

Model 150 Helical Tiebacks

Project: Historic Home Tiebacks

Location: Davenport, IA

Challenge:

A historic home built in the early 1900s was experiencing both lateral and vertical movement as an adjacent 17-foot tall sheet pile retaining wall continued to lean down slope. The 75-foot long retaining wall, constructed in the 1950s, is approximately eight feet from the home and roughly parallel to the rear foundation wall. The top of the retaining wall deflected seven inches over the past two years and had to be stabilized to prevent further movement of the home. The local historic society provided grant money to help fund the wall stabilization project. Access to the back face of the sheet pile wall was limited due to existing trees and the steep slope, so a temporary earth embankment was constructed to provide a working surface for equipment and personnel. Soil borings completed between the retaining wall and the home identified clay fill with trace amounts of brick and stone to depths up to 10 feet. The fill was underlain by stiff to very stiff native lean clay (glacial till) to a depth of 24 feet, over medium dense to dense sandy silt to silty sand to the maximum depths explored of 30 feet.

Solution:

Helical tiebacks were selected to stabilize the sheet pile wall, with an original design including three rows of tiebacks with a design working tension load of 21 kips each. A crane lowered a mini-excavator onto the temporary working surface and openings were torch-cut in the sheet pile wall at each anchor location. As the first tieback of the upper row was advanced, an obstruction was encountered at a length of approximately eight feet from the wall. The soils were excavated between the home and the retaining wall, exposing unexpected concrete underpinning beneath the existing foundation. This discovery prompted a redesign of the project, including eliminating one row of tiebacks, decreasing the tieback spacing, and coring holes through the existing concrete underpinning to allow for the installation of the tiebacks. The final tieback design included twenty-four Model 150 (1.5-inch round corner square bar) helical tiebacks with 12"-14" helix plate configurations. The tiebacks were generally positioned in rows six feet and 13 feet below the top of the sheet pile wall, spaced approximately five to six feet apart, and installed at a downward angle of 20 degrees. The tiebacks were advanced to lengths of 12 feet (bottom row) to 35 feet (top row) behind the wall and to installation torque values correlating to ultimate capacities of at least two times the design working load of 21 kips ($FOS \geq 2$). Pieces of the sheetpile wall cut out to allow tieback installation were modified to fit over the tiebacks and then welded back in place. A waler system consisting of two C6x13 steel channels was installed to distribute the tieback forces evenly across the sheetpile wall. The tiebacks were pre-tensioned to the design working load with a calibrated hollow-core hydraulic cylinder. Despite the challenging working conditions and unforeseen obstructions, the tiebacks were installed and the sheet pile wall stabilized in nine days.

Project Summary

Structural Engineer: Missman Stanley and Associates

Geotechnical Engineer: American Testing and Engineering Corp.

Tieback Installer: MidAmerica Basement Systems

Products Installed: (24) Supportworks® Model 150 Helical Tiebacks, 12"-14" Helix Plate Configuration, Installed to Lengths of 12 to 35 feet, Design Working Load of 21 kips



Lowering mini-excavator onto working surface below wall



Maneuvering for tieback installation



Tiebacks advanced through core holes of concrete underpinning



Waler detail



Tieback and waler installation complete