

GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

CODE AMENDMENT FORM

ITEM NO: _____ (DCA USE ONLY) PAGE 1 OF 2

CODE: IBC Chapter 18 SECTION: 1810.3.1.5

PROPONENT: Cantsink Manufacturing DATE: Nov. 16, 2017

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CHECK ONE: Revise section to read as follows: Add new section to read as follows:
 Delete section and substitute the following: Delete without substitution:

~~LINE THROUGH MATERIAL TO BE DELETED~~ UNDERLINE MATERIAL TO BE ADDED

Approve Approve as amended (DCA STAFF ONLY) Disapprove Withdrawn

DESCRIPTION:

Helical piles are defined in section 1802.1, and may be used to support axial compression, or resist axial tension and lateral loads. Pursuant to section 1810.3.1.5, request is hereby made to amend the language as follows: “Helical piles shall be designed and manufactured in accordance accepted engineering practice to resist all stresses induced by installation into the ground and service loads, and which have been tested and evaluated in accordance with ICC-ES AC 358, (Acceptance Criteria for Helical Foundation Systems and Devices), or be required to conduct load testing for verification in meeting the load specifications”.

The Code Amendment request is to recognize the use of only certified helical piles that have an evaluation report issued in accordance with ICC-ES AC 358, or require load testing for non-certified piles & anchors.

REASON/INTENT:

To recognize the use of tested and evaluated products that meet the guidelines noted in ICC-ES AC 358. The use of tested and documented capacities of helical pile systems will enhance the building process of providing sound foundation systems when helical piles are specified, and removes subjectivity outside of code officials.

FINANCIAL IMPACT OF PROPOSED AMENDMENT:

There are many helical pile manufacturers that have received evaluation reports that meet ICC-ES AC 358 guidelines. Since the use of helical piles is approved through IBC under section 1802, the financial burden is placed on the individual Owner / Contractor to choose the system or installer that offers the most value. Helical piles are generally used for deep foundation support, along with other methods based on engineers design. In most cases the Owner / Contractor has options based on the Engineer’s recommendations. Thus we anticipate minimal financial impact relative to the current changes being incurred. Supporting ESR’s are attached.

GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

CODE AMENDMENT FORM INSTRUCTION SHEET

1. Do not complete the line entitled “Item No. _____”.
2. Use a separate form for each proposed code amendment.
3. “Sheet ____ of _____” indicates the number of sheets for each individual proposed code amendment, not the number of sheets for all the amendments submitted.
4. Identify the code and code section that is the subject of the proposed amendment.
5. The proponent’s name, address, telephone number and fax number must be filled out completely.
6. Be sure to indicate the type of recommended action in the space referred to as “Check One”.
7. If the proposed amendment revises the language of the code section, deletes the entire code section, or deletes the entire code section and offers substitute language, include the language of the present code section and line through the language to be deleted and underline the language of the proposed amendment.
8. Under the “Reason” section, provide the reasoning behind the proposed code amendment. The reason should be clear and concise. Test reports, standards or other supporting information and documentation may be submitted with the proposed amendment and must be attached to the amendment form.
9. **A Statement of Financial Impact must accompany all proposed code amendments.** The statement should be clear and concise. Test reports, standards or other supporting information and documentation may be submitted with the proposed amendment and must be attached to the amendment form.
10. **All proposed amendments must be typed and completed in full and the original submitted to the Codes and Industrialized Buildings Section of the Department of Community Affairs NO LATER THAN DECEMBER 15TH.** The proposed code change shall be submitted for review to the State Codes Advisory Committee at their quarterly meeting in January. An incomplete form will be sent back to the proponent for completion. An amendment submitted after the submittal deadline date will be returned to the proponent.
11. The proponent will be notified when the proposed amendment will be considered by the State Codes Advisory Committee.
12. Information concerning submittal of code amendments, including deadline dates for submittal, can be obtained by contacting the Codes and Industrialized Buildings Section at (404) 679-3118. All proposed code amendments should be submitted to:

The Department of Community Affairs
Codes and Industrialized Buildings Section
60 Executive Park South, NE
Atlanta, Georgia 30329-2231



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ESR-1559

Reissued 12/2016

This report is subject to renewal 12/2018.

