FOUNDATION SUPPORTWORKS

CASE STUDY

Commercial

Helical Piles, Tiebacks and Soil Nails

Project: Cass Lake Clinic Expansion
Location: Cass Lake, MN
Date: September 2014

Challenge:

The Cass Lake Clinic expansion consisted of an approximate 25,400 square foot addition to the existing hospital/clinic building. The project required demolition of an eastern portion of the existing building and construction of the addition adjacent to a combination of existing interior and exterior wall lines. After demolition activities, a 156-foot long wall section required underpinning to facilitate excavation below the existing footings for construction of the basement level of the addition. Portions of the existing footings required new construction piles embedded into concrete grade beams and dowelled into the existing footings to support new column loading from the addition. An earth retention system was required along the entire underpinned wall with retained soil heights varying from about 5.7 to 6.5 feet. The retrofit and new construction piles would resist service loads of 25 and 40 kips, respectively. The geotechnical investigation included four borings advanced to a depth of 20.5 feet and one boring advanced to a depth of 41 feet. The borings indicated a general soil profile consisting of about six to 11 feet of very loose to loose sand fill, medium dense sand to a depth of about 25 feet, dense sand to a depth of about 35 feet, and medium dense sand to the termination of the deepest boring at 41 feet. Groundwater was observed at a depth of 34 feet.

Solution:

The underpinning was accomplished with a combination of retrofit and new construction helical piles. The 28 retrofit piles consisted of the HP288 (2.875-inch OD by 0.276-inch wall) round shaft with an 8”-10”-12” helix plate configuration and a FS288B retrofit bracket with 30-inch external sleeve. The HP288 helical pile capacity was verified with a field compression load test which showed less than 0.16 inch of net pile head movement at the 25 kip service load. The results of the load testing easily met the failure criteria established for the project which allowed no more than of 0.5 inch of net pile head movement at the service load. The installation of the test pile/reaction anchors and performance of the compression load test were completed in one day. The eight new construction helical piles consisted of the HP350 (3.50-inch OD by 0.313-inch wall) round shaft with a 10”-12”-14” helix plate configuration. The HP288 and HP350 helical piles were installed to lengths ranging from 14 to 21 feet and to minimum torque correlated ultimate capacities of at least two times the required service loading (FOS ≥ 2). The 28 retrofit helical piles (HP288) and eight new construction helical piles (HP350) were installed over a period of three days. Following installation of the underpinning system, helical tiebacks were installed for lateral wall support and helical soil nail/shotcrete walls were constructed for earth retention below the underpinned wall sections. The installation of 12 HA150 (1.5-inch solid square bar) helical tiebacks and 70 HS150 helical soil nails, and construction of the shotcrete earth retention system, were completed in four days.

Project Summary

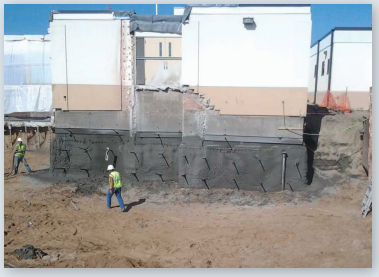
Structural Engineer: EAPC Engineers and Architects
Geotechnical Engineer: Braun Intertec
General Contractor: Nor-Son, Inc.
Certified Installer: Innovative Foundation Supportworks®
Products Installed: (8) FSI HP350 Helical Piles, (28) FSI HP288 Helical Piles, (12) FSI HA150 Helical Tiebacks and (70) FSI HS150 Helical Soil Nails

Compression load test on HP288 helical pile

Installation of HP288 helical pile

Concrete coring for helical tieback locations above new construction/retrofit helical piles

New construction/retrofit helical piles and tiebacks after excavation



Completed shotcrete wall section