Supportworks®

COMMERCIAL **CASE STUDY**

Model 288 Helical Piles

Project: Renovation and Seismic Upgrades

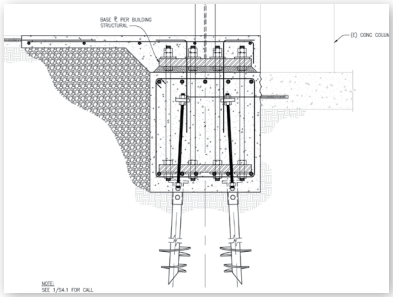
Location: Portland, OR

Challenge

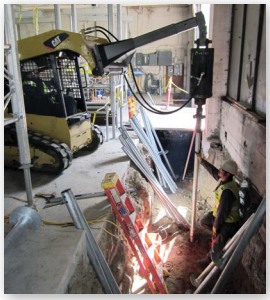
Renovations were planned for a circa 1920s, two-story building in downtown Portland. The project involved adding a third story to the structure as well as seismic upgrades to include new braced frames and moment frames. However, a structural evaluation found that the building was generally constructed with unreinforced concrete and wood framing. In order to complete the proposed renovation, a new three-foot wide, 40-foot long grade beam had to be installed to support three new columns. Deep foundations would be required to resist both compression and tension loading. A geotechnical investigation at the site identified four feet of silt fill underlain by native alluvial soils (sandy silt and silty sand) to the explored depth of 35 feet. Six-inch diameter grouted micropiles with calculated design lengths on the order to 60 feet were originally proposed to resist the design loads.

Solution:

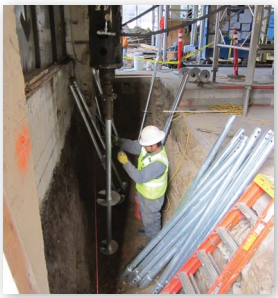
TerraFirma Foundation Systems was contacted to discuss the feasibility of using helical piles in lieu of micropiles. It was determined that helical piles could support the design loads for the project, the piles could be installed inside the building and around the temporary column supports, and product and equipment could be mobilized quickly to keep the project on schedule. The foundation design included twelve (12) Model 288 (2.875-inch OD by 0.276-inch wall) hollow round shaft piles with a 10”-12” double-helix lead section to support design working loads of 27.6 kips in compression and 19.8 kips in tension. Some of the piles would be installed vertically, while others would be installed with an outward batter of three degrees to provide a center to center spacing of at least three times the diameter of the helix plate at the helix plate depths. A tension load test was completed on one of the production piles in general accordance with the procedures of ASTM D3689. Measured pile deflections at design load and two times design load met the specified criteria. The piles were installed to a depth of 32 feet below the bottom of grade beam elevation to exceed the minimum required installation depth. Installation torque was monitored as the piles were advanced and terminated to determine torque-correlated ultimate pile capacities for both tension and compression. Factors of safety based on torque-correlated ultimate capacities were generally higher than 1.5 for compression and 2.0 for tension. Factors of safety extrapolated from the successful load test were even higher. Specialty termination “brackets” were bolted to the tops of the helical piles and cast into the grade beam. The production piles were installed and the load test was completed in less than two days.



Grade beam detail for two battered piles



Installing vertical pile; equipment between temporary supports



Aligning helical pile for installation

Tension test frame and equipment

Rendering of completed project

Project Summary

Architect:	GBD Architects
Structural Engineers:	KPFF Consulting Engineers & SFA Design Group
Geotechnical Engineer:	Geo Design
General Contractor:	Lease Crutcher Lewis
Pile Installer:	TerraFirma Foundation Systems
Products Installed:	(12) Supportworks® Model 288 Helical Piles, 10”-12” Lead Section, Installed to Depths of 32 feet Below Bottom of Grade Beam Elevation, Design Working Loads of 27.6 kips Compression and 19.8 kips Tension