

Helical Piles and Anchors

Project: Montgomery Tower Support • **Location:** St. Louis, MO
Foundation Supportworks® Dealer/Installer: Foundation Supportworks® by Woods

Challenge: The Montgomery tower is a 240-foot high communication tower supported with guy wires attached to three 16-foot high reaction guy poles. The tower load at each guy pole is then resisted with two helical anchors. The southwest guy pole support and main tower experienced excessive movement which required emergency temporary restraint to prevent tower failure. Additional helical anchors were then planned to increase the guy support capacity at all three guy pole foundations. When the field work started, it was discovered that a redesign was required for the proposed helical anchor system at two of the three guy pole supports. Helical anchors battered out from the tower could not extend into the railroad easement at the northeast leg and fiber optic and gas line utilities would obstruct anchor installation at the northwest leg. The geotechnical investigation provided limited deep soil information for the northeast and northwest guy pole locations so the anchor design was based on a deeper boring completed southwest of the tower base. Installation of the anchors would also be a challenge as equipment access was obstructed by existing guy wires and the temporary restraint system at the southwest guy pole.

Solution: The original retrofit anchorage design consisted of two additional helical anchors per guy pole support battered at 40 degrees from vertical (away from tower) with ultimate axial tension loads of 45 kips. The Model 150 square shaft (1.5-inch round corner square bar) helical anchor with an 8"-10"-12" triple-helix lead configuration was selected to provide the 45 kip ultimate tension capacity. The Model 150 anchors were installed at the southwest guy pole support to lengths of 27 and 37 feet (depths of 21 and 28 feet) to meet the termination torque criteria. For the northeast and northwest guy pole locations, the design consisted of two vertical and two battered (45 degrees toward tower) helical piles. With this geometry, the battered piles would have ultimate compression loads of 32.6 kips and the vertical piles would have ultimate tension loads of 59 kips. The Model 288 round shaft (2.875-inch OD by 0.276-inch wall) helical pile was selected for both loading conditions. The tension piles were installed to depths ranging from 11 to 24.5 feet and the compression piles were installed to lengths ranging from 11 to 26.5 feet (depths ranging from 7.8 to 18.7 feet) to meet the termination torque criteria. Due to variable soil conditions, helix plate configurations varied from 8"-10"-12" to 8"-10"-12"-14"-14". The Model 288 piles were fitted with new construction brackets/caps and cast into an above-grade reinforced concrete beam. All tension piles and anchors were proof tested to above the design working loads with recorded deflections of 0.25 to 0.375-inch.

Commercial



Compression and tension pile system installed at the northwest guy location



Finished grade beam reaction system at the northwest guy location

FOUNDATION NATION

FSI NEWSLETTER FOR DESIGN PROFESSIONALS

HELIXPRO™ DESIGN SOFTWARE



Available Now!

HelixPro™ - "Helical Foundation Design Software for Professionals" was released on September 4, 2012 after nearly a year of design, development and programming efforts. We are proud and excited to now introduce the software to our nearly 4,000 subscribers to Foundation Nation for Design Professionals (FNDF). FSI engineers routinely travel throughout the United States and Canada to promote the use of helical foundation systems through engineering seminars and presentations. We heard loud and clear when you asked for an accurate, easy to use design tool for helical foundations.

The following two pages of this newsletter provide a design example to illustrate the software's layout and functionality. The example utilizes real soil and project information for a guyed tower project completed in St. Louis, Missouri. The tower supports were retrofitted with helical piles and anchors to provide additional support and stability. The example is for the design of the southwest guy support where two Model 150 square shaft helical anchors were installed at a 40 degree batter. The case study for this guyed tower project is presented on the back page of the newsletter.

What is HelixPro™?

HelixPro™ is a state-of-the-art, web-based software created by FSI. With the software being web-based, you never have to worry about having the current version. Updates are automatic. The program calculates bearing and uplift capacities of FSI helical piles as well as tension capacities of FSI helical tiebacks. HelixPro™ calculates pile and tieback capacities using the Individual Bearing Method. For more information about the Individual Bearing Method you can reference the latest edition of the FSI Technical Manual or the cover article of the Summer 2011 issue of this newsletter.



The program is ideal for analyzing both vertical and battered piles for deep foundations of new structures, seismic retrofitting applications, tension/uplift elements of guyed structures, tie-downs, and much more.

Why use HelixPro™?

HelixPro™ allows you to perform multiple trials with varying soil profiles and helix configurations, making it easy to select the most economical and practical solution for your project.

HelixPro™ provides a step-by-step "wizard" approach, making it easy to use and navigate. There are help menus and buttons along the way to further assist the user through the design

Some of the many other features of the software include:

- Links to case studies, current and previous issues of FNDF, and technical content on the FSI website
- Ability to save and manage projects and sort these projects by date, application and project status
- Graphical representation of soil layers and helix plate depths
- Graphical representation of installation torque with depth along with boundary lines to represent the torsional rating of the shaft
- Pop-up warnings to alert the user when the torsional rating of the shaft is exceeded, when non-standard helix

plate configurations are selected, when minimum depth or embedment criteria are violated, etc.

- Generation of a summary report with a graphical representation of the proposed installation
- **FREE of charge to you**

How can you get started using HelixPro™?

It's easy! Type the following URL into your web browser: www.helixpro.foundationssupportworks.com and click on the "Register Now" link. The software will walk you through some simple registration steps. Within two working days, you should receive an email stating that your account has been activated.

FSI engineers utilize HelixPro™ every day to prepare preliminary designs for our contractor network. We are confident that you will also find HelixPro™ to be a valuable tool for your design of helical foundations.



Don Deardorff, P.E.
Senior Application Engineer

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