FOUNDATION SUPPORTWORKS®

CASE STUDY

Commercial

Push Piers, Helical Tiebacks, and Helical Soil Nails

Project: Memorial Hospital Addition
Location: Seward, NE
Date: July 2014

Challenge:

An addition with a basement level was planned for the hospital. The existing exterior foundation walls adjacent to the addition would be underpinned to prevent settlement and the excavations made for the proposed basement would be shored to prevent sloughing of soil from beneath the existing structure. A drilled shaft retaining wall with intermittent helical tiebacks was originally planned; however, due to limited access and a quick turnaround needed to maintain the construction schedule, other retention systems were considered. A geotechnical investigation conducted in the area of the proposed addition identified a soil profile predominately consisting of stiff to very stiff lean clay to a maximum explored depth of 30 feet.

Solution:

Hydraulically driven push piers, helical tiebacks, and helical soil nails were chosen as an alternate underpinning and soil retaining system. The underpinning design included twenty seven (27) Model 288 (2.875-inch O.D. by 0.165-inch wall) hydraulically-driven push piers. The piers were spaced from approximately six to eight feet and advanced to depths ranging from 46 to 72 feet to achieve ultimate pier capacities at least 50 percent higher than the specified design working loads (FOS≥1.5).

Nine (9) helical tiebacks were installed along one section of excavation to laterally support the existing foundation. The helical tiebacks consisted of Model 287 (2.875-inch O.D. by 0.203-inch wall) hollow round shaft with a 10”-12”-14” triple-helix lead section. The helical tiebacks were installed to lengths of at least 12 feet to achieve torque-correlated ultimate capacities of at least twice the design working tension loads (FOS≥2.0). A lateral restraint system was attached to corresponding push pier brackets.

One hundred eighty one (181) Model 150 (1.5-inch round corner square bar) soil nails were installed to retain soil during the basement level construction. The soil nails included six-inch helix plates spaced evenly along the lead section and extensions. The soil nail walls ranged in height from six to 10.5 feet with the soil nails arranged in grid patterns consisting of two to three rows. Vertical spacing ranged from three to 3.5 feet and horizontal spacing ranged from four to six feet. The soil nails were installed at a ten-degree downward angle to approximate lengths from seven to ten feet to achieve torque-correlated ultimate capacities of at least twice the design working loads (FOS≥2.0). Approximately 1,700 square feet of soil nail walls were sprayed with shotcrete. The shotcrete was reinforced with welded wire mesh and vertical and horizontal rebar walers at the nail heads.

Project Summary

Architect/Structural Engineer: Davis Design, Inc.
Geotechnical Engineer: Alfred Benesch & Company
General Contractor: Sampson Construction
Certified Installer: Foundation Supportworks® by Thrasher
Products Installed: (27) FSI PP288 Push Piers, Installed Depths from 46 to 72 feet, Design Working Loads from 20 to 30 kips; (9) FSI HP287 Helical Tiebacks, 10”-12”-14” Lead Section, Installed Lengths of at least 12 feet, Design Working Tension Loads from 5 to 7.5 kips; (181) FSI HS150 Soil Nails, Installed Lengths from 7 to 10 feet, Design Working Tension Loads up to 9.25 kips

Driving Model 288 push pier

Installed push piers with side-load foundation brackets

Partially completed soil nail wall

Helical soil nail head detail

Two-tiered soil nail wall under construction

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