SP-155067
(New)

SPECIAL PROVISIONS
FOR
HELICAL SCREW FOUNDATION PILES

Des Moines County
EDP-0977(653)--7Y-29

Effective Date
June 15, 2021

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

155067.01 DESCRIPTION.

A. Description.

1. Subsurface soils investigations have been made at project site.
   - **a.** Soils information was obtained for use in preparing foundation design.
   - **b.** Examine site and soils report and determine character of materials to be encountered.

2. **Definitions.**
   Helical Screw Foundation (HSF) Piles: A small diameter, soil displaced, cast-in-place screw pile, in which most of the applied load is resisted by the steel shaft and steel reinforcement.

B. Quality Assurance.

1. Assume complete responsibility for design and installation of the HSF piles, as well as damage resulting from installation of piles.

2. **Contractor Qualifications.**
   - **a.** HSF Contractor shall be an authorized Helical Screw Foundation Pile Manufacturer certified contractor. Certification documents shall be provided upon request.
   - **b.** The HSF pile contractor shall be fully experienced in all aspects of HSF pile design, construction, and load testing HSF piles. The contractor must have successfully completed at least five projects in the last 5 years of similar scope and size.
   - **c.** Contractor shall provide names and written verification of relevant experience of all key on-site personnel assigned to be materially involved with the work. Key personnel shall have experience on at least five projects of similar scope over the 5 years. These personal shall include foreman, machine operator and project engineer/manager “In Responsible Charge” of supervising the work.
   - **d.** Contractor shall retain the services of a Professional Engineer licensed in the State of Iowa.

3. **Design Criteria.**
   - **a.** HSF piles shall achieve a minimum capacity of 20 kips downward and 10 kips uplift.
   - **b.** Indicated minimum required capacities are unfactored service loads.

4. **Tolerances.**
   - **a.** Centerline of HSF Pile shall not be more than 3 inches from indicated plan location.
   - **b.** HSF Pile plumbness shall be within 2 Deg. of design alignment.
   - **c.** Top of HSF Pile shall be within plus +1 inch or -3 inches of design vertical elevation.

5. All HSF Piles shall be installed in the presence of the Engineer.

6. **Site Tests.**
   - **a. Pre-Production Pile Tests.**
     - **1)** Load Test Procedures: ASTM D1143
     - **2)** Conduct load tests to verify design torque and embedment depth.
     - **3)** Test one sacrificial pile to twice design load.
     - **4)** Conduct test prior to installation of production piles.
     - **5)** Use the quick load test method.
     - **6)** Test deemed acceptable if test load can be maintained for 30 minutes and no more than 0.3 inches of net settlement has occurred. Net settlement is that which remains after test load has been removed.
   - **b. Production Pile Tests.**
     - **1)** Conduct proof load tests on four production piles.
     - **2)** Piles to be tested shall be selected by the Engineer.
     - **3)** Test to design load.
     - **4)** Test deemed acceptable if no more than 0.15 inches of net settlement has occurred.
     - **5)** Production pile tests may be waived if in the opinion of the Engineer, the pre-production test pile satisfactorily represents all production piles.

7. **Corrosion protection.**
   - **a.** Design for aggressive corrosion environment.
   - **b.** Galvanize central lead shaft.
   - **c.** Galvanize central shaft extensions.

8. **Referenced Standards.**
   - **a.** ASTM A29 Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished,
   - **b.** ASTM A36 Standard Specification for Carbon Structural Steel.
   - **c.** ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   - **d.** ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   - **e.** ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   - **f.** ASTM D1143 Standard Test Method for Piles Under Static Axial Compressive Load.
   - **g.** ASTM D3689 Standard Test Method for Individual Piles Under Static Axial Tensile Load.
   - **h.** AWS D1.1 Structural Welding Code – Steel

C. Site Conditions.

1. The Geotechnical Report, including logs of soil borings as shown on the boring location plan, shall be considered to be representative of the in-situ subsurface conditions likely to be encountered on the project site. Said Geotechnical Report shall be used as the basis for designing helical foundation piles.

2. The Contractor shall visit, inspect and evaluate the site and familiarize self with existing site conditions affecting the work. No claims for additional costs will be allowed due to contractor's lack of knowledge to any existing site conditions discernible from site observations, adjoining property and available sources of information.

