

Model 450 Helical Piles

Project: Performing Arts Center Addition
Location: Grand Junction, CO
Date: September 2012

Challenge:

A slab-on-grade, steel-framed addition was proposed for the Moss Performing Arts Center at Colorado Mesa University. Previous subsurface explorations completed near the project site identified soft sandy clay soils extending approximately 50 feet below grade. A high water table was also anticipated. A deep foundation system including helical piles was therefore considered to penetrate the saturated, soft sandy clays for bearing within deep competent soils. Design working loads of 60 kips and 30 kips in compression and tension, respectively, were specified for each helical pile. The proposed addition was located between the existing Performing Arts Center and a busy roadway. With the limited working space, material had to be staged off site. Additional safety and traffic control measures were also required. The construction schedule allowed only seven days for mobilization and helical pile installation.

Solution:

The deep foundation system included thirty-one (31) Model 450 (4.5-inch OD by 0.337-inch wall) round shaft helical piles with a 10"-12"-14" triple-helix lead section. All helix plates were ½-inch thick with a V-style leading edge to allow for better penetration into the deep bearing soils. An embedment length within the competent bearing material was specified in order to achieve both the required tension and compression capacities. Piles would be advanced to the specified embedment length and to torque-correlated ultimate capacities of at least twice the design working loads ($FOS \geq 2$). To verify that the piles could achieve the required torque and embedment, two test piles were advanced within the footprint of the proposed structure. A calibrated electronic torque transducer was utilized to monitor pile installation torque directly. The test piles were removed after the depth and torque were achieved and confirmed. A 45,000 ft-lb hydraulic drive head and a John Deere 200D track excavator were used to provide sufficient torque and crowd during installation. Standard ten foot extensions were used to advance the piles to the necessary depths. The tops of the piles were fitted with custom brackets. Various combinations of battered and vertical piles were used at the pile cap locations. To maintain a continuous supply of material during installation, a two-man crew was assigned specifically to deliver product from the staging area to the project site. Installation of the helical piles, including the test piles, was completed in just four days.

Project Summary

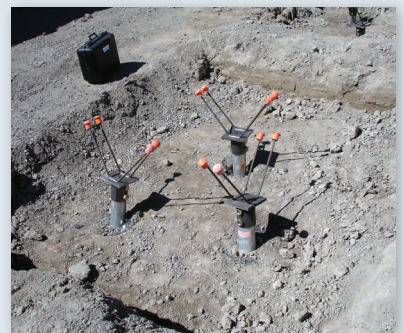
Structural Engineer: Lindauer-Dunn, Inc.
Geotechnical Engineer: Huddleston-Berry Engineering & Testing, LLC
General Contractor: Asset Engineering
Certified Pile Installer: Foundation Repair of Western Colorado, LLC
Products Installed: (31) Foundation Supportworks® HP450 Helical Piles, 10"-12"-14" Lead Section, Pile Depths of 50 to 65 feet, Design Working Loads of 60 kips (Compression) and 30 kips (Tension)



45 kip-ft drive head installing helical piles



Track excavator installing battered HP450 helical piles



Piles fitted with custom new construction brackets



Helical piles cast into concrete pile caps



Proposed addition under construction