

## **MACLEAN/DIXIE HELICAL ANCHORING SYSTEMS SPECIFICATIONS**

- Helix piers shall be manufactured by MacLean/Dixie Anchoring Systems, Birmingham, Alabama.
- Helix piers shall be installed by an authorized MacLean/Dixie Anchoring Systems contractor who has satisfied the certification requirements relating to the technical aspects of the product and the ascribed installation techniques. Proof of current certification by the MacLean/Dixie Anchoring Systems must be provided.
- All work as described herein shall be performed in accordance with all applicable safety codes in effect at the time of installation.
- Helix pier materials shall have ICC REPORT No. PFC-5551.
- The helix lead sections and extensions shall be solid steel, rounded corner square shaft configuration, with one or more helix bearing plates welded to the shaft.
- All helix shafts and helices must be corrosion protected by hot dip galvanization per ASTM A153.
- Installation units shall consist of a rotary type torque motor with forward and reverse capabilities. These units shall be either electrically or hydraulically powered.
- Installation units shall be capable of developing the minimum torque as required to develop the minimum capacities specified on the plans.
- Installation units shall be capable of positioning the helix at the proper installation angle. This angle may vary between vertical and 5 degrees depending upon application and type of foundation termination specified.
- Installation torque shall be monitored throughout the installation process.
- Helix piers shall be installed at the locations shown on the plans to the minimum torque value required to provide the load capacities specified on the plans.
- The appropriate steel underpinning bracket or new construction cap shall be used.
- Appropriate helix pier selection will consider load plus safety factor (which may be specified on the plans), soil parameters and the installation torque versus capacity equation as per the manufacturers recommendations.

## END OF SPECIFICATION

Extended Helix Pier Specification organized in accordance with CSI specifications:

## STEEL HELIX PIERS

### PART 1: GENERAL

#### 1.1 DESCRIPTION:

- A) The work of this section consists of furnishing and installing steel helix piers manufactured by MacLean/Dixie Anchoring Systems, Birmingham, Alabama.
- B) Steel helix piers shall be designed and installed to resist the unfactored design loads as shown on Sheet S-\_\_\_\_. The geotechnical report \_\_\_\_\_ for the site dated \_\_\_\_\_ by \_\_\_\_\_ is included in this project manual as specification section \_\_\_\_\_.
- C) Related Work Specified Elsewhere: \_\_\_\_\_

#### 1.2 QUALITY ASSURANCE

- A) Installer Qualifications: Installation shall be done by a MacLean/Dixie Anchoring Systems authorized installation contractor. Proof of current certification with the MacLean/Dixie Anchoring Systems shall be submitted to the Structural Engineer prior to starting installation.
- B) A soils engineer's representative shall be present during installation of the helix piers.
- C) Welding: Meet requirements of AWS "Structural Welding Code," D1.1, latest edition. All welders shall be AWS certified.

#### 1.3 SUBMITTALS

- A) Submit shop drawings indicating shaft and helix sizes, and include manufacturer's catalog cuts and data sheet.

## **PART 2: PRODUCTS**

### **2.1 MATERIAL**

- A) The steel helix piercing system shall be ICC REPORT listed. Installing contractor shall furnish evidence to the Structural Engineer by means of the ICC REPORT Evaluation Report number PFC-5551.
  
- B) Pier Hubs (Lead Section and Extensions):
  - 1. The 1 1/4-, 1 1/2-, and 1 3/4-inch round cornered square (RCS) solid steel shafts shall be formed from hot-wrought carbon steel and shall conform to ASTM A576 and the following descriptions:
    - a) Grade C-1045, having a minimum yield strength of 45 ksi (310 Mpa) and a minimum tensile strength of 82 ksi (565 Mpa), or
    - b) Grade 1530M, having a minimum yield strength of 60 ksi (414 Mpa) and a minimum tensile strength of 110 ksi.
  - 2. The round cornered square (RCS) solid steel shafts shall conform to the following torque rating (torsional force):
    - a) 3,400 ft-lbs (4.61 kN-m) for 1 1/4-inch (31.8 mm) RCS shafts.
    - b) 6,000 ft-lbs (8.14 kN-m) for 1 1/2-inch (38 mm) RCS shafts.
    - c) 10,000 ft-lbs (13.56 kN-m) for 1 3/4-inch (45 mm) RCS shafts.
  
- C) Helical Plates:
  - 1. Helical plates shall be either 3/8- or 1/2-inch thick and shall conform to the following ASTM specification:
    - a) Hot-wrought carbon steel helical plates shall conform to ASTM A36, with a minimum yield strength of 36 ksi (248 Mpa) and a minimum tensile strength of 58 ksi (400 Mpa).
  
