

### Model 350 Helical Piles

**Project:** Carriage House Boardwalk

**Location:** Lake Delton, WI

#### Challenge:

A new carriage house was constructed to include a workshop, lounge, indoor racquetball court and rooftop pool. The carriage house was located approximately 200 feet behind the main home and at the base of a wooded slope. There was approximately 40 feet of elevation change from the flat rear yard of the main residence to the floor elevation of the carriage house. Access to the carriage house from the main house was by a long driveway that snaked around the hillside. A 120-foot long elevated boardwalk was proposed to provide a more convenient and direct passageway between the two buildings. A geotechnical investigation was not performed for the proposed boardwalk; however, based on experience with constructing both the main home and the carriage house, the general contractor expected competent soils at relatively shallow depths. Gravel and cobbles were also expected within the soil profile. The original foundation design for the boardwalk included drilled shafts installed to depths up to eight feet. However, augering the holes, setting sonotube forms and placing concrete on the steep slope would not only be extremely difficult, but also potentially dangerous. In addition, the client wanted a foundation solution that would have minimal impact on the slope and preserve as many trees along the boardwalk as possible.

#### Solution:

The design included twenty-one (21) Model 350 (3.5-inch OD by 0.313-inch wall) hollow round shaft helical piles with 8"-10" double-helix lead sections to support a design working load of ten kips per pile. The larger, more rigid shaft size was also selected to provide lateral stability at the base of the boardwalk columns. With roots and cobbles anticipated during installation, a V-style leading edge was utilized on the 8-inch helix plate and both plates were Grade 50, ½-inch thick steel. The helical piles were advanced to an average depth of approximately ten feet below the ground surface to achieve torque-correlated ultimate capacities of at least twice the design working load ( $FOS \geq 2$ ). Five of the helical piles at the base of the slope were installed with a skid steer. The remaining piles located on the steeper part of the slope were installed with a Lull material handler with a 45-foot extendable boom. A custom drive head mount was fabricated for the forklift attachment. For either equipment option, the drive head was operated off the hydraulic system of the skid steer. Custom saddle brackets were field welded to the tops of the piles to accept the 8-inch square wood columns of the boardwalk. Installation of the 21 helical piles was completed in two days.

### Project Summary

**Architect:** Shulfer Architects, LLC.

**General Contractor:** Friede & Associates

**Certified Pile Installer:** Foundation Supportworks® of Wisconsin

**Products Installed:** (21) Foundation Supportworks® Model 350 Helical Piles, 8"-10" Lead Section, Installed to an Average Depth of 10 feet, 10 kip Design Working Load



Installing piles with extended boom of material handler



Steep slope; advancing lead section



Pile installation from bottom of slope near carriage house



Saddle bracket connection to columns



Completed boardwalk