DIVISION: 31 00 00—EARTHWORK

SECTION: 31 63 00—BORED PILES

REPORT HOLDER:

CANTSINK MANUFACTURING, INC.

71 FIRST AVENUE

LILBURN, GEORGIA 30047

EVALUATION SUBJECT:

CANTSINK HELICAL PILE FOUNDATION SYSTEMS



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DIVISION: 31 00 00—EARTHWORK
Section: 31 63 00—Bored Piles

REPORT HOLDER:

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EVALUATION SUBJECT:

CANTSINK HELICAL PILE FOUNDATION SYSTEMS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)[†]

[†]The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties evaluated:

Structural and geotechnical

2.0 USES

Cantsink Helical Pile Foundation Systems are used either to underpin foundations of existing structures or to form deep foundations for new structures; and are designed to transfer compression and tension loads from the supported structure to suitable soil bearing strata. Underpinning of existing foundations is generally achieved by attaching the helical piles to the repair brackets, which support compression loads. Deep foundations for new construction are generally obtained by attaching the helical piles to new construction brackets that are embedded in concrete pile caps or grade beams, which support both compression and tension loads.

When helical piles are installed under the IRC, an engineered design is required in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 GENERAL:

The Cantsink Helical Pile Foundation Systems consist of a helical pile lead section, optional extension sections, and a bracket that allows attachment to the foundation of the supported structure. The helical pile is screwed into the ground by applying torsion to a desired depth and suitable soil bearing strata. The bracket is then installed to connect the pile to the concrete foundation of the supported structure.

3.2 System Components:

3.2.1 Shafts: The lead sections consist of 2⁷/₈-inch-
outside-diameter (73 mm) round steel tubing (round
HSS2.875x0.203) having a nominal wall thickness of
0.203 inch (5.16 mm). The helical plates, which are
factory-welded to the lead, allow advancement into the
soil as the pile is rotated. The helical plates are
hexagonally shaped with an area equal to a helix of
either 8-, 10-, 12- or 14-inch outside diameter (203, 254,
305 or 356 mm), and are made from 3¹/₈-inch-thick
(9.5 mm) steel plates. The helical plates are formed with
a 3-inch (76 mm) pitch and radially stiffening ribs, and
are then factory-welded to the lead. The extension
sections are similar to the lead sections, except that the
extensions do not have helical plates. Extension
sections have a factory cold-formed bell-shaped end
segment to fit over the lead shaft or other extension
sections. Connection of extension sections to the lead
shaft or other extension sections is made by through-
bolted connections with three 3³/₄-inch-diameter (19 mm)
steel bolts through the extension bell-shaped segment
and the connected lead or other extensions. Leads and
extensions may be either bare steel or hot-dipped
galvanized in accordance with ASTM A123, with a
minimum coating thickness of 0.005 inch per side
(0.127 mm). See Figures 4 and 5 of this report.

3.2.2 Foundation Attachments (Brackets):

3.2.2.1 Repair Bracket: A foundation repair bracket is
used to transfer compressive loads from existing
concrete foundations to a helical pile. The main body of
the bracket is cut from square HSS10x10x3³/₈ inch
(254 by 254 by 9.5 mm) steel tubing. The 12-inch-wide-
by-11-inch-high (305 mm by 279 mm) steel shelf and
supporting tabs are cut from 1¹/₄-inch-thick (6 mm) ASTM
A36 steel and are factory-welded to the HSS main body.

A lifting T-pipe consists of a rectangular HSS3 x 2 x 1/4 inch (76 by 51 by 6 mm) steel tubing and a 2 3/8-inch-outside-diameter (60 mm) round steel tubing (round HSS2.375 x 0.154) having a nominal wall thickness of 0.154 inch (4 mm) and a length of 48 inches (1219 mm). The lifting T-pipe is connected to the bracket main body through two 7/8-inch-diameter (22 mm) steel threaded rods, two matching steel nuts and matching steel washers. See Figures 2 and 3 of this report. The repair bracket may be either bare steel or hot-dipped galvanized in accordance with ASTM A123 with a minimum coating thickness of 0.005-inch per side.

