

Model 350 Helical Piles

Project: Light Rail Maintenance Facility
Location: Englewood, CO
Date: September 2010

Challenge:

The RTD Elati Light Rail Maintenance Facility project included the construction of a new rail car wash bay. The 120-foot by 40-foot addition was planned immediately adjacent to the west wall line of the existing building. Two test borings identified sandy clay to clayey sand fill to depths up to 8 feet, stiff lean clay with sand from 8 to 16 feet, medium dense to very dense sand with gravel from 16 to 24 feet, and sandstone bedrock to the bottoms of the test borings at 28 feet. Although the SPT blow count values within the fill indicated relatively stiff/dense conditions, the degree of fill compaction could not be verified. There was also some risk that areas or pockets of loose fill may exist within the footprint of the addition. Even so, the lightly loaded continuous wall footings could be reasonably sized for a relatively low allowable bearing pressure for support within the fill. The proposed 200 to 400 kip column loads, on the other hand, could not practically be supported with a spread footing sized for a similar bearing pressure.

Solution:

Helical piles were selected to support the proposed column loads so the dimensions of the footings (pile caps) could be minimized. Helical piles could also be installed with smaller equipment, which was an advantage for this site given the limited access. The foundation design for the columns included 80 Model 350 (3.5-inch OD by 0.313-inch wall) round shaft helical piles with 10"-12"-14" triple-helix lead sections to support a design working load of 50 kips per pile. The 10-inch diameter helix plate also included a "V-style" cut to allow for easier penetration into dense soils. The helical piles installed adjacent to the existing building included a batter of 5 degrees to further minimize the size of the pile cap. The batter allowed the tops of the piles to be closer together, while also creating the design spacing at the helix plate depth. The piles were advanced to depths ranging from 18 feet to 25 feet for bearing within the medium dense to very dense sand or the sandstone bedrock. Installation torque values of at least 14,300 ft-lbs correlated to ultimate pile capacities of at least 100 kips (FOS=2).



Site for proposed wash bay addition



Helical pile installation adjacent to building



Tops of helical piles cast into pile caps



Limited pile cap dimensions adjacent to building

Project Summary

Architect: RNL
Geotechnical Engineer: Kumar & Associates, Inc.
Structural Engineer: AECOM
General Contractor: White Construction Group
Certified Pile Installer: Complete Basement Systems
Products Installed: (80) Foundation Supportworks™ Model 350 Helical Piles, 10"-12"-14" Lead Section, Installed to Depths Ranging from 18 to 25 feet, 50 kip Design Working Load