

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**SPECIAL PROVISION**

**ATLANTA BELTLINE NORTHEAST TRAIL**

**SECTION 999 – HELICAL PILES**

**999.1 General Description**

This Specification consists of furnishing all necessary engineering and design services, supervision, labor, materials, equipment, tools and services for design and construction of helical piles and includes all incidentals and additional work in conjunction therewith. All materials, construction, and fabrication shall meet the requirements of the project plans, Special Provisions and Standard and Supplemental Specifications.

**999.1.01 Definitions**

**Crowd:** Axial compressive force applied to the helical pile shaft as needed during installation to ensure the pile advances at a rate approximately equal to the helix pitch for each revolution.

**Helical Pile:** A pile consisting of a central steel shaft with one or more helix-shaped bearing plates and a load transfer device (bracket) that allows attachment to structures. A helical pile is installed into the ground by application of torque and axial compressive force.

**Helix (Helical) Plate:** Generally, a round steel plate formed into a helical spiral and welded to the central steel shaft. When rotated in the ground, the helix shape provides thrust along the pile's longitudinal axis thus aiding in pile installation. The plate transfers axial load to the soil through bearing.

**Helix Pitch:** The distance measured along the axis of the shaft between the leading and trailing edges of the helix plate.

**Lead Section:** The first helical pile shaft component installed into the soil. The lead section consists of one or more helical plates welded to a central shaft.

**999.1.02 Related References**

General Provisions 101 through 150.

**999.1.03 Submittals**

**A. Product Data**

Submit data on the helical piles including, but not limited to, shaft dimensions, helical plate dimensions, brackets and ancillary products to be supplied and material properties to the Engineer for approval before beginning the work.

## **B. Helical Pile Design Calculations**

Contractor's engineer shall submit details and calculations for the design of the helical piles to resist the loads indicated in the plans. Calculations shall be signed by a professional engineer in the State of Georgia for the size, estimated length and capacity of piles to be installed to the Engineer for approval before beginning the work.

## **C. Shop Drawings**

Submit shop drawings to the Engineer for review and approval before beginning the work. Indicate the following in the drawings:

1. Connection detail to the existing foundation pile cap
2. Ultimate pile capacity and correlated torque
3. Minimum pile termination torque requirements
4. Minimum and/or maximum embedment lengths or other site-specific embedment data requirements as may be appropriate for the site soil profiles.
5. Inclination of the helical pile
6. Termination criteria

## **D. Installer Certification**

Submit installer's certification from the manufacturer to install the helical pile system.

## **E. Calibration Reports**

Submit certified calibration reports for torque measuring equipment and load test measuring equipment to be used on the project. Submit reports for calibrations performed within one year of the proposed helical pile installation starting date. If repairs have been performed to equipment that may have impacted the calibration, submit reports for calibrations after the repair was performed.

## **F. Installation Records**

Installation Records: The Contractor shall provide the City copies of Helical Pile installation records within 24 hours after each installation is completed. Formal copies shall be submitted on a weekly basis. These installation records shall include, but are not limited to, the following information.

- Name of project and Contractor
- Name of Contractor's supervisor during installation
- Date and time of installation
- Name and model of installation equipment
- Type of torque indicator used
- Location of Helical Pile by assigned identification number
- Actual Helical Pile type and configuration – including lead section (number and size of helix plates), number and type of extension sections
- Helical Pile installation duration and observations
- Total length of installed Helical Pile
- Cut-off elevation
- Inclination of Helical Pile
- Installation torque at one-foot intervals for the final 10 feet
- Comments pertaining to interruptions, obstructions, or other relevant information
- Calculated geotechnical capacity based on final torsional resistance

## 999.2 Materials

Unless noted otherwise all materials shall be in accordance with the GDOT Standard Specifications.

