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Cover Article

FSI Receives Evaluation Report ESR-3074 from ICC-ES

"Although ESR-3074 is specific for the FSI Model HP288 system, the report may also be considered to qualify other helical products designed and manufactured by FSI."

Retrofit bracket testing per AC358

Featured Case Studies:

Upcoming Webinar Opportunities

An Introduction to Helical Foundation Systems
1st Wednesday of every month 11:30am(CST) and 1:30pm(CST)

An Introduction to Polyurethane Foam Injection
2nd Wednesday of every month 11:30am(CST) and 1:30pm(CST)

An Introduction to Hydraulically Driven Push Pier Systems
3rd Wednesday of every month 11:30am(CST) and 1:30pm(CST)

To sign up email Kimberly at *kimberly.hancock@foundationsupportworks.com* with the following information:

- Name of the firm
- Location of firm
- Approximate number of engineers/architects/GCs that will be in attendance

*FSI is an approved provider through the AIA, RCEP and the Florida State Board of Engineers for continuing education credits

Foundation Nation™
FSI Newsletter for Design Professionals
Quarterly Newsletter • Issue 17
Fall 2013

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FSI Newsletter for Design Professionals

FSI Receives Evaluation Report ESR-3074 from ICC-ES

Don Deardorff, P.E. • *Senior Application Engineer*

Foundation Supportworks® is pleased to announce the issuance of evaluation report ESR-3074 by the ICC Evaluation Service (ICC-ES). The report confirms compliance of FSI's Model HP288 (2.875-inch O.D. by 0.276-inch wall) helical foundation system with the International Building Code (IBC). Product evaluation followed submittal of design calculations and field and laboratory test results, all completed in accordance with ICC-ES AC358, Acceptance Criteria for Helical Pile Systems and Devices. AC358 is the only published standard for establishing system capacities for helical foundations.

AC358 requires evaluation of the four major components of a helical pile system; the bracket (new construction or retrofit), the shaft and coupling, the helix plate(s), and the soil capacity (soil-structure interaction). A significant amount of field and laboratory testing is required in AC358 to evaluate these components along with supporting structural calculations. Each of the four components of the system is evaluated to determine the individual component capacity with the lowest component capacity then governing the system capacity.

ICC-ES is an independent subsidiary of the International Code Council (ICC), created in 2003 when four national building product evaluation services were combined to provide consistent, professional evaluation of building components, products and processes. ICC-ES reports assure customers, design professionals and code officials that these products can be trusted to perform as indicated. The ESRs offer independent, verified evidence of a product's code compliance, as well as summarizing relevant installation requirements and testing references. In addition to several tables identifying the tension and compression capacities of the various components and systems, ESR-3074 includes sections that describe the scope of the evaluation report, uses of the helical pile system, details of the system components, design and installation requirements, conditions of use, evidence submitted and product identification.

Although ESR-3074 is specific for the FSI Model HP288 system, the report may also be considered to qualify other helical products designed and manufactured by FSI. FSI follows similar design and testing protocol as required by AC358 for all of our square shaft and round shaft helical systems.

ESR-3074

Foundation Supportworks® is one of only four manufacturers to have an ESR for helical pile systems, which is a testament to the difficulty involved with meeting the strict criteria established by ICC-ES. With AC358, ICC-ES established a well-needed, high standard for design and manufacturing of helical pile systems. In the United States alone, there are more than 50 facilities that claim to manufacture helical piles, with most of these fabricating product for their own use. These products generally do not conform to AC358 and applicable sections of the IBC. The claimed capacities for these systems are therefore suspect at best.

Foundation Supportworks® is committed to being the leading manufacturer of helical foundation systems and is proud to have completed this important phase in verifying code compliance of our products. A copy of ESR-3074 can be obtained free of charge by visiting the ICC-ES website at *www.icc-es.org / Evaluation Reports* or by visiting the Foundation Supportworks® website at *www.fsicommercial.com.*

Foundation Supportworks

- **New Construction and Retrofit Helical Piles**
- **Helical Tiebacks**
- **Helical Soil Nails**
- **Hydraulically Driven "Push" Piers**
- **Wall Stabilization Systems**
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CASE STUDIES