3.2.2.2 New Construction Bracket: This bracket is embedded into concrete footings, grade beams, or pile caps. It comes in two configurations. The first configuration, identified as NCB-C, which is used for compression load transfer only consists of an 8-by-8-by-3/8-inch (203 by 203 by 9.5 mm) bare steel plate factory-welded to 2 3/8-inch-outside-diameter (60 mm) bare steel round tubing (round HSS2.375 x 0.154) having a nominal wall thickness of 0.154 inch (3.91 mm) and a length of 2 inches (51 mm). The second configuration, identified as NCB-TC, which is used for compression and tension load transfer, consists of an 8-by-8-by-3/8-inch (203 by 203 by 9.5 mm) bare steel plate or coated steel plate hot-dipped galvanized in accordance with ASTM A123, factory-welded to 3 1/2-inch-outside-diameter (89 mm) bare steel round tubing (round HSS3.5x 0.216) having a nominal wall thickness of 0.216 inch (5.49 mm) and a length of 6 inches (152 mm). This configuration also includes three predrilled hole locations used to receive three (3) 3/4-inch-diameter (19 mm) bolts. See Figure 1.

3.3 Material Specifications:

3.3.1 Helical Plates: The carbon steel plates conform to ASTM A36, having a minimum yield strength of 36,000 psi (248 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The helical plates and the shafts to which they are factory-welded may be either bare steel or hot-dipped galvanized in accordance with ASTM A123 with a minimum coating thickness of 0.005 inch per side (0.127 mm).

3.3.2 Leads and Extension Sections: The leads and extension sections are carbon steel round tubes that conform to ASTM A500, Grade B, except for having a minimum yield strength of 50,000 psi (345 MPa) and a minimum tensile strength of 65,000 psi (448 MPa). The leads and extension sections may be either bare steel or hot-dipped galvanized in accordance with ASTM A123 with a minimum coating thickness of 0.005 inch per side (0.127 mm).

3.3.3 Repair Bracket: The square steel tubing used to fabricate the repair bracket main body conforms to ASTM A500 Grade B, having a minimum yield strength of 46,000 psi (317 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The round steel tubing which is part of the lifting T-pipe is made from steel conforming to ASTM A500 Grade B, having a minimum yield strength of 42,000 psi (290 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The rectangular steel tubing which is part of the lifting T-pipe is made from steel conforming to ASTM A500 Grade B, except for having a minimum yield strength of 50,000 psi (345 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The steel shelf plate and supporting tabs are made from ASTM A36 steel having a minimum yield strength of 36,000 psi (248 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The steel threaded rods conform

to ASTM A307 Grade A. ASTM A563 nuts and ASTM F844 washers are used to fasten the threaded rods to the bracket. The repair bracket may be either bare steel or hot-dipped galvanized in accordance with ASTM A123 with a minimum coating thickness of 0.005-inch per side.

3.3.4 New Construction Bracket: The steel plate conforms to ASTM A36, having a minimum yield strength of 36,000 psi (248 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The round steel tubing conforms to ASTM A500, Grade B, and has a minimum yield strength of 42,000 psi (290 MPa) and a tensile strength of 58,000 psi (400 MPa). When required for the NCB-TC, the bolts must comply with Section 3.3.5 of this report. The new construction bracket is made from bare steel or galvanized in accordance with ASTM A123 with a minimum coating thickness of 0.005 inch per side (0.127 mm).