- D) Bolts / Nuts:

1. The sizes and types of bolts and nuts used to connect the helix pier extensions to lead sections or another extension shall conform to the following ASTM specifications:
  - a) Coupling bolts shall be 5/8-, 3/4- or 7/8-inch diameter and shall comply with ASTM A325 Type 1, and shall have a Class C, hot-dipped, zinc coating that complies with ASTM A153.
  - b) Coupling nuts shall conform to either ASTM A194 Grade 2H or ASTM A563 Grade DH and shall have a Class C, hot-dipped, zinc coating that complies with ASTM A153.
- E) Couplings: Couplings will be formed as an integral part of (RCS) shaft extension material through a forging process.
- F) Finish: All other material shall have a Class B1, hot-dipped, galvanized coating, complying with ASTM A153.

## **PART 3: EXECUTION**

### **3.1 EQUIPMENT:**

- A) Installation Equipment:
  1. Shall be a rotary type motor with equal forward and reverse torque capabilities. This equipment shall be capable of continual adjustment of the torque drive unit's revolutions per minute (RPM's) during installation. Percussion drilling equipment will not be allowed.
  2. Shall be capable of applying installation torque equal to the torque required to meet the pier loads.
  3. Equipment shall be capable of applying down pressure and torque simultaneously.
- B) Torque Monitoring Devices:
  1. The torque being applied by the installing units shall be monitored throughout the installation by the installer. The torque monitoring device shall either be a part of the installing unit or an independent device in-line with the installing unit. Calibration for either unit shall be available for review by the owner.

### **3.2 INSTALLATION PROCEDURES:**

#### **A) Advancing Sections:**

1. Engage and advance the helix pier sections in a smooth, continuous manner with the rate of pier rotation in the range of 5 to 20 RPM.
2. Apply sufficient down pressure to uniformly advance the helix sections to approximately 3-inches (76.2 mm) per revolution. The rate of rotation and magnitude of down pressure must be adjusted for different soil conditions and depths in order to maintain the penetration rate.
3. If the helix section ceases to advance, refusal will have been reached and the installation shall be terminated.

#### **B) Termination Criteria:**

1. The torque as measured during the installation shall not exceed the torsional strength rating of the steel helix lead and extension sections.
2. The minimum depth criteria indicated on the Drawings must be satisfied prior to terminating the steel helix pier.
3. The top helix is to be located not less than five (5) feet (1.5 m) below the bottom of the foundation.
4. If the torsional strength rating of the pier and/or installing unit has been reached prior to satisfying the minimum depth required, the installing contractor shall have the following options:
  - a) Terminate the installation at the depth obtained with the approval of the Structural Engineer or
  - b) Remove the existing pier and install a pier with smaller and/or fewer helices. This revised pier shall be terminated at least three (3) feet (0.9 m) beyond the terminating depth of the original pier.
5. In the event the minimum installation torque is not achieved at minimum depth, the Contractor shall install the foundation deeper using additional plain extension sections.
6. The average torque for the last 3 feet (0.9 m) of penetration shall be used as a basis of comparison with the minimum recommended installation torque. The average torque is the average of the last three readings recorded at 1 foot (0.3 m) intervals. This average torque is intended solely as an indication of the pier's ultimate compression capacity.

7. The installer shall keep a written installation record for each helix pier. This record shall include the following information:
  - a) Project name and location.
  - b) Name of authorized and certified dealer and installer.
  - c) Name of installer's foreman or representative witnessing the installation.
  - d) Date of installation.
  - e) Location of helix pier.
  - f) Description of lead section including number and diameter of helices and extensions used.
  - g) Overall depth of installation from a known reference point.
  - h) Installation torque at termination of pier.

**END OF SPECIFICATION**

## **FIELD INSPECTION**

The following items should be verified in the field by the field inspector:

- A. Installing contractor certification by the helix screw pile or tension anchor manufacturer, if required. The installing contractor should produce a certification card signed by an authorized representative of the manufacturer.
- B. Helix screw pile or tension anchor material verification. Verify the steel materials by checking the material code on the shaft of each pile or anchor. The installing contractor will show the inspector where to find the manufacturer code, if one exists, on each pile or anchor lead section or extension and what the codes mean from literature produced by the manufacturer.
- C. Verify helix screw pile or tension anchor locations. Are the piles or anchors laid out in the correct horizontal and vertical locations?
- D. Verify depths of helix screw piles or tension anchors. Have the pile or anchor depths been recorded? Have the piles or anchors been installed at least to the minimum specified depth, if any?
- E. Installation torque. Has each helix screw pile or tension anchor been installed to the specified capacity as determined by the torque readings? This is accomplished by correlating installation torque hydraulic pressure in the torque motor with the “Shear Pin Torque Indicator”, a device that uses metal shear pins to measure the torque exactly. Once the inspector is satisfied a particular pressure reading correlates to the required torque, the shear pin torque indicator need not be used. If there is no pressure gauge to measure hydraulic pressure, then the shear pin torque indicator must be used to verify installation torque for each pile or anchor.
- F. Vertical location of the top of helix screw piles or ends of tension anchors.
- G. Verification that the type of load transfer device is what is specified.
- H. For tiebacks, verify the post tension load, if specified, is placed on the tieback. This is accomplished by the installing contractor with the use of a center-hole hydraulic ram with load calibrated to a pressure gauge.