

## Model 450 Helical Piles

**Project:** Plantation House Elevator

**Location:** Captiva Island, FL

### Challenge:

The Plantation House is one of many luxurious guest buildings at the South Seas Island Resort on Florida's west coast. The 330-acre resort offers this three story structure as rentable beachfront condominiums to vacationing guests year-round. In order to make the upper floor levels more easily accessible, an elevator addition was proposed to replace one of the three exterior stairwells at the front of the Plantation House. The 12-foot by 18-foot elevator addition would be supported on a three-foot thick concrete mat foundation and poured concrete foundation walls. The elevator walls above grade would be constructed of masonry block. A single test boring was completed to a depth of 65 feet. A generalized subsurface profile consists of very loose to loose sand with medium dense sand layers in the upper 45 feet, very dense sand from 45 to 52 feet, and medium dense to dense sand to the bottom of the boring. The groundwater table was encountered 4.5 feet below the ground surface elevation at the time of the boring. A deep foundation system was required to transfer the structural loads to the competent medium dense to very dense sands below a depth of 40 feet. The deep foundation system would also have to be installed with smaller equipment capable of accessing the project site and working within the tight construction area. Minimal noise and ground vibrations were additional requirements as the elevator construction would be completed at a time of high resort occupancy.

### Solution:

N Square consulted with the engineering staff at Supportworks®, Inc. to provide the general contractor with an efficient and functional helical pile recommendation. Buckling of the piles had to be considered with very loose and "weight of hammer" sand layers in the upper 35 feet of the profile. The foundation design included eleven (11) Model 450 (4.50-inch OD by 0.337-inch wall) round shaft helical piles with 10"-12"-14" triple-helix lead sections to support a design working load of 45 kips per pile. The helical piles were installed to torque-correlated ultimate capacities of at least 90 kips (FOS ≥ 2). Pile lengths varied from 36 to 49 feet with the tops of the piles set approximately six feet below ground surface elevation. Select piles were installed with a slight batter of two degrees to provide adequate separation of the piles at the helix plate depths. New construction brackets with ¾-inch thick by 11-inch square cap plates were placed on the tops of the piles and cast into the mat foundation. The eleven piles were installed within two days.

## Project Summary

**Architect:** Avalon Engineering, Inc.

**Structural Engineer:** TRC Worldwide Engineering

**Geotechnical Engineer:** Universal Engineering

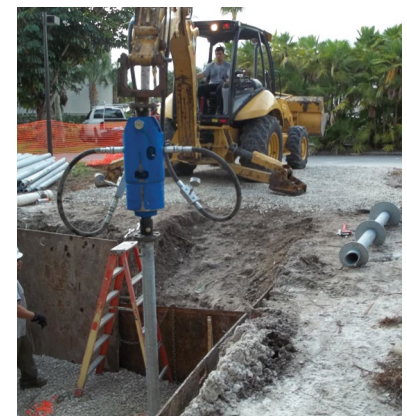
**General Contractor:** Owen-Ames-Kimball Florida

**Pile Installer:** N Square, Inc.

**Products Installed:** (11) Supportworks® Model 450 Helical Piles, 10"-12"-14"  
Lead Section, Pile Depths of 42 to 55 feet, 45 kip Design  
Working Load



Proposed location for new elevator addition



Rubber-tired backhoe advancing Model 450 helical pile



Installing helical piles



Helical piles fitted with new construction brackets