3.3.5 Bolts for Coupling and for NCB-TC: The bolts, used to connect the lead and extension sections or connect shaft with the NCB-TC, conform to ASTM A307 GRADE A and the matching hex nuts conform to ASTM A563, Grade A or ASTM A194, Grade 2H. Bolts and nuts can be either bare steel or hot-dipped galvanized in accordance with ASTM A153.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Engineering calculations and drawings, prepared by a registered design professional, must be submitted to the code official for each project, must be based on accepted engineering principles as described in IBC Section 1604.4, and must conform to 2015, 2012 and 2009 IBC Section 1810 (2006 IBC Section 1808). The load capacities shown in this report are based on allowable stress design (ASD), described in IBC Section 1602 and AISC 360 Section B3.4. The engineering analysis must address helical foundation system performance related to structural and geotechnical requirements. The calculations must address the ability (considering strength and stiffness) of the supported foundation and structure to transmit the applied loads to the helical foundation system and the ability of the helical piles and surrounding soils to support the loads applied by the supported foundation and structure. The structural analysis must consider all applicable internal forces (shear, bending moments and torsional moments, if applicable) due to applied loads, load transfer between the bracket and the pile segments (leads and extensions) and maximum span(s) between helical foundations. The result of the analysis and the structural capacities must be used to select a helical foundation system. The minimum embedment depth for various loading conditions must be included, based on the most stringent requirements of the following: engineering analysis; tested conditions described in this report; a site-specific geotechnical investigation report; and site-specific load tests, if applicable. A soil investigation report must be submitted to the code official as part of the required submittal documents, prescribed in 2015, 2012 and 2009 IBC Section 107 (2006 IBC Section 106), at the time of permit application. The geotechnical report must include, but is not limited to, all the following:

1. A plot showing the location of the soil investigation.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of soil profile.

4. Information on groundwater table, frost depth and corrosion-related parameters, as described in Section 5.5 of this report.
5. Soil design parameters, such as shear strength, soil bearing pressure, unit weight of soil, deformation characteristics and other parameters affecting pile support conditions as defined in 2015, 2012 and 2009 IBC Section 1810.2.1 (2006 IBC Section 1808.2.9).
6. Confirmation of the suitability of helical foundation systems for the specific project.
7. Recommendations for design criteria, including, but not be limited to, mitigation of effects of differential settlement and varying soil strength and effects of adjacent loads.
8. Recommended center-to-center spacing of helical pile foundations, if different from spacing noted in Section 5.14 of this report; and reduction of allowable loads due to the group action, if necessary.
9. Field inspection and reporting procedures (to include procedures for verification of the installed bearing capacity, when required).
10. Load test requirements.
11. Any questionable soil characteristics and special design provisions, as necessary.
12. Expected total and differential settlement.
13. The axial compression and axial tension load soil capacities, if values cannot be determined from this evaluation report.

The allowable axial compressive or tensile load of the helical pile system must be based on the least of the following in accordance with 2015, 2012 and 2009 IBC Section 1810.3.3.1.9:

- Area of the helical bearing plate affixed to the pile shaft times the ultimate bearing capacity of the soil or rock comprising the bearing stratum divided by a safety factor of at least 2. This capacity will be determined by a registered design professional based on site-specific conditions.
- Allowable capacity determined from well-documented correlations with installation torque. Section 4.1.5 of this report includes torque correlation factors used to establish pile capacities based on documented correlations.
- Allowable capacity predicted by dividing the ultimate capacity determined from load tests by a safety factor of at least 2.0. This capacity will be determined by a registered design professional for each site-specific condition.
- Allowable axial capacity of pile shaft and pile shaft couplings. Section 4.1.3 of this report includes the smaller of pile shaft and shaft coupling capacities.
- Allowable axial capacity of helical bearing plates affixed to the pile. Section 4.1.4 of this report includes helical plate axial capacities.
- Allowable axial capacity of the bracket connecting to the foundation. Section 4.1.2 of this report includes bracket capacities.

4.1.2 Bracket Capacity: The concrete foundation must be designed and justified to the satisfaction of the code official with due consideration to the direction and eccentricity of applied loads, including reactions provided by the brackets, acting on the concrete foundation. Only localized limit states of supporting concrete, including punching shear and bearing, have been considered in this evaluation report. Other limit states are outside the scope of this evaluation report and must be determined by the registered design professional. The effects of reduced lateral sliding resistance due to uplift from wind or seismic loads must be considered for each project. Reference Table 2 for the allowable bracket capacities.

