

# Helical Piles Provide Column Support for Building Addition

## Project

Mayo Clinic Hospital Expansion

## Location

Phoenix, AZ

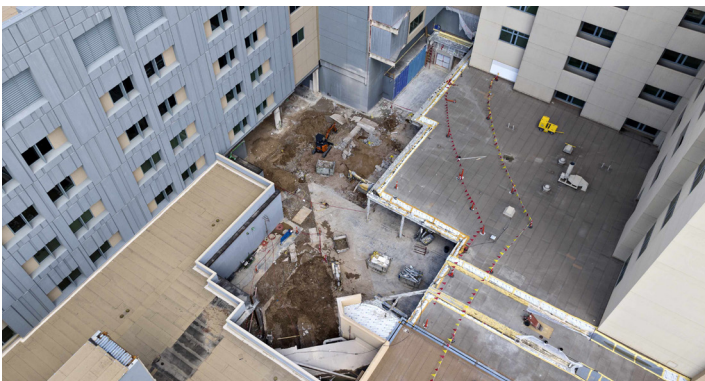
## Date

April 2023

### CHALLENGE ►

The Mayo Clinic Hospital, located in Phoenix Arizona, is part of nationwide multi-campus medical clinic and tertiary medical center. An expansion to the hospital was planned as part of a five-year project that included the construction of an approximate 583,800 square foot addition to the west side of the hospital along with additions and renovations to other existing support facilities. Part of the center's expansion was in a courtyard area surrounded by existing structures with no access for large construction equipment. This part of the project was for an elevated walkway addition which required foundations to handle loads from nine column locations with service compression loads ranging from 56 kips to 326 kips and one column with a service tension load of 67 kips.

The closest soil boring to the project area showed 6 feet of medium dense clay fill underlain by loose to medium dense sand to a depth of 9 feet where it transitioned to very stiff to hard clay to the termination of boring depth of 61.5 feet. Because of the high column loading, space limitations and poor subgrade soil conditions, the column support in this area required a deep foundation system.



Aerial view of the project area with no equipment access

### SOLUTION ►

Given the access limitations, helical piles were selected as the most economical solution for deep foundation support at the column locations. Four different pile cap layouts were designed with helical pile quantities of either 4, 6, or 9 piles per cap. The resulting individual helical pile loads ranged from 7.5 kips in tension to 37 kips in compression. Two different helical pile configurations were used at the pile caps; the Model HP288 (2.875-inch OD by 0.276-inch wall) system with an 8"-10" helix plate configuration and the Model HP350 (3.5-inch OD by 0.340-inch wall) system with a 10"-12"-14" helix plate configuration. The original concrete pile cap design included a total of 53 helical piles with new construction brackets. The project required installation equipment with a drive head capable of at least 11,000 ft-lb of torque. The project was bid with the assumption that the installation equipment could be placed into the project area by crane; however, the crane capacity was subsequently derated and another solution was necessary for getting the installation equipment into the project area. Arizona Foundation Solutions coordinated getting access for a CAT 259 compact track loader and drive head to the work area through the hospital entry and corridors during off-hours.

Based on the soil profile, the termination depths of the helical piles were estimated to range from 14 to 25 feet. Prior to pile installation, two tension load tests were performed to verify pile capacity. After verifying the pile design with load testing, the 53 helical piles were installed to an average termination depth of 14.5 feet after achieving torque-correlated ultimate capacities of at least 2 times the required service load. This phase of the work was done over a two-day period.

After some of the concrete pile caps were poured, it was determined that additional loading was necessary at eight of the nine pile cap locations. A combination of new construction helical piles and retrofit helical piles were used to provide the additional capacity. Four pile caps had not been

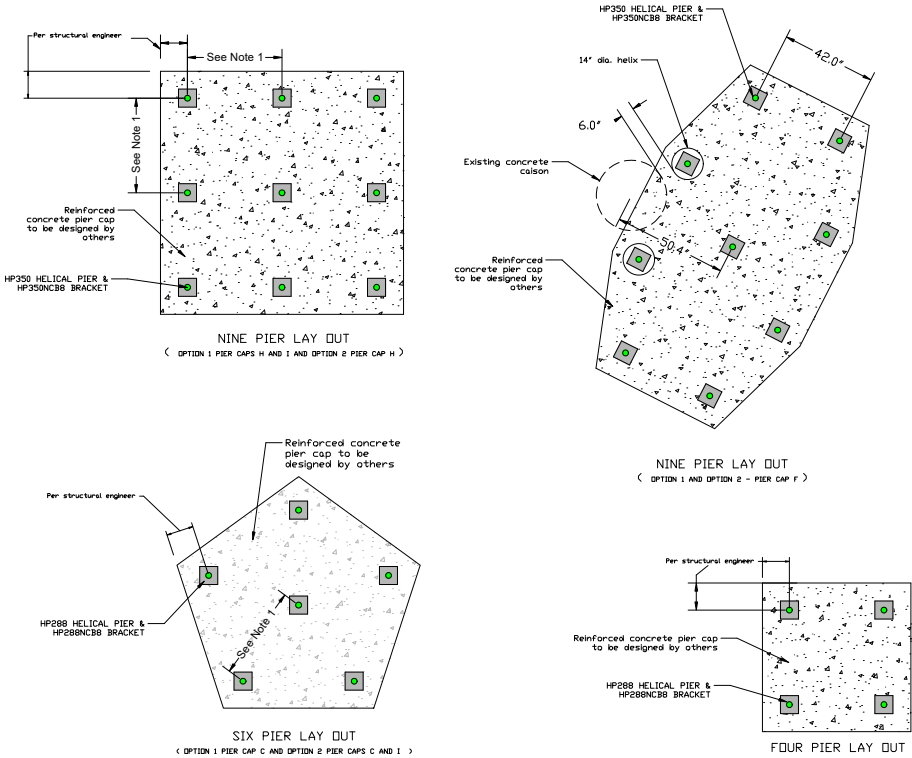
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poured, which allowed larger pile cap designs with additional new construction helical piles. Four of the pile caps had already been poured so retrofit helical piles were used at these locations to provide the additional capacity. A total of 6 Model HP288 and 11 Model HP350 helical piles were added to the pile cap locations with 9 of them using retrofit brackets and 8 of them using new construction brackets. Both shaft types had an 8"-10" helix plate configuration and were installed to torque-correlated ultimate capacities of at least 2 times the required service load. The second phase of work was performed in one day.



Four original pile cap layouts



Installing helical piles



Helical piles installed in pile cap excavation

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Helical piles with new construction brackets installed



Reinforcement installed around helical piles



Concrete pile cap with retrofit helical piers installed



Additional helical piles installed to increase capacity



Aerial view of walkway construction

## PROJECT SUMMARY ►

Structural Engineer:	PK Associates
General Contractor:	DPR Construction
Subcontractor:	Suntec Concrete
Geotechnical Engineer:	Speedie & Associates
Helical Pile Designer:	Copper State Engineering
Helical Pile Installer:	Arizona Foundation Solutions
Products Installed:	(50) Foundation Supportworks® Model 288 Helical Piles with Service Compression Loads of 32.5 kips or less and Service Tension Loads of 7.5 kips or less, (20) Foundation Supportworks® Model 350 Helical Piles with Service Compression Loads of 36.3 kips or less, Average Installed Depth of 14.5 feet.

For additional case study and technical information please visit [Commercial.Supportworks.com](https://Commercial.Supportworks.com).