

Helical Tiebacks and Helical Piles

Project: Palmer College Elevator Addition

Location: Davenport, IA

Challenge:

Palmer College of Chiropractic planned an elevator addition to the outside of an existing building near the location where two "wings" of the building meet. The 12-foot by 17-foot foundation for the proposed elevator would be 18 feet deep and approximately seven feet away from the adjacent building. A permanent steel sheet pile wall would be constructed between the existing building and the proposed elevator to allow for the excavation and prevent undermining of the existing foundations. Helical tiebacks were proposed to support the top of the sheet pile wall. New construction helical piles were proposed to support the mat foundation of the elevator and a grade beam for a structural slab at the elevator entrance. A geotechnical investigation identified up to six feet of fill, soft to stiff clay to a depth of 11 feet, loose to medium dense silt to a depth of 28.5 feet, and stiff to very stiff lean clay with sand (glacial till) to the explored depth of 45 feet.

Solution:

The sheet pile wall design included three (3) helical tiebacks with a design working tension load of 9 kips each. Openings were torch-cut through the completed sheet pile wall at each tieback location. Model 150 (1.5-inch square bar) helical tiebacks with a 10"-12"-14"-14"-14" helix plate configuration were advanced at a downward angle of 20 degrees from horizontal, to lengths of 30 to 35 feet, and to installation torques of at least 2,700 ft-lb, correlating to ultimate capacities of at least 27 kips ($FOS \geq 3$). A Factor of Safety of at least 3.0 was recommended to reduce creep movements within the marginal bearing soils. A waler system consisting of two MC6x15.1 steel channels was installed and the tiebacks were pre-tensioned to the design working load. The foundation design included nine (9) helical piles to support the mat foundation and one (1) helical pile to support the grade beam for the structural slab. The helical pile configuration consisted of the Model 287 (2.875-inch OD by 0.203-inch wall) hollow round shaft with a 10"-12"-14" triple-helix lead section to support a design working compression load of 15 kips per pile. The piles were advanced to depths ranging from 14 to 21 feet below the excavation (32 to 39 feet below grade) and to ultimate torque-correlated soil capacities of at least twice the design working load ($FOS \geq 2$). The tops of the piles were cut to the specified elevation and fitted with new construction brackets. The installation of the three helical tiebacks and ten helical piles was completed in less than two days.

Project Summary

Structural Engineer: Missman Stanley and Associates

Geotechnical Engineer: American Testing and Engineering, LLC

General Contractor: Estes Construction

Certified Pile Installer: MidAmerica Basement Systems

Products Installed: (3) Model 150 Helical Tiebacks, 10"-12"-14"-14"-14" Helix Plate Configuration, Installed to Lengths of 30 to 35 feet, Design Working Load of 9 kips; (10) Model HP287 Helical Piles, 10"-12"-14" Helix Plate Configuration, Installed to Depths of 32 to 39 feet Below Grade, Design Working Load of 15 kips



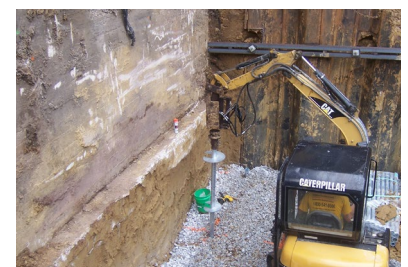
Lowering mini-excavator into excavation



Tieback lead section advanced through sheet pile wall



Tieback and waler installation complete



Pile lead section advanced



Completed pile installation