

Models 150 and 175 Helical Tiebacks

Project: Private Boat Harbor
Location: Naples, FL
Date: December 2014

Challenge:

A 216-foot-long by 60-foot-wide, L-shaped inlet waterway was planned at the site of a bayside residence. The proposed dredging would allow water from the adjacent bay to flow along the north side of the property to wrap around the front of the home and create a 42-by-65-foot boat harbor. The private waterway would also be bound to the north by an existing parking garage complex.

Prior to constructing the waterway, the residence was built and the dense vegetation between the home and the parking complex was removed. Composite sheet pile walls were proposed for the waterway's perimeter. The sheet piles would need to be driven approximately 20 feet below grade and the walls anchored at the tops to allow for up to 12 feet of dredging. The wall anchor system would also have to avoid the auger-cast deep foundations of the newly-built home as well as the existing foundations/utilities of the parking garage.

A geotechnical investigation conducted for the proposed residence identified loose to medium dense sand to approximately 12 feet over very loose to loose sand and organics to a depth of 32 feet. Five feet of medium dense to dense sand was observed to the bottom of the test boring at 37 feet. The groundwater table was encountered at a depth of 2.5 feet below grade at the boring location, corresponding with the water level of the bay.

Solution:

Helical tiebacks were chosen as the ideal solution to support the sheet pile walls. The tieback system design included 79 helical tiebacks to be advanced from the tops of the installed sheet pile walls at a 30 degree angle (from horizontal) with typical spacing from six to ten feet to avoid known obstructions. Both the anchor heads and the tops of the sheet pile walls would be encased within two-foot-wide by two-foot-deep concrete seawall caps. Thirty (30) Model 150 (1.5-inch round corner square bar) and forty-nine (49) Model 175 (1.75-inch round corner square bar) tiebacks, both with an 8"-10"-12"-14" helix plate configuration, were installed to support design working tension loads from 13 kips to 50 kips. The tiebacks were advanced to lengths from 44 to 94 feet beyond the sheet pile walls to achieve torque-correlated ultimate capacities of at least twice the design working tension loads ($FOS \geq 2$). All of the tieback components were hot-dip galvanized for corrosion protection.

Project Summary

Structural Engineer: Humiston & Moore Engineers
Geotechnical Engineer: Forge Engineering, Inc.
General Contractor: Kelly Brothers, Inc.
Certified Tieback Installer: N Square, Inc.
Products Installed: (30) Foundation Supportworks (FSI) HA150 Helical Tiebacks and (49) FSI HA175 Helical Tiebacks, 8"-10"-12"-14" Helix Plate Configuration, Design Working Tension Loads from 13 to 50 kips, Tieback Lengths from 44 to 94 feet



Sheet pile wall installed behind parking garage



Advancing tiebacks from top of sheet pile wall



Tieback installed, ready to be cut and fitted with standard new construction bracket



Seawall caps poured and inlet dredged