New Construction & Retrofit Helical Piles

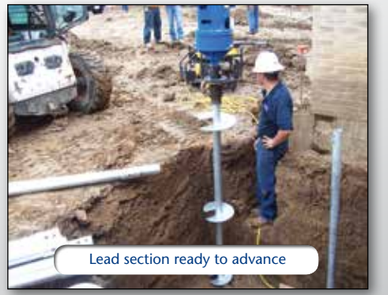
Commercial

Project: School Addition and Renovation ● **Location:** Nebraska City, NE
Foundation Supportworks® Dealer/Installer: Foundation Supportworks® by Thrasher

Challenge: Plans for a new addition and renovation of the existing building included a new gymnasium, auditorium, classrooms and administrative offices. A review of pre-construction site conditions identified cracking in the exterior brick veneer, indicating that the existing structure was experiencing differential settlement. A geotechnical exploration for the proposed addition encountered fill soils to depths of ten feet, Peoria loess and Loveland loess to depths of 32 to 45 feet, and glacial till to the explored depth of 50 feet.

Solution: Foundation recommendations included underpinning and widening sections of the existing exterior wall footings before starting the new construction and renovation phases of the project. These sections of existing foundations would receive additional load from the planned construction. New foundations placed within 15 feet of the existing building would also be supported by helical piles. A helical pile test probe was advanced to a depth of 100 feet to gather deep soil strength information. Soil parameters can be back-calculated by knowing the test probe configuration and monitoring torque in one-foot intervals during installation. An allowable pile capacity of 25 kips with a factor of safety of at least 2.0 was estimated based on the test probe information.

Thirty-five retrofit helical piles and 55 new construction helical piles were proposed to support the existing structure and new addition, respectively. For both applications, the helical pile design consisted of the Model 288 (2.875-inch OD by 0.276-inch wall) round shaft with 10”-12”-14” triple-helix lead sections and 14”-14” double-helix extensions. Retrofit foundation brackets were positioned below and against the existing footings and the piles were uniformly loaded with hydraulic cylinders to the recommended seating load. The retrofit and new construction helical piles were advanced to depths ranging from 45 to 65 feet and to torque-correlated ultimate capacities of at least two times the design working loads of 22.5 to 25 kips (FOS ≥ 2).



Lead section ready to advance

Retrofit pile installation complete; preparing widened footing/grade beam

Model 288 Helical Piles

Commercial

Project: Jib Crane at Water Survival Training Center ● **Location:** Pensacola, FL
Foundation Supportworks® Dealer/Installer: Alpha Foundation Specialists, Inc.

Challenge: A new jib crane was planned for an existing indoor pool facility. The foundation design for the jib crane consisted of a four-foot thick pile cap with plan dimensions of 15 feet by 23 feet. A soil exploration was performed at the proposed jib crane location prior to excavating for the pile cap. The exploration identified medium dense sand to a depth of 22 feet underlain by loose sand to a depth of 28 feet. The loose sand was underlain by dense to very dense sand to the maximum depth explored of 40 feet. Groundwater was estimated to be on the order of two feet below the elevation of the pool deck. A nine-foot by nine-foot roll-up door provided the only access for equipment to the proposed jib crane site. A fixed construction schedule dictated that installation equipment be mobilized quickly and the deep foundations be installed within a three-day window.

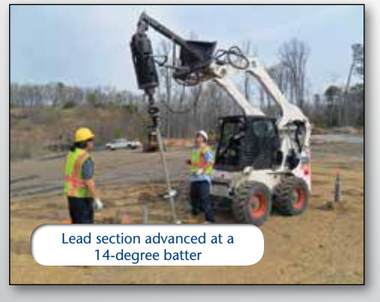
Solution: Helical piles were selected for this project due to the low relative cost compared to other deep foundation systems. Helical piles can also be installed with relatively small installation equipment without vibrations and they can be installed through groundwater without the need for casing or pumping pre-drilled holes. The original foundation design included fourteen (14) Model 288 (2.875-inch OD by 0.276-inch wall) hollow round shaft piles with a 10”-12”-14”-14” helix plate configuration to support design working loads of 20 kips in both compression and tension. Prior to the installation of the production piles, four load tests (two compression and two tension) were performed to determine pile displacement versus load and to verify the helical pile configuration. The pile load tests met the specified deflection criteria with less than ¼-inch of movement at the design working load and less than 1-inch of movement at 3.5 times the design working load.

The soil strengths observed during the installation of the production piles were highly variable from one pile location to the next; therefore, in order to achieve the recommended bearing depth, the engineer of record revised the piles to a 10”-12”-14” triple-helix configuration. The piles were advanced to depths of 19 to 24 feet and to torque-correlated ultimate capacities of at least 70 kips (FOS ≥ 3.5). The four load tests and the installation of 14 helical piles were completed in just two days, one day ahead of schedule.

