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This MANU-SPEC™ utilizes the Construction Specifications Institute (CSI) *Manual of Practice*, including *MasterFormat™*, *SectionFormat™* and *PageFormat™*. A MANU-SPEC is a manufacturer-specific proprietary product specification using the proprietary method of specifying applicable to project specifications and master guide specifications. Optional text is indicated by brackets []; delete optional text in final copy of specification. Specifier Notes typically precede specification text; delete notes in final copy of specification. Trade/brand names with appropriate symbols typically are used in Specifier Notes; symbols are not used in specification text. Metric conversion, where used, is soft metric conversion.

This MANU-SPEC specifies power installed helical screw foundations for structural support. This product is manufactured by AB Chance. Revise MANU-SPEC section number and title below to suit project requirements, specification practices and section content. Refer to CSI *MasterFormat* for other section numbers and titles.

SECTION 02450
FOUNDATION & LOAD BEARING ELEMENTS
(HELICAL SCREW FOUNDATIONS)

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Helical Screw Foundations for Structural Support.

Specifier Note: Revise paragraph below to suit project requirements. If a reader of this section could reasonably expect to find a product or component specified in this section, but it is actually specified elsewhere, then the related section number(s) should be listed in the paragraph below. Add section numbers and titles per CSI *MasterFormat* and specifier's practice. In the absence of related sections, delete paragraph below.

- B. Related Sections:
1. Division 2 Section: Foundation Walls.
 2. Division 2 Section: Electrical and Communication Structures.
 3. Division 2 Section: Anchors.

Specifier Note: Article below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain References Article when specifying products and installation by an industry reference standard. If retained, list standard(s) referenced in this section. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Conditions of the Contract or Division 1 References Section may establish the edition date of standards. This article does not require compliance with standard. It is a listing of all references used in this section.

1.02 REFERENCES

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. ASTM International:
1. ASTM A29/A29M Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for.
 2. ASTM A36/A36M Standard Specification for Carbon Structural Steel.

3. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 4. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 5. ASTM A193/A193M Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 6. ASTM A252 Standard Specification for Welded and Seamless Steel Pipe Piles.
 7. ASTM A320/A320M Standard Specification for Alloy/Steel Bolting Materials for Low-Temperature Service.
 8. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 9. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 10. ASTM A618 Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
 11. ASTM A656 Standard Specification for Hot-Rolled Structural Steel, High-Strength Low-Alloy Plate with Improved Formability.
 12. ASTM A775 Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 13. ASTM A1018 Standard Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, Columbium or Vanadium, and High-Strength Low-Alloy with Improved Formability.
 14. ASTM D1143 Standard Test Method for Piles Under Static Axial Compressive Load.
 15. ASTM D3689 Standard Test Method for Individual Piles Under Static Axial Tensile Load.
- C. Society of Automotive Engineers (SAE):
1. SAE J429 Mechanical and Material Requirements for Externally Threaded Fasteners.

1.03 DEFINITIONS

Specifier Note: Other definitions may be added to suit project requirements and special situations. Consult manufacturer's product literature or contact manufacturer for more information.

- A. Special definitions that apply to this section include:
1. Power Installed Helical Screw Foundation: Consists of steel screw anchors with one or more helix-shaped steel plates attached to a central steel tube. Product is specifically designed for above-grade and on-grade mounting of parking area/site lighting standards. Fabricated from high-strength pipe shafts to resist bending moments and installing-torque ratings. Referred to hereinafter using the abbreviation "HSF."

Specifier Note: Article below should be restricted to statements describing design or performance requirements and functional (not dimensional) tolerances of a complete system. Limit descriptions to composite and operational properties required to link components of a system together and to interface with other systems.

1.04 SYSTEM DESCRIPTION

- A. Design Requirements:
1. Design HSF to meet the specified loads and acceptance criteria as shown on the drawings.
 2. Design power installed HSF application by [A designer employed by HSF manufacturer] [Professional Structural Engineer experienced in design of this work and licensed in {Specify state.}]. Comply with the following requirements:
 - a. Allowable Working Load in Compression (KIPS): [Specify allowable working load in compression (KIPS)].
 - b. Allowable Working Load in Tension (KIPS): [Specify allowable working load in tension (KIPS)].
 - c. Ultimate Structural Capacity in Compression (KIPS): [Specify ultimate structural capacity in compression (KIPS)].
 - d. Ultimate Structural Capacity in Tension (KIPS): [Specify ultimate structural capacity in tension (KIPS)].
 - e. Lateral Load and Bending (KIPS): [Specify Lateral Load and Bending (KIPS)].
 - f. Critical Buckling Load (KIPS): [Specify Critical Buckling Load (KIPS)].
- B. Performance Requirements: Provide power installed HSFs that have been manufactured, fabricated and installed to the

following criteria:

1. Maximum Installing Torque (Foot Pounds): [Specify maximum installing torque (foot pounds)].

Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Conditions of the Contract and Division 1 Submittal Procedures Section.