3. The Contractor shall verify location of underground utilities prior to pile installation.

D. Submittals.

1. Product Data: Submit manufacturer's product data and installation instructions.

2. **Shop Drawings.**
   - **a.** Provide drawings prepared, signed and sealed by Contractor's Registered Engineer, indicating profiles and product components and accessories and indicate the following:
     - **1)** HSF number, location and pattern by assigned identification number.
     - **2)** HSF design load.
     - **3)** Type and size of central steel shaft.
     - **4)** Helix configuration (number and diameter of helix plates).
     - **5)** Minimum effective installation torque.
     - **6)** Minimum overall length.
     - **7)** Inclination of HSF.
     - **8)** Cutoff elevation.
     - **9)** Splice and coupling details.
     - **10)** HSF attachment to pile cap, etc.
   - **b.** Detailed plans for the method proposed for testing the HSF piles. This shall include all necessary drawings and details to clearly describe the test method and equipment proposed.

3. **Project Information.**
   - **a.** Design Data: Design data and calculations prepared, signed, and sealed by Contractor's Registered Engineer.
   - **b.** Manufacturer's certificate that products meet or exceed specified requirements.
   - **c.** Detailed description of the construction procedures proposed for HSF pile installation including, but not limited to, consecutive steps and approximate time required for each step and list of equipment to be used.
   - **d.** Installation Records: Provide the Contracting Authority copies of HSF installation records within 24 hours after each installation is completed. Include, at a minimum, the following information.
     - **1)** Name of project and Contractor.
     - **2)** Name of Contractor's supervisor during installation.
     - **3)** Date and time of installation.
     - **4)** Name and model of installation equipment.
     - **5)** Type of torque indicator used.
     - **6)** Location of HSF by assigned identification number.
     - **7)** Actual HSF type and configuration - including lead section (number and size of helix plates), number and type of extension sections (manufacturer's SKU numbers).
     - **8)** HSF installation duration and observations.
     - **9)** Total length of installed HSF.
     - **10)** Cutoff elevation.
     - **11)** Inclination of HSF.
     - **12)** Installation torque at 1-foot intervals for the final 10 feet.
     - **13)** Comments pertaining to interruptions, obstructions, or other relevant information.
     - **14)** Rated load capacities.
   - **e.** In addition, as-built plans showing the location of the piles, their depth and inclination, and details of their composition shall be submitted within 21 calendar days of the project completion.

f. Field Test Reports: Provide the Contracting Authority copies of field test reports within 24 hours after completion of the load tests. Include, at a minimum, the following information:
1) Name of project and Contractor.
2) Name of Contractor's supervisor during installation.
3) Name of third-party test agency, if required.
4) Date, time, and duration of test.
5) Location of HSF pile by assigned identification number.
6) Type of test (i.e., tension or compression).
7) Description of calibrated testing equipment and test setup.
8) Actual HSF type and configuration - including lead section, number, and type of extension sections (manufacturer's SKU numbers).
9) Steps and duration of each load increment.
10) Cumulative pile-head movement at each load step.
11) Comments pertaining to test procedure, equipment adjustments or other relevant information.
12) Signed by third party test agency representative, registered professional engineer or as required by local jurisdiction.

155067.02 MATERIALS.

A. Acceptable Manufacturers.

1. Manufacturer: AB Chance Company.
Contact: 210 N. Allen St., Centralia, MO 65240; Telephone: (573) 682-5521; Fax: (573) 682-8714; E-mail: hpscontact@hps.hubbell.com; Website: www.abchance.com.

2. Optional Manufacturer: Helical Pier Systems, LTD.
Contact: RR1; S-31A, C-1; Kalenda, BC; Canada V0H1K0; Telephone: (250) 497-8175; Fax: (250) 497-8141; E-mail: ed@hpier.com; Website: www.helicalpiersystems.com

B. Delivery, Storage & Handling.

1. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

2. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

C. Materials.

1. Central Steel Shaft.
Hot rolled Round-Cornered-Square (RCS) solid steel bars, in compliance with ASTM A29. The bar shall be High Strength Low Alloy (HSLA), low to medium carbon steel grade with improved strength due to fine grain size. Minimum yield strength 90 ksi.

2. Helix Bearing Plate.
SS 175 Material: Comply with ASTM A656 or ASTM A1018 with minimum yield strength of 80 ksi. Minimum Plate thickness shall be 3/8 inch. Provide a lead section consisting of 8 inches, 10 inches, and 12 inches or a 10 inches, 12 inches, and 14 inches diameter triple helix.

3. Bolts.
The size and type of bolts used to connect the central steel shaft sections together shall conform to the following ASTM specifications: 7/8 inch diameter bolts per ASTM A193 Grade B7.

4. **Couplings.**
   a. Formed as integral part of the plain and helical extension material.
   b. For Type SS material, the couplings shall be hot upset forged sockets.