Installing HP288 piles

Compression load test

Commercial



Lead section advanced at a 14-degree batter

Monitoring torque with a calibrated torque transducer

Model 288 Helical Piles

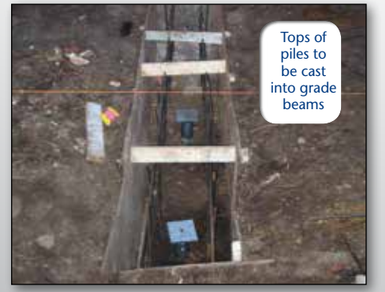
Project: Millworks Headstock ● **Location:** Midlothian, VA
Foundation Supportworks® Dealer/Installer: JES Construction, Inc.

Challenge: A 35-foot tall reproduction of an 18th century wood-frame headstock was planned to be constructed over an abandoned coal mine shaft at the Midlothian Mines Park. The coal mine was opened in the 1700’s and operated until 1923. Records provided by the Department of Mines, Mineral, and Energy suggested that the original mine shaft was 11 feet square by 750 feet deep. In the 1980’s, the mine shaft was permanently sealed with a concrete cap placed over the sediment-filled shaft. Up to 15 feet of earth fill was reportedly spread across the site and over the concrete cap; however, the fill was not placed in a controlled manner. This uncontrolled fill was determined not to be suitable for the support of the proposed headstock structure.

A soil investigation completed at the site included the advancement of five soil borings to a maximum depth of 41.5 feet. The borings generally identified uncontrolled fill with coal and rock fragments to depths up to ten feet. Beneath the fill, inter-layered loose to dense silty sand and stiff to hard sandy fat clay to sandy silt was identified to depths of 20 to 35 feet where the soil transitioned into partially weathered bedrock. Groundwater was observed at depths of six to 20 feet at the time of the exploration.

Solution: Due to the uncontrolled fill and erratic site conditions, helical piles were selected as the deep foundation system to support the headstock structure. The foundation design included eight isolated concrete pile caps, each with three helical piles. The design working loads for the helical piles were 15 kips in compression and 10 kips in tension. The helical pile configuration consisted of the Model 288 (2.875-inch OD by 0.276-inch wall) hollow round shaft with an 8”-10” double-helix lead section. A V-style leading edge on the 8-inch helix plates allowed the piles to penetrate through the fill and into the bearing soils. Five of the helical piles were installed at a 4V:1H batter to resist lateral loads. The piles were advanced to depths of 23 to 25 feet and to an ultimate torque-correlated soil capacity of at least 30 kips (FOS ≥ 2). Installation torque was monitored throughout the installation process using a calibrated torque transducer. The tops of the piles were cut to the required elevation and holes were drilled through the shafts to bolt on new construction brackets.

Commercial



Tops of piles to be cast into grade beams

Concrete piers poured over the grade beams - north deck

Model 288 Helical Piles

Project: Buzzard Billy’s Deck Support ● **Location:** Des Moines, IA
Foundation Supportworks® Dealer/Installer: Foundation Supportworks® of Central Iowa

Challenge: Buzzard Billy’s Restaurant was moving to a freshly renovated building north of the downtown area of Des Moines. The building’s original location was in the Court Avenue section of town that was flooded in 2008. Two new decks were planned on the north and south sides of the building. The design dead and live loads for the proposed decks were relatively light; however, a geotechnical investigation at the project site encountered soft soils and possible rubble about seven feet deep. An economical and effective deep foundation system was required to support the proposed decks. Design loads per deep foundation element were 10 kips and 20 kips for the north and south decks, respectively.

Solution: The foundation design for the north deck included thirteen (13) Model 288 (2.875-inch OD by 0.276-inch wall) helical piles with an 8”-10” double-helix lead section. The foundation design for the south deck included seventeen (17) Model 288 helical piles with a 10”-12”-14” triple-helix lead section. The first six piles that were installed for the south deck encountered rubble fill within a few feet of the surface and had to be withdrawn. After further investigation, it was discovered that foundation walls and basement level floor slabs remained from a previous structure that occupied the property. The foundations had been removed to just below the surface and the basement filled in. The old foundations and floor slabs were removed to allow installation of the helical piles. The piles were installed to depths of 25 to 28 feet and to torque-correlated ultimate capacities of at least twice the design working loads (FOS ≥ 2). Despite these major setbacks and installation challenges, the 30 helical piles were installed in just five days.