1.05 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Shop Drawings: Provide drawings 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. HSF attachment to structure relative to grade beam, column pad, pile cap, etc.
- D. Quality Assurance/Control Submittals: Submit the following:
 1. Design Data: Engineer's design data and calculations.
 2. Test Reports: Certified test reports showing compliance with specified characteristics and physical properties.
 3. Certificates: Submit the following:
 - a. Manufacturer's certificate that products meet or exceed specified requirements.
 - b. Manufacturer's Certificate of Registration for ISO 9001 compliance.
 - c. Mill test reports as requested.
- E. Closeout Submittals: Submit the following:
 1. Installer's Field Reports: Accurately record the following: Type, size and actual locations of HSF, torque installation records on all HSF and torque monitoring calibration data.

Specifier Note: Article below should include statements of prerequisites, standards, limitations and criteria that establish an overall level of quality for products and workmanship for this section. Coordinate article below with Division 1 Quality Assurance Section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and who is authorized and trained by the manufacturer to install its products.
- B. Manufacturer Qualifications: Utilize products from a manufacturer maintaining a quality system in compliance with ISO 9001 Requirements.

Specifier Note: Paragraph below should list obligations for compliance with specific code requirements particular to this section. General statements to comply with a particular code are typically addressed in Conditions of the Contract and Division 1 Regulatory Requirements Section. Repetitive statements should be avoided.

- C. Regulatory Requirements and Approvals: [Specify applicable requirements of regulatory agencies].
- D. Certifications: Certified mill test reports for the central steel shaft, as the material is delivered, for record purposes. Provide ultimate strength, yield strength, percent elongation and chemistry composition. [Specify requirement for certifications].

Specifier Note: Retain paragraph below if preinstallation meeting is required.

- E. Preinstallation Meetings: [Specify requirements for meeting.]

Specifier Note: Article below should include specific protection and environmental conditions required during storage. Coordinate article below with Division 1 Product Requirements Section.

1.07 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirement Section.
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

PART 2 PRODUCTS

Specifier Note: Retain article below for proprietary method specification. Add product attributes, performance characteristics, material standards, and descriptions as applicable. Use of such phrases as "or equal" or "or approved equal" or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal and regulatory) and assignment of responsibility for determining "or equal" products.

2.01 HELICAL SCREW FOUNDATIONS

Specifier Note: Paragraph below is an addition to CSI *SectionFormat* and a supplement to MANU-SPEC. Retain, edit or delete paragraph below to suit project requirements and specifier practice.

- A. Manufacturer: AB Chance Company.
 - 1. Contact: 210 N. Allen St., Centralia, MO 65240; Telephone: (573) 682-8414; Fax: (573) 682-8660; E-mail: hpscontact@hps.hubbell.com; Web site: www.abchance.com.
- B. Proprietary Products/Systems: Power Installed Helical Screw Foundations, including the following:
 - 1. AB Chance Helical Screw Foundation:
 - a. Manufacturer Model Number Designation: Type SS5.
 - 2. AB Chance Helical Screw Foundation:
 - a. Manufacturer Model Number Designation: Type SS150.
 - 3. AB Chance Helical Screw Foundation:
 - a. Manufacturer Model Number Designation: Type SS175.
 - 4. AB Chance Helical Screw Foundation:
 - a. Manufacturer Model Number Designation: Type SS200.
 - 5. AB Chance Helical Screw Foundation:
 - a. Manufacturer Model Number Designation: Type SS225.
 - 6. AB Chance Helical Screw Foundation:
 - a. Manufacturer Model Number Designation: Type HS.

Specifier Note: Edit Article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

2.02 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

Specifier Note: Specify materials to be furnished. This article may be omitted and the materials can be included with the description of a manufactured unit, equipment, component or accessory. Retain, edit or delete language to suit project and specifier practice.

