

## Innovative products

*Brian Gerber, S.E.*

### *Helical foundation systems*

Helical foundation systems—consisting of steel shafts, helical bearing plates, and support brackets—have long been used to provide foundation stability in industrial, commercial, and residential structures. Uses range from excavation shoring and earth retention to residential floor slab and footing support.

The systems provide excellent deep-foundation alternatives that resist tension, compression, and lateral loadings, and can be installed at an angle. Often, these systems are more affordable than other foundation alternatives and easier to install. Yet, there is no common industry standard for the manufacture and application of the entire helical foundation system in terms of capacity and quality.

There are a number of published technical papers that provide tremendous insight into the strength characteristics of these systems. As well, the International Code Council's Evaluation Service, Inc. (ICC-ES), legacy reports address the structural steel support capacity of the systems and certain loading directions, but do not address load transfer and soil interactions.

With the demand for helical foundation systems on the rise in industrial, residential, and especially commercial applications, the ICC-ES and the Ad Hoc Committee of Helical Foundation Manufacturers (CHFM) launched a program to develop comprehensive acceptance criteria that establishes intended capacities and resolves previous limitations.

Howard Perko, Ph.D., a principal engineer with CTL|Thompson, Inc., and technical lead for the CHFM, comments, "Our goal was to create a common standard for the overall helical foundation system, not just its components, to give manufacturers a common quality standard to meet, and to provide the industry the assurance that these systems do what they are intended to do."

After more than two years of work between CHFM and the ICC-ES, the ICC-ES Evaluation Committee approved the Acceptance Criteria for Helical Foundation Systems and Devices (AC358) at the June 5, 2007 ICC ES hearing.

AC358 outlines the capacity and qualification testing requirements for helical foundation systems used structurally, including structural analysis, test procedures and conditions of acceptance, manufacturing specifications, and quality control during manufacture. In addition, this criteria describes the capacity and testing requirements of all helical foundation system elements, including the bracket, shaft, helix, and the soil. For example, the criteria requires that the shaft be evaluated either separately or in total for intended uses, such as tension, compression, torsion, shear resistance, elastic shortening/lengthening, and combined stresses. The helix capacity is evaluated for punching flexure, weld shear, and torsion. In addition, the systems' load and deformation capacity in the soil may be determined in accordance with the criteria. Provisions for corrosion potential are included, since the devices are limited to structural steel materials.

With the recent ICC-ES Evaluation Committee approval of the first issuance of AC358, the ICC-

ES staff, testing laboratories, inspection agencies, and manufacturers of helical foundation systems have a guide to follow in evaluating these systems. Members of the CHFM are expected to be among the first to submit applications ICC-ES for an Evaluation Service Report (ESR) to meet AC308 requirements.

An ESR offers building officials an independent resource for accepting the systems; structural engineers also can use the report as a resource for preparing a design. Complete ESR reports can be downloaded from the ICC-ES website.

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