### A. Helical Piles

#### 1. Lead Section

- The lead section of the helical anchor shall consist of circular steel plate pipe or plates to a central steel shaft.
- The shaft shall be round cornered square solid steel bar, minimum area of 2.25 square inches based on preliminary analysis, and formed of ASTM A29 steel with minimum yield and tensile strength of 70 and 100 ksi, respectively.
- Length of lead section shall be sufficient to provide not less than five feet minimum depth to top of the helix.
- Shaft shall have an earth penetrating pilot on the bottom of the shaft.
- Shaft shall have a coupler means on the top of the shaft.

#### 2. Helix

- Circular steel plate welded to the central steel shaft shall form the helix.
- Each helical plate shall be center punched to accept the central steel shaft.
- All radial sections of the helix shall be normal to the central longitudinal axis + 3°.
- Pitch of the helix shall be 3-inches to allow soil penetration of 3-inches per revolution.
- Thickness of helix plate shall be not less than 3/8-inch.
- When more than one helix is attached to a common central shaft, spacing between the adjacent helical plates shall be three times the diameter of the lower helix. Align helixes so that upper helixes thread into the grooves cut by the preceding helixes.
- Helical plates shall be ASTM A36 or A572, with a minimum yield strength of 36 ksi and a minimum tensile strength of 58 ksi.

#### 3. Shaft Extension

- Extension shall consist of the same size steel shaft required for the lead section.
- Extension may or may not require helical plates.
- Each extension shall have a coupler means on one end and a connection means on the other. The coupler shall be an integrally formed socket that slips over the end of the central shaft of either the lead section or another extension.
- Each end of the extension shall have a hole drilled perpendicular to the central axis near the end of the shaft to accommodate a bolted connection for a lead section, shaft extension, or support bracket.

#### 4. Underpinning Brackets

- Underpinning bracket shall be provided to meet design intent as shown on plans.
- Underpinning brackets shall be sized by the contractors engineer to provide the necessary horizontal bearing surface and vertical mounting surface to facilitate transfer of the allowable pier loads as shown on plans.
- All post-installed connection hardware for underpinning and brackets to existing concrete foundation shall be designed and specified by contractor's engineer.
- All existing concrete shall be assumed to be 3,000 PSI compressive strength unless noted otherwise.

#### 5. Coupling Bolts

- Shaft extensions or support brackets shall be coupled to their companion members via a bolted connection.
- Bolts shall be ASTM A320 Grade L7 or ASTM A325

## **6. Galvanizing**

- All components, including lifting bolts and coupling bolts, shall be galvanized after fabrication.
  - Galvanizing of helical plates shall be done following welding to the central shaft of the lead section or the extension such that the entire assembly is galvanized after fabrication. Galvanization shall be hot-dipped in accordance with ASTM A153
7. Use helical piles with an ICC Evaluation Service, Inc. (ICC-ES) report. Helical piles without an ICC-ES report may be approved at the discretion of the Engineer. Provide couples, thread bar adapters, and bolts recommended by the Pile Manufacturer to connect helical piles together and to piles.

## **8. Manufacturers**

Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

- Foundation Technologies, Inc.
- Foundation Supportworks, Inc.
- Approved equal

### **999.2.01 Delivery, Storage, and Handling**

Do not deform or bend shaft or helical plates on helical piles during handling and storage. Place helical piles to be stored for a prolonged period on enough skids to prevent ground contact and deflection. Keep the helical piles fully drained.

## **999.3 Construction Requirements**

### **999.3.01 Personnel**

Construct helical piles and supervise the work with personnel who are experienced in this type of work. Visit and examine the work site and all conditions and take into consideration all such conditions that may affect the work. At least 30 days prior to beginning helical pile work, submit to the Engineer for review and approval the following proof of the ability of the personnel to install helical piles.

1. Evidence of the successful completion of at least five projects similar in concept and scope to the proposed foundation. Include names, addresses and telephone numbers of the owners' representatives for verification.
2. Resumes of employees performing this work. Provide evidence showing that each employee possesses experience and knowledge similar in concept and scope of this work for performing. The owner will be sole judge of the qualification of the employees.
3. A detailed sequence of construction that describes all materials, methods and equipment to be used to complete the helical pile work.

Do not begin helical pile construction until the qualifications, construction plan and methods have been approved in writing by the Engineer.

