

New Construction & Retrofit Helical Piles

Project: *Alta Vista Charter School*
Location: *Lamar, CO*
Date: *January 2011*

Challenge:

The Alta Vista Charter School is the only charter school in southeast Colorado. The school currently occupies a two-story brick building that was constructed in 1917 and is on the State Historic Register. In 2011, the school planned a “historic” renovation to approximately 6,240 square feet of the existing building as well as construction of a new addition of 18,000 square feet. The geotechnical exploration included six test borings completed to depths ranging from 10 to 25 feet. The four deeper borings of 20 and 25 feet encountered predominately clay soils with sand layers between about 13 and 20 feet. The clay soils in the upper 13 feet of the profile were described as soft to medium stiff with standard penetration test blow count values (N-values) of 2 to 5 blows per foot, the sands were described as loose to dense with N-values of 8 to 36 blows per foot and the deeper clays were described as very stiff to hard with N-values of 24 to 38 blows per foot. Groundwater was encountered at depths of 8 to 11 feet. Laboratory testing on samples of near-surface clay soils found significant consolidation potential with loadings less than 1,000 pounds per square foot. Support of the building on shallow spread footings would therefore pose a higher risk of settlement and potential damage to the structure.

Solution:

Helical piles were selected as the ideal deep foundation support option for this site given the subsurface conditions, groundwater levels, ease of installation and ability to efficiently size the piles for the design working loads ranging from 18.5 to 45 kips. Four different shaft sizes with five different helix plate configurations were utilized. Shaft sizes consisted of the HP288 (2.875” OD by 0.276” wall), HP349 (3.50” OD by 0.300” wall), HP350 (3.50” OD by 0.313” wall) and HP450 (4.50” OD by 0.337” wall). Shaft selection considered bending or buckling of the upper section of the pile shaft within the soft clay soils. Helix plate configurations ranged from a triple-helix 10”-12”-14” to a five plate 10”-12”-14”-14”-14”. Five full scale load tests were completed for the project, one for each pile configuration. One hundred thirty-two (132) new construction helical piles were advanced to depths ranging from about 23 to 30 feet, bearing within the loose to dense sands and the very stiff to hard clay. Certified drive heads and a calibrated in-line torque transducer were used to accurately measure the applied torque. The piles were installed to near the torque ratings of the shafts (over 20,000 ft-lb for the HP450) in order to penetrate further into the bearing strata and ultimately minimize pile deflections under service loads. The torque-rated ultimate pile capacities were therefore more than twice the design working loads for a factor of safety greater than two. Four retrofit HP349 piles were also used to support a section of the existing building foundation.

Project Summary

Architect: *SlaterPaul Architects*
Structural Engineer: *Anderson & Hastings Consultants, Inc.*
Geotechnical Engineer: *CTL Thompson, Inc.*
General Contractor: *JHL Constructors, Inc.*
Certified Pile Installer: *Complete Basement Systems*
Products Installed: *(132) Foundation Supportworks™ Models 288, 349, 350 and 450 New Construction Helical Piles, (4) Model 349 Retrofit Helical Piles, Multi-Helix Plate Configurations, Installed to Depths of 23 to 30 feet, Design Working Loads of 18.5 to 45 kips*



Alta Vista Charter School



Installing test and reaction piles



Helical pile load test



Installing HP450 helical pile



HP450 ten-foot lead section