2.03 MATERIALS
A. Central Steel Shaft:

1. Consists of lead sections, helical extensions and plain extensions, Type [SS] [HS] [SS to HS Combination Pile].
2. SS5 1 1/2 inch Material: Hot rolled Round-Cornered-Square (RCS) solid steel bars meeting dimensional and workmanship requirements of ASTM A29. The bar shall be modified medium carbon steel grade with improved strength due to fine grain size. Torsional strength rating 5500 ft-lb (7457 N x m). Minimum yield strength 70 ksi (482.6 MPa).
3. [SS150 1 1/2 inch] [SS175 1 3/4 inch] [SS200 2 inch] [SS225 2 1/4 inch] Material: Hot rolled Round-Cornered-Square (RCS) solid steel bars meeting the dimensional and workmanship requirements of 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. Torsional strength rating: [SS150 7000 ft-lb (9491 N x m)] [SS175 10,000 ft-lb (13,558 N x m)] [SS200 15,000 ft-lb (20,337 N x m)] [SS225 20,000 ft-lb (27,116 N x m)]. Minimum yield strength 90 ksi (620.5 MPa).
4. HS 3 1/2 inch OD Material: Structural steel tube or pipe, seamless or straight-seam welded, in compliance with ASTM A53, ASTM A252, ASTM A500 or ASTM A618. Wall thickness is 0.300 inch (Schedule 80). Torsional strength rating 11,000 ft-lb (14,914 N x m). Minimum yield strength 50 ksi (344.7 MPa).
5. SS to HS Combo Pile Material: Type SS and HS material as described above with a welded adapter for the transition from SS to HS.

B. Helix Bearing Plate:

1. Hot rolled carbon steel sheet, strip or plate formed on matching metal dies to true helical shape and uniform pitch. Bearing plate material shall conform to the following ASTM specifications.
2. SS5 Material: Comply with ASTM A572, ASTM A1018 or ASTM A656 with minimum yield strength of 50 ksi (344.7 MPa). Plate thickness 3/8 inch (9.5 mm).
3. [SS150] [And] [SS175] Material: Comply with ASTM A656, or ASTM A1018 with minimum yield strength of 80 ksi (551.6 MPa). Plate thickness 3/8 inch (9.5 mm).
4. [SS200] [And] [SS225] Material: Comply with ASTM A656, or ASTM A1018 with minimum yield strength of 80 ksi (551.6 MPa). Plate thickness 1/2 inch (12.7 mm).
5. HS Material: Comply with ASTM A36, ASTM A572, ASTM A1018 or ASTM A656 depending on helix diameter, per the minimum yield strength requirements cited above. Plate thickness 3/8 inch (9.5 mm).

C. Bolts:

1. The size and type of bolts used to connect the central steel shaft sections together shall conform to the following ASTM specifications: [SS5 and SS150 1 1/2 inch Material: 3/4 inch diameter bolt per ASTM A320 Grade L7.] [SS175 1 3/4 inch Material: 7/8 inch diameter bolt per ASTM A193 Grade B7.] [SS200 2 inch Material: 1 1/8 inch diameter bolt per ASTM A193 Grade B7.] [SS225 2 1/4 inch Material: 1 1/4 inch diameter bolt per ASTM A193 Grade B7.] [HS 3 1/2 inch OD Material: 3/4 inch diameter bolts (3 per coupling) per SAE J429 Grade 5].

D. Couplings:

1. Formed as integral part of the plain and helical extension material.
2. [For Type SS material, the couplings shall be hot upset forged sockets.] [For Type HS material, the couplings shall be hot forge expanded sockets].

E. Plates, Shapes or Pier Caps: For structural steel plates and shapes for HSF top attachments, conform to ASTM A36 or ASTM A572, Grade 50.

Specifier Note: Corrosion protection is a function of structure type, service life, loading condition and the overall aggressiveness of the project soils. The need for corrosion protection of HSFs subjected to tension loads must be carefully determined and specified as necessary. Corrosion resistant coatings (i.e., epoxy, plastic sheath) on the lead section are impractical due to abrasive action wearing off the coating as the soil flows over the helix plates and around the central steel shaft. Hot dip galvanization is the only practical means to provide a corrosion resistant coating capable of withstanding the rigors of installation. Extension sections are typically hot-dip galvanized, but other coatings can be specified. Retain, edit or delete language below to suit project requirements and specifier practice.

F. Corrosion Protection:

1. Epoxy Coating: Electrostatically apply coating to the central steel shaft to a thickness of 7 - 12 mil (0.178 - 0.305 mm)

in accordance with ASTM A775. Bend test requirements are not required. Coupling bolts, nuts and displacement plates are not required to be epoxy coated.

2. Galvanization: All [Type SS material shall be hot dipped galvanized in accordance with ASTM A153] [Type HS material shall be hot dipped galvanized in accordance with ASTM A153] after fabrication.

PART 3 EXECUTION

Specifier Note: Article below is an addition to the CSI *SectionFormat* and a supplement to MANU-SPEC. Revise article below to suit project requirements and specifier’s practice.

3.01 MANUFACTURER’S INSTRUCTIONS

- A. Comply with the instructions and recommendations of the power installed HSF manufacturer.

Specifier Note: Specify requirements where an unusually high quality of workmanship is required. Retain, edit or delete to suit project requirements.

3.02 ACCEPTABLE INSTALLERS

- A. [Specify acceptable installers and contact information.].

