

Model 288 Helical Piles

Project: Historic Fleming Building Renovation

Location: Des Moines, IA

Date: July 2012

Challenge:

The 11-story Fleming Building in downtown Des Moines was built in 1909. The low-rise building was constructed as a steel rigid frame with a brick and granite façade. Renovation plans were to convert current office space within the building to a mix of commercial and residential units. Retail, office and restaurant space would be provided on the first two floors, while the remaining nine floors would consist of residential apartments. The renovation also included new three-story and 11-story interior stairwells at opposite ends of the building. A geotechnical exploration was not performed due to scheduling and difficulties of access for both truck rigs and hand equipment. Subsurface conditions for the area of downtown Des Moines that includes the Fleming Building are known to consist of relatively weak sand and clay in the upper part of the profile. Deep foundations were then specified to support the loads from the new stairwells. All work would have to be completed from within the basement of the building.

Solution:

Helical piles are a cost-effective deep foundation option that can be installed with small machines or hand held equipment. A design working load of 20 kips per pile was specified with the capacity verified with a full-scale load test. Without a subsurface exploration for the project, a helical test probe consisting of a single 14-inch diameter helix plate on a 1.5-inch square-bar shaft was advanced with hand held equipment in the area of the proposed 11-story stairwell. The installation torque was monitored continuously to back-calculate soil strengths for helical pile design. A Model 288 (2.875-inch O.D. by 0.276-inch wall) round shaft helical pile with a 10"-12" double-helix lead section was then selected for the test pile. With the limited access and limited space within the basement, set-up of a load frame for a full-scale compression test was not practical. Instead, a tension test, requiring only a single reaction beam and wood cribbing, was completed to estimate the pile/soil deformation to load response. Fourteen production piles were installed, eight to support the 11-story stairwell and six to support the three-story stairwell. The test pile and production piles were installed with hand held equipment powered by a remote hydraulic source. The piles were advanced to depths from 30 to 45 feet below the basement floor elevation to achieve torque-correlated ultimate capacities of at least twice the design working load ($FOS \geq 2$). All work, including the tension load test, was completed in just five days.

Project Summary

Structural Engineer: Raker Rhodes Engineering

General Contractor: Nelson Development, LLC

Certified Pile Installer: Foundation Supportworks® of Central Iowa

Products Installed: (14) Foundation Supportworks® Model 288 Helical Piles, 10"-12" Lead Section, Installed to Depths of 30 to 45 feet Below Basement Floor Elevation, Design Working Load of 20 kips



Fleming Building



Proposed stairwell; view up through floor penetrations



Tension test completed in basement



Production piles installed with hand held equipment



Pile installation complete; pile cap being prepared