### **999.3.02 Equipment**

#### **A. Torque Motor**

Use a rotary type, hydraulic power drive torque motor with clockwise and counterclockwise rotation capabilities. The torque motor shall:

- Be capable of continuous adjustment to revolutions per minute (rpm) during installation

- Provide a torque capacity 15% greater than the torsional strength rating of the central steel shaft to be installed
- Helical Piles should be installed with high torque, low RPM torque motors, which allow the helical screw plates to advance with minimal soil disturbance.
- Equipment shall be capable of applying adequate down pressure (crowd) and torque simultaneously to suit project soil conditions and load requirements. The equipment shall be capable of continuous position adjustment to maintain proper helical pile alignment.

## **B. Installation Tooling**

Use tools in accordance with the manufacturer's written installation instructions. Installation tooling should be maintained in good working order and be safe to operate at all times. Flange bolts and nuts should be regularly inspected for proper tightening torque. Bolts, connecting pins, and retainers should be periodically inspected for wear and/or damage and replaced with identical items provided by the manufacturer. Heed all warning labels. Worn or damaged tooling should be replaced.

Use a torque indicator during helical pile installation. The torque indicator shall:

- Be an integral part of the installation equipment or externally mounted in-line with the installation tooling
- Provide continuous measurement of applied torque throughout the installation
- Be capable of torque measurements in increments of at least 500 ft-lb
- Be calibrated prior to pre-production testing or start of work. Torque indicators which are an integral part of the installation equipment shall be calibrated on-site. Torque indicators which are mounted in-line with the installation tooling, shall be calibrated either on-site or at an appropriately equipped test facility. Indicators that measure torque as a function of hydraulic pressure shall be calibrated at normal operating temperatures.
- Be re-calibrated, if in the opinion of the Engineer and/or Contractor reasonable doubt exists as to the accuracy of the torque measurements.

## **999.3.03 Construction**

The helical pile installation technique shall be such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

### **A. Install Lead Section**

Position the lead section at the location as shown on the working drawings. Battered helical piles can be positioned perpendicular to the ground to assist in initial advancement into the soil before the required batter angle shall be established.

Advance the helical pile in a smooth, continuous manner at a rate of rotation of 5 to 20 revolution per minute (rpm).

### **B. Install Extensions**

Provide extension sections to obtain the required minimum overall length and installation torque as shown on the shop drawings. Connect sections together using coupling bolt(s) and nut torqued to installer's recommendation.

Apply sufficient crowd to uniformly advance the helical pile sections at a rate approximately equal to the pitch of the helix plate per revolution. Adjust the rate of rotation and magnitude of downward pressure for different soil conditions and depths.

### **C. Termination Criteria**

The shop drawings submitted by the contractor shall clearly indicate the termination criteria for the helical piles.

### 999.3.04 Quality Acceptance

#### A. Installation Tolerance

- Install helical piles within 3-inches of the indicated plan location.
- Do not allow the helical pile to deviate from the design alignment by more than 2-degrees.
- Top elevation of helical piles shall be within 2-inches of the design vertical elevation.

#### B. Load Test

A minimum of (1) load-test shall be conducted on site. The contractor shall submit the proposed location to the geotechnical engineer and structural engineer for review. The contractor shall be responsible for installation, execution, monitoring and documentation associated with the load test. The owner's inspector shall be present during the testing to witness the testing and provide independent documentation of the testing procedures and results. The contractor shall submit the testing procedure and equipment calibrations to the geotechnical engineer and structural engineer for review. The contractor shall submit a final report to the engineer prior to beginning production piles for project record. The contractor's engineer shall review the results and provide a signed and sealed cover letter confirming the load test satisfied the allowable capacities specified in plans.

### 999.4 Measurement

The work will be paid for at the Contract Price per Lump Sum, complete in place.

### 999.5 Payment

The work will be paid for at the Contract Price per Lump Sum, complete in place.

Payment is full compensation for all costs of complying with this Special Provision, including incidentals and additional work.

Payment will be made under:

Item No. 999	Helical Pile Foundation	Per lump sum
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