FOUNDATION SUPPORTWORKS

CASE STUDY Commercial

Model 350 Helical Piles

Project: Jet Bridge Support - Reagan National Airport
Location: Arlington, VA
Date: May 2012

Challenge:

The Washington National Airport was opened in 1941 and renamed as the Ronald Reagan Washington National Airport in 1998. Renovations to Terminal A included a new jet bridge at Gate 8, a gate utilized by JetBlue Airways. The jet bridge would include a main column next to the terminal building and wheel-mounted column supports toward the end of the bridge. The jet bridge would have the ability to extend and swing radially from the main column, creating relatively high overturning moments on the proposed spread footing. A soil boring completed at the location of the proposed column encountered approximately ten feet of old fill over a layer of native organic soils over lowland terrace deposits consisting of gravel, sand, silt and clay. The shallow fill soils and underlying organics were determined not to be acceptable for direct support of the concrete foundation. With the age of the airport, there was also concern that contaminated soils could be encountered. Any deep foundation option considered for the project had to be installed with minimal vibrations and with smaller equipment to prevent disruption to airport operations. The adjacent gates along Terminal A would remain in service during the jet bridge construction.

Solution:

Helical piles were considered as an ideal deep foundation system for the project. Helical piles do not generate spoils during installation so any contaminated soils would remain in the ground and high treatment and disposal costs of contaminated material (due to pile installation) would be avoided. Helical piles can also be installed with smaller equipment within limited access areas and the installation generates little to no vibration. The original pile cap design included six helical piles to support design working loads per pile of 55 kips in compression and 46 kips in tension. The pile configuration consisted of the Model 350 (3.5-inch OD by 0.313-inch wall) hollow round shaft with a 10”-12”-14” triple-helix lead section and a single 14” helix plate on the first extension. A calibrated electronic torque transducer was utilized for direct measurement of pile installation torque. The piles were installed to torque-correlated ultimate capacities exceeding the design working loads by a factor of safety of at least two. Pile installation depths varied widely from about 22 to 45 feet below the bottom of pile cap elevation (average of 33 feet). Two of the piles refused abruptly within the dense bearing soils, raising some concern about whether the tension capacity was achieved. With the tight construction schedule, the design team decided to install two additional piles in lieu of performing pile load tests. New construction brackets were bolted to the tops of the pile shafts and cast into the concrete foundation.

Jet bridge at adjacent gate

Aligning drive head and pile for installation

Advancing helical pile

Monitoring torque during installation

Pile installation complete

Project Summary

Architect: John N. Bratichak Architects
Structural Engineer: Johnson, Mirmiran & Thompson, Inc.
Geotechnical Engineer: Thomas L. Brown Associates, P.C.
General Contractor: J & J Construction
Certified Pile Installer: JES Construction, Inc.
Products Installed: (8) FSI Model 350 Helical Piles, Triple 10”-12”-14” Lead Section with Single 14” Extension, Installed to an Average Depth of 33 feet, Design Working Loads of 55 kips (Compression) and 46 kips (Tension).