

Model 350 Helical Piles

Project: Industrial Park Levee
Location: Council Bluffs, IA
Date: January 2015

Challenge:

Two new, independent sections of stormwater outfall sewers were proposed through a flood mitigation levee along the east bank of the Missouri River. One section would be approximately 180 feet long of 48-inch-diameter ductile iron pipe. The second sewer section would be constructed roughly 1,000 feet to the south and be approximately 90 feet long of 60-inch-diameter pipe. The project designers specified new construction helical piles (both vertical and battered) to support the headwalls, pipe outfalls, pipe supports, and floodgate structures.

A geotechnical investigation included the advancement of three soil borings to a maximum depth of 40 feet. The subsurface profile generally consisted of up to nine feet of gravel fill or medium dense silt over very loose to loose sand to a depth of 27 feet. The loose sand was underlain by medium dense sand to the maximum explored depths. Groundwater was encountered as high as nine feet below grade at the time of the exploration.

Solution:

The proposed outfall sewer sections would be located between their corresponding test borings and the Missouri River; i.e., downslope from and closer to the river than the identified soil profiles. Therefore, variability in soil conditions was anticipated. A Model 175 (1.75-inch solid square shaft) helical pile test probe with an 8"-10" helix plate configuration was advanced at three locations to depths from 55 to 77 feet to back-calculate soil strengths from the measured installation torque. The helical test probes identified highly variable soil strengths with the upper 40 feet of the profile generally weaker than what was identified at the soil boring locations.

The deep foundation design included sixty nine (69) Model 350 (3.50-inch OD by 0.313-inch wall) round-shaft helical piles with a 10"-12"-14"-16"-16" helix plate configuration to support design working loads of 55 kips in compression and 27.5 kips in tension. The battered piles were installed roughly 14 degrees from vertical. The helical piles were advanced to lengths from 27 to 91 feet to achieve torque-correlated ultimate capacities at least twice the design working loads (FOS ≥ 2). Pile depths were on the order of 45 to 95 feet below the preconstruction ground surface. The helical pile installation was completed in 11 days.

Project Summary

Structural Engineer: HGM Associates, Inc.
Geotechnical Engineer: CDM Smith, Inc.
General Contractor: Erikson Construction
Certified Pile Installer: Thrasher, Inc.
Products Installed: (69) Foundation Supportworks® HP350 Helical Piles, 10"-12"-14"-16"-16" Helix Plate Configuration, Installed Lengths from 27 to 91 feet, Design Working Loads of 55 kips (Compression) and 27.5 kips (Tension)



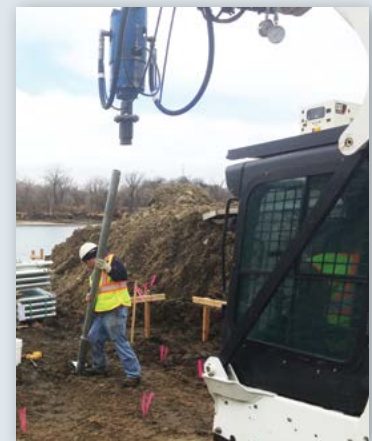
Helical test probe; torque monitored with calibrated torque transducer



Helical pile installation through levee



Installing battered piles



Coupling blank extension to pile