4.1.3 Pile Shaft Capacity: The top of the shafts must be braced as described in 2015, 2012 and 2009 IBC Section 1810.2.2 (2006 IBC Section 1808.2.5), and the supported structures such as concrete footings are assumed to be adequately braced such that the supported structures provide lateral stability for the pile systems. In accordance with 2015, 2012 and 2009 IBC Section 1810.2.1 (2006 IBC Section 1808.2.9), any soil other than fluid soil must be deemed to afford sufficient lateral support to prevent buckling of the systems that are braced, and the unbraced length is defined as the length of piles standing in air, water, or in fluid soils plus an additional 5 feet (1524 mm) when embedment is into firm soil, or an additional 10 feet (3048 mm) when embedment is into soft soil. Firm soils must be defined as any soil with a Standard Penetration Test (SPT) blow count of five or greater. Soft soils must be defined as any soil with a SPT blow count greater than zero and less than five. Fluid soils must be defined as any soil with a SPT blow count of zero [weight of hammer (WHO) or weight of rods (WOR)]. Standard Penetration Test blow count must be determined in accordance with ASTM D1586. The ASD shaft capacities recognized in this evaluation report, as listed below, are for helical pile shafts that are installed in fully braced conditions as noted in this section, including piles not standing in air, water, or fluid soils. The shaft capacity of the helical foundation systems in air, water or fluid soils must be determined by a registered design professional:

- **ASD Compression Capacity:** 24,630 lbf (108 kN) for bare steel shaft and bare steel coupling bolts; 29,950 lbf (133 kN) for galvanized shaft and galvanized coupling bolts, for shafts that are sidesway fully braced along its length.
- **ASD Tension Capacity:** 22,712 lbf (101 kN) for bare steel shaft and bare steel coupling bolts; 27,708 lbf (123 kN) for galvanized shaft and galvanized coupling bolts.
- **Torque Rating: 6000 ft-lb (8139 N-m)**

The elastic shortening/lengthening of the pile shaft will be controlled by the strength and section properties of the 2.875-inch-diameter (73 mm) shaft sections and the shaft couplers, as applicable. The mechanical properties of the shaft section are shown in Table 3 and can be used to calculate the shortening of the pile shaft. The slip of the helical pile coupler is 0.0625 inch (1.6 mm) at rated allowable compression/tensile load per coupling.

4.1.4 Helix Plate Capacity: The allowable axial compressive/tensile load capacities of the hexagonally shaped helical plates described in Section 3.2.1 of this report are the following:

- 8-inch diameter plate= 52,225 lbf (232 kN)
- 10-inch diameter plate= 52,013 lbf (231 kN)
- 12-inch diameter plate= 49,011 (218 kN)
- 14-inch diameter plate= 42,490 lbf (189 kN).

4.1.5 Soil Capacity: The allowable axial compressive or tensile soil capacity must be determined by a registered design professional. This can be determined by a site-specific soils investigation, as described in Section 4.1.1, combined with the individual helix bearing method (Method 1), or from field load tests conducted under the supervision of a registered design professional (Method 2). For either Method 1 or Method 2, the predicted axial load capacities must be confirmed during the site-specific production installation, such that the axial load capacities predicted by the torque correlation method are equal to or greater than that is predicted by Method 1 or 2 as described above. The individual bearing method (the individual bearing method is defined as the area of the helical bearing plate times the ultimate bearing capacity of the soil or rock comprising the bearing stratum, divided by a safety factor of at least 2) must be used by a registered design professional when the appropriate soils information is available for the site. The design allowable axial load must be determined by dividing the total ultimate axial load capacity predicted by either Method 1 or 2, above, by a safety factor of at least 2. The torque correlation method must be used to determine the ultimate capacity (Q_{ult}) of the pile (Equation 1). A factor of safety of at least 2 must be applied to the ultimate capacity to determine the allowable soil capacity (Q_{all}) of the pile (Equation 2).

$$Q_{ult} = K_t T \quad (\text{Equation 1})$$

$$Q_{all} = 0.5 Q_{ult} \quad (\text{Equation 2})$$

where:

K_t = Torque correlation factor of 9 ft^{-1} (29 m^{-1}) for axial compression load; or 8 ft^{-1} (26 m^{-1}) for axial tensile load

T = Final installation torque in ft-lbf or N-m. The final installation torque is the torque measurement recorded at the final installation depth.

