

New Construction Helical Piles

Project: Sankey Residence
Location: Pelican Lake, WI
Date: September 2011

Challenge:

The owners eventually planned to build a future retirement home on the property. However, discussions about potential changes to area zoning laws prompted them to start construction immediately. An existing cottage was first removed in order to start construction of the proposed 4,200 square foot home. The soil profile in this area was known to include soils that were dredged from the bay adjacent to the property. Three soil borings were completed to depths of 10, 25 and 34 feet. The geotechnical investigation identified soft clayey silts with trace organics to depths of 21 to 27 feet over medium dense gravelly sand to the bottoms of the borings. Groundwater was encountered at depths of 2 to 3.5 feet. Settlement of the home was a concern given the soft clayey silts and organics in the upper part of the profile.

Solution:

The design team recommended helical piles to penetrate the soft silts and organics to bear within the medium dense sand. Helical piles were an ideal deep foundation option for this site given the limited access and the ability to install the piles with smaller equipment, resulting in less anticipated disturbance of the soft surficial soils. The geotechnical engineer contacted Foundation Supportworks® of Wisconsin (FSW) to estimate pile capacities so the structural engineer could develop a pile location plan. Potential pile buckling was considered due to the presence of the soft soils. With buckling considered, the allowable capacities of the Model 288 (2.875-inch OD by 0.276-inch wall) and Model 349 (3.5-inch OD by 0.300-inch wall) round shaft helical piles were limited to 18 kips and 32 kips, respectively, while maintaining a factor of safety of two. The foundation design included 14 Model 288 and 26 Model 349 helical piles to support the design working loads ranging from 6.7 kips to 32 kips. The Model 288 piles included 10"-12"-14" triple-helix lead sections and the Model 349 piles included 10"-12"-14" triple helix leads followed by a single 14" plate on the first extension. The 40 piles were advanced to depths of 27 to 40 feet below the pre-construction ground surface and to torque-correlated ultimate capacities greater than twice the design working loads. Due to the high groundwater levels, the tops of the piles were set one to two feet below pre-construction ground surface elevations. The 40 piles were installed in less than three days. After the foundation walls were poured, up to 2.5 feet of fill was placed around the footprint of the home to provide frost protection. The design of the home included a crawl space throughout, so no fill was placed inside the foundation walls.

Project Summary

Structural Engineer: General Engineering Company
Geotechnical Engineer: American Engineering Testing, Inc.
General Contractor: Central Wisconsin Builders, Inc.
Certified Pile Installer: Foundation Supportworks® of Wisconsin
Products Installed: (14) Foundation Supportworks® Model 288 Helical Piles, 10"-12"-14" Lead Section; (26) Foundation Supportworks® Model 349 Helical Piles, 10"-12"-14" Lead Section Followed by Single 14" Extension; Piles Installed to Depths of 27 to 40 feet, Design Working Loads Ranging from 6.7 kips to 32 kips



Soils on property included dredged material from bay



Advancing lead section of 3.5-inch O.D. pile



Piles advanced to refusal in the deep gravelly sand



Piles cut to design elevation and new construction brackets tack-welded in place



Completed piles and brackets