Specifier Note: Specify actions to physically determine that conditions are acceptable to receive primary products of the section.

3.03 EXAMINATION

- A. Site Verification of Conditions:
 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 HSFs may commence without restriction.
 - b. Verify that all HSFs 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 foundations until unacceptable conditions are corrected.

Specifier Note: Coordinate article below with manufacturer’s recommended installation requirements.

3.04 INSTALLATION

- A. General:
 1. The HSF installation technique shall be consistent with the geotechnical, logistical, environmental and load carrying conditions of the project.

Specifier Note: Helical screw piers are designed to be installed with high torque, low RPM torque motors, which allow the helical screw plates to advance with minimal soil disturbance.

2. Installation equipment shall be rotary type, hydraulic power driven torque motor with clockwise and counterclockwise rotation capabilities.
 - a. Utilize a torque motor capable of continuous adjustment to number of revolutions per minute (RPM) during installation and with a torque capacity 15% greater than the torsional strength rating of the central steel shaft to be installed. Do not use percussion drilling equipment.
 - b. Utilize equipment capable of applying adequate downward pressure and torque simultaneously to suit project soil conditions and load requirements, and capable of continuous position adjustment to maintain proper HSF alignment.
3. Installation tooling shall consist of a Kelly Bar Adapter (KBA) and Type SS or HS drive tool as manufactured by AB Chance Company.
4. A calibrated torque indicator shall be used during HSF installation. The torque indicator may be an integral part of the installation equipment or externally mounted in-line with the installation tooling.

- B. Central Steel Shaft Installation Procedure:

1. Engage and advance HSF into soil in a smooth, continuous manner at a rate of rotation of 5 - 20 RPM. Provide extension sections to obtain the required minimum overall length and installation torque as shown on the working drawings. Connect sections together using coupling bolt and nut tightened to torque of 40 ft-lb (54 N x m).
 2. Apply sufficient down pressure to uniformly advance the HSF sections approximately 3 inches (76 mm) per revolution. Adjust rate of rotation and magnitude of down pressure for different soil conditions and depths.
- C. Termination Criteria:
1. Satisfy the minimum installation torque and minimum overall length criteria as shown on the working drawings prior to terminating the HSF.
 2. The torque as measured during the installation shall not exceed the torsional strength rating of the central steel shaft.
 3. 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:
 - a. Terminate the installation at the depth obtained subject to the review and acceptance of the Owner, or:
 - b. Remove the existing HSF 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 Owner. If reinstalling in the same location, the topmost helix of the new HSF shall be terminated at least 3 feet (1 m) beyond the terminating depth of the original HSF.
 4. If the minimum installation torque as shown on the working drawings is not achieved at the minimum overall length, and there is no maximum length constraint, the Contractor shall have the following options:
 - a. Install the HSF deeper using additional extension sections.
 - b. 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 Owner. If reinstalling in the same location, the topmost helix of the new HSF shall be terminated at least 3 feet (1 m) beyond the terminating depth of the original HSF.
 - c. 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 the review and acceptance by the Owner.
 5. 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 Owner.
 6. 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.
 7. The average torque for the last 3 feet (1 m) 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 (0.3 m) intervals.

Specifier Note: The tolerances quoted in this section are suggested maximums. The actual values established for a particular project will depend on the structural application.

- D. Site Tolerances: Install HSF to the following allowable variation:
1. Centerline of piling shall not be more than 3 inches (76 mm) from indicated plan location.
 2. Pile plumbness shall be within 2 degrees of design alignment.
 3. Top elevation of pile shall be within +1 inch (25 mm) to -2 inches (50 mm) of the design vertical elevation.

Specifier Note: Specify the tests and inspections required for installed or completed work. Retain, edit or delete to suit project requirements.

3.05 FIELD QUALITY CONTROL

Specifier Notes: The manufacturer provides extensive information on load test procedures and acceptance criteria. Specific procedures and criteria will vary depending on project requirements. Consult manufacturer for more information. Specify to suit project

requirements and specifier practice.

- A. Site Tests:
 - 1. Load Test Procedures (ASTM D1143, ASTM D3689): [Specify load test procedures and applicable standards here and above under References article.].
 - 2. Acceptance Criteria: [Specify acceptance criteria and applicable standards here and above under References article.].
- B. Site Test Records: Provide the Owner 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 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.
- C. Installation Records: Provide the Owner 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 (0.3 m) intervals for the final 10 feet (3.1 m).
 - 13. Comments pertaining to interruptions, obstructions or other relevant information.
 - 14. Rated load capacities.

Specifier Note: Specify provisions for protecting work after installation but prior to acceptance by the owner. Coordinate article below with Division 1 Execution Requirements Section.

3.06 PROTECTION

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

END OF SECTION