

Helical Soil Nails

Project: Farm Credit Services of America

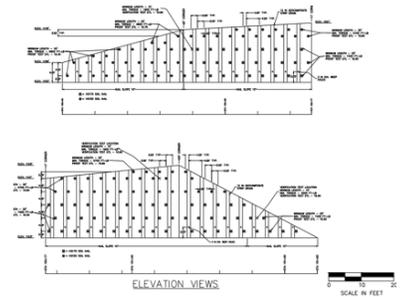
Location: Omaha, NE

Challenge:

A four-story office building was planned directly west of and across the road from the existing Farm Credit Service of America (FCSA) building in Omaha, NE. The new building would be linked to the existing FCSA building via a new skywalk constructed across South 118th Street. The west building would have two lower floors for a parking garage with two floors of office space above. Significant earthwork operations were required to construct the parking garage at the south and southwest areas of the site with maximum vertical excavations of about 25 feet anticipated. The excavations would require a temporary shoring system that would not encroach on the P Street right of way at the southwest corner of the site. Low density cellular concrete was then planned as backfill between the temporary shoring wall face and the parking garage, effectively taking the shoring wall out of service and limiting the earth pressure on the new foundation walls. A geotechnical investigation near the area of proposed shoring showed a soil profile consisting of about 4 to 12 feet of stiff to very stiff lean clay fill underlain by stiff to very stiff residual lean clay.

Solution:

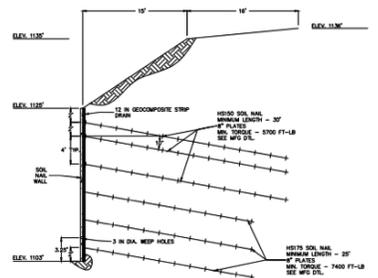
Helical soil nails and a shotcrete wall were selected for the earth retention system at the south and southwest areas of the site based their cost effectiveness and ability to stay away from the P Street right of way. Olsson Associates designed a 160-foot long helical soil nail wall with 6 rows of nails at its tallest point, approximately 22-feet high. At this height, the six rows consisted of three upper rows of Model 150 (1.5-inch square shaft) and three lower rows of Model 175 (1.75-inch square shaft) helical soil nails with 8-inch helix plates spaced evenly along the nail length for both shaft sizes. The wall required a total of 71 Model 150 nails and 81 Model 175 nails. The Model 150 helical soil nails were installed to lengths ranging from 30 to 35 feet and termination torques ranging from 4,780 to 6,470 ft-lb. The Model 175 helical soil nails were installed from 25 to 35-foot lengths and 5,750 to 7,790 ft-lb. Verification testing was performed on three sacrificial soil nails to verify the equivalent design bond pressure and eight proof tests were performed on production nails to verify capacity and creep criteria. Reinforcement and drainage medium were installed prior to shotcreting. The wall reinforcement consisted of continuous 6x6-W1.4xW1.4 welded wire mesh and two horizontal and vertical waler bars of #4 steel rebar. The drainage medium was installed vertically along the soil face of the excavation with connections to weep holes located at the bottom of wall. The shotcrete was placed with a minimum 4-inch thickness and a required minimum concrete compressive strength of 4,000 psi. The soil nail wall was constructed over a period of 12 days. After construction of the building foundations, 3,060 cu. yd. of low density (30 pcf) permeable cellular concrete was placed in 4-foot lifts around the perimeter of the building.



Elevation plan drawing of the helical soil nail locations



Helical soil nail wall in service prior to building construction



SNW SECTION (B-B) NTS

Cross-section view of tallest portion of the helical soil nail wall

Project Summary

Architect: The Clark Enersen Partners

Structural Engineer: Olsson Associates

Geotechnical Engineer: Thiele Geotech

General Contractor: Sampson Construction

Pile/Cellular Concrete Installer: Thrasher Commercial Group

Products Installed: (71) Foundation Supportworks® Model 150 and (81)

Foundation Supportworks® Model 175 Helical Soil Nails;
Installed Lengths of 25 to 35 feet; Final Installation Torques
of 4,780 to 7,790 ft-lb. 3,060 cu. yd. of Cellular Concrete



Cellular concrete placed between office building and soil nail wall