

New Construction & Retrofit Helical Piles

Project: Boulder Rural Fire Station
Location: Boulder, CO
Date: December 2010

Challenge:

The Boulder Rural Fire Department planned to renovate an older office building to serve as a fire station. The project included construction of a new stair tower and building addition, as well as remodeling the interior of the existing structure. New foundations were needed to support the addition. The addition and renovation also created new loads on existing grade beams. The existing office building was supported on drilled concrete piers.

Two test borings were completed to depths of 30 and 35 feet. A generalized subsurface profile consisted of three feet of sandy clay fill over 20 to 23 feet of silty, sandy clay over claystone bedrock. The existing fill soils and the deeper sandy clay were determined to be unsuitable to support the new foundation loads. Even though the silty, sandy clay was described as having a relatively low expansive potential, layers of moderately expansive clay soils could exist within this stratum. The silty, sandy clay was also relatively weak near the encountered groundwater depth of six feet.

Solution:

Foundation recommendations in the geotechnical report included drilled concrete piers with helical piles as an alternative foundation type. Helical piles were ultimately selected as the more economical solution due to the high groundwater table and the anticipated need for casing of the drilled concrete piers. Three new construction helical piles and five retrofit helical piles were proposed to support design working loads ranging from 15 to 25 kips. The five retrofit piles would support new loads on the existing grade beam and drilled pier foundation system. The uppermost helix plate along the pile shaft was specified at a depth of at least 20 feet. The new construction and retrofit helical piles consisted of the Model 288 (2.875" OD by 0.276" wall) hollow round shaft with 10"-12" double-helix lead sections. The piles were installed to depths of 25 feet and to torque values correlating to ultimate pile capacities of at least twice the design working loads (FOS ≥ 2). The retrofit bracket assemblies included external sleeves around the pile shaft to resist the bending forces generated by the side-load condition. The eight helical piles were installed in one day despite snowy conditions, low temperatures (12° F) and dealing with groundwater within excavations.

Project Summary

Architect: OZ Architecture
Structural Engineer: JVA, Inc.
Geotechnical Engineer: Scott, Cox & Associates, Inc.
General Contractor: GH Phipps Construction Companies
Certified Pile Installer: Complete Basement Systems
Products Installed: (8) Foundation Supportworks® Model 288 Helical Piles (Three New Construction and Five Retrofit), 10"-12" Lead Section, Installed to Depths of 25 feet, Design Working Loads of 15 to 25 kips



Excavation made for retrofit helical piles



Aligning the drive head with the pile for installation



Advancing helical pile



Setting cap plate on the retrofit bracket assembly



Makeshift sump to keep water levels down