundations near completion