5. **Plates, Shapes or Pier Caps.**
   For structural steel plates and shapes for HSF top attachments, conform to ASTM A36 or ASTM A572, Grade 50. Minimum size for compression shall be 6 inch by 6 inch.

6. **Corrosion Protection.**
   Galvanization: All material to be galvanized shall be hot dipped galvanized in accordance with ASTM A153 after fabrication.

7. **Concrete.**
   a. Conform to Special Provisions for Cast-in-Place Concrete.
   b. Grout: shall have a minimum 28 day unconfined compressive strength of 4000 psi when tested in accordance with ASTM C 109.
   c. Test Cylinders: One set of three cubes per pile.

8. **Reinforcing steel.**
   As permitted in Special Provisions for Cast-in-Place Concrete.

9. **Concrete admixtures.**
   As permitted in Special Provisions for Cast-in-Place Concrete.

155067.03 CONSTRUCTION.

A. Examination.

1. Verify that site conditions are acceptable for installation of power installed helical screw foundations.
   a. Verify that all work of other trades is completed to the point where HSF piles may commence without restriction.
   b. Verify that all HSF piles may be installed in accordance with all pertinent codes and regulations regarding such items as underground obstructions, right-of-way limitations, utilities, etc.

2. Do not proceed with installation of power installed helical screw foundation piles until unacceptable conditions are corrected.

B. Installation.

1. **General.**
   a. The HSF installation technique shall be consistent with the geotechnical, logistical, environmental and load carrying conditions of the project.
   b. Comply with the instructions and recommendations of the HSF pile manufacturer.

2. **Termination Criteria.**
   a. Satisfy the minimum installation torque and minimum overall length criteria as shown on the shop drawings and verified by test prior to terminating the HSF pile.
   b. The torque as measured during the installation shall not exceed the torsional strength rating of the central steel shaft.
   c. If the torsional strength rating of the central steel shaft and/or installation equipment has been reached prior to achieving the minimum overall length required, the installer shall have the following options:
      1) Terminate the installation at the depth obtained subject to a production pile proof test and the review and acceptance of the Geotechnical engineer, or:

2) Remove the existing HSF pile and install a new one with fewer and/or smaller diameter helix plates. The new helix configuration shall be subject to review and acceptance of the Geotechnical Engineer. If reinstalling in the same location, the topmost helix of the new HSF pile shall be terminated at least 3 feet beyond the terminating depth of the original HSF.

d. If the minimum installation torque as shown on the shop drawings is not achieved at the minimum overall length, and there is no maximum length constraint, the Contractor shall have the following options:

1) Install the HSF deeper using additional extension sections.

2) Remove the existing HSF and install a new one with additional and/or larger diameter helix plates. The new helix configuration shall be subject to review and acceptance of the Geotechnical Engineer. If reinstalling in the same location, the topmost helix of the new HSF shall be terminated at least 3 feet beyond the terminating depth of the original HSF.

3) De-rate the load capacity of the HSF and install additional pile(s). The de-rated capacity and additional pile location shall be subject to a production pile proof test and the review and acceptance by the Structural Engineer.

e. If the HSF is refused or deflected by a subsurface obstruction, terminate the installation, and remove the pile. Remove the obstruction, if feasible, and reinstall the HSF. If it is not feasible to remove the obstruction, install the HSF at an adjacent location, subject to review and acceptance by the Structural Engineer.

f. If the torsional strength rating of the central steel shaft and/or installation equipment has been reached prior to proper positioning of the last plain extension section relative to the final elevation, the Contractor may remove the last plain extension and replace it with a shorter length extension. If it is not feasible to remove the last plain extension, the Contractor may cut the extension shaft to the correct elevation. Do not reverse (back-out) the helical screw foundation to facilitate extension removal.

g. The average torque for the last 3 feet of penetration shall be used as the basis of comparison with the minimum installation torque as shown on the working drawings. The average torque shall be defined as the average of the last 3 readings recorded at 1 foot intervals.

C. Rejected Piles.

1. Replace rejected piles.

2. Piles may be rejected for following reasons:

a. Piles out of horizontal and vertical alignment, in excess of tolerances indicated.

b. Piles of improper size and depth.

c. Installation not complying with specifications.

3. Pay for additional engineering work required for redesign due to rejected piles.

D. Protection.

Protect installed work from damage due to subsequent construction activity on the site.

155067.04 METHOD OF MEASUREMENT.

Helical foundation piles will not be measured for payment.

155067.05 BASIS OF PAYMENT.

Payment for this item will be incidental to line item Shade Structure.