

Model 288 Helical Piles

Project: Sanitary Sewer Pipeline Replacement

Location: Beardstown, IL

Date: November 2019

Challenge

An above-grade, 16-inch diameter, steel pipeline, used for treated water transport, was severely corroded along an approximate 910-foot long section. A new pipeline of similar diameter was, therefore, planned to replace the old, corroded pipeline. The construction of the new pipeline was complicated by the presence of a wetland/marsh with as much as 4 feet of standing water in one area. The construction would also have to be completed adjacent to the existing pipeline and overhead utility lines, which would limit equipment access. Three soil borings were completed along the project length, which identified soft clay with organics in the upper 5 to 7 feet, loose sand below the clay extending to a depth of about 12 feet, and then medium dense sand to the termination depths of the borings at 56 to 62 feet. A deep foundation system was required for the pipeline supports due to the poor bearing soils across the wetland. However, smaller installation equipment was preferred to minimize disturbance to the wetland and for access adjacent to the existing pipeline and overhead utilities.

Solution:

Helical piles appeared to be an ideal deep foundation for the project. The design called for 90 foundation support locations with two helical piles per support. Five expansion joints were planned along the 910-foot length that required 20 custom steel support platforms. The remaining 70 supports were a more typical steel cradle design. The compression and tension (uplift) working loads on each helical pile were 1 kip or less, which could easily be supported in the medium dense sands. However, the pile heads would also see moment and lateral loading, which would control the pile design due to the poor surficial soil conditions and the lack of lateral restraint at the support locations. Based on a lateral load and buckling analysis, the Model 288 (2.875-inch O.D by 0.276-inch wall thickness) hollow round shaft with a minimum embedment depth of 15 feet was specified. The piles would have an 8"-10"-12" helical plate configuration. Prior to construction, dewatering operations were employed to reduce the amount of standing water. Even so, the helical pile installation equipment was supported by 1-foot thick, floating timber matting to both protect the wetland and provide a stable working platform. The helical piles were bolted to the steel pipe supports using custom brackets. The 180 helical piles were installed to lengths of 21 to 28 feet and final installation torques of 7,500 to 7,800 ft-lb. The helical piles were installed over a period of seven days.

Project Summary

Geotechnical Engineer: McCleary Engineering
Structural Engineer: Farnsworth Group
General Contractor: Modern Piping
Helical Pile Designer: Modern Piping/Case Engineering
Pile Installer: Foundation Supportworks® by Woods
Products Installed: (180) Supportworks® Model 288 Helical Piles, 8"-10"-12" Helix Plate Configuration, Installed Lengths of 21 to 28 feet



Installing helical piles adjacent to the existing pipeline and overhead utilities



Timber matting support for the pile installation equipment



Connection of helical pile to cradle support



Pipeline support at an expansion joint



Steel cradle and helical piles support pipeline