4.2 Installation:

The Cantsink Foundation Systems must be installed by a Cantsink-certified installer, in accordance with Section 4.2 of this report, 2015, 2012 and 2009 IBC Section 1810.4.11, the Cantsink published installation instructions, and approved site-specific construction documentation. In case of conflict, the most stringent requirement governs.

4.2.1 Helical Piles: The helical piles must be installed and located in accordance with the approved plans and specifications. The helical piles are typically installed using hydraulic rotary motors having forward and reverse capabilities, as recommended by Cantsink Manufacturing, Inc. The installation torque must not exceed 6000 ft-lb (8139 N-m). Helical piles must be installed vertically into the ground with a maximum allowable angle of inclination of 1 degree from vertical. The helical piles must be rotated clockwise in a continuous manner with the lead section advancing at the helix pitch. Extensions (number and length) are selected based on the approved plans as specified per the site conditions by a registered design professional. The extensions and the lead section must be connected by the use of three coupling bolts and nuts as described in Section 3.3.5. Coupling bolts must be snug-

tightened as defined in Section J3 of AISC 360. The final installation torque must equal or exceed that specified by the torque correlation method, to support the allowable design loads of the structure. The final installation torque must not exceed 6,000 ft-lbs (8139 N-m). The helical piles must be installed to the minimum depth described in the approved plans, but with the helical plate not less than 5 feet (1.53 m) below the bottom of the supported concrete foundation. For tension application, the helical pile must be installed such that the minimum depth from the ground surface to the uppermost helix is $12D$, where D is the diameter of the largest helix.

4.2.2 Foundation Attachments:

4.2.2.1 Repair Bracket: The repair bracket must be installed as specified in the approved plans. The repair bracket is installed by excavating the bottom of the footing or foundation a minimum of 30 inches wide (762 mm) x 30 inches deep (762 mm) from final face of the footing. Footing is chipped back so exposed footing from the wall is less than the footing depth. The excavation is extended under the footing for 12 inches (305 mm) and below the footing for 12 inches (305 mm). The underside of the footing for the bracket bearing plate is cleaned and chipped if highly irregular. Existing concrete footing capacity must not be altered, such as with notching of concrete or cutting of reinforcing steel, without the approval of the registered design professional and the code official. The helical pile is installed vertically and located 2 to 3 inches (51 to 76 mm) from the footing face. The repair bracket is installed over the pile facing, away from the concrete footing. The bracket is rotated into place under the footing and raised into position. The pile is cut off squarely 3 inches (76 mm) above the bracket in the raised position. The T-pipe is installed over the pile shaft, and threaded rods, nuts and washers are added to hold the bracket in position. Coupling nuts, jacking bracket and lifting jack are installed to raise the foundation to the desired elevation. Any lifting of the existing structure must be verified by a registered design professional and is subject to approval of the code official to ensure that the foundation, superstructure and helical piles are not overstressed. Once the foundation has been raised to its desired elevation, the hex nuts over brackets are tightened and jacking brackets and lifting jacks are removed. The threaded-rod nuts must be snug tightened. The field cutting and bolting must be in accordance with the most restrictive requirements as described in this evaluation report, the IBC, AISC 360, and the manufacturer's written instructions. The excavation must be backfilled in accordance with 2015, 2012 and 2009 IBC Section 1804 (2006 IBC Section 1803).

4.2.2.2 New Construction Bracket: New construction brackets must be placed over the top of the helical piles. The top of pile elevation must be established and must be consistent with the specified elevation. If necessary, the top of the pile may be cut off level to the required length in accordance with the manufacturer's instructions and AISC 360 requirements so as to ensure full, direct contact (bearing) between the top of the pile shaft and the bracket. In the case of the New Construction Bracket- Tension Compression (NCB-TC), three ¼-inch-diameter (19 mm) bolts and matching nuts as described in Section 3.3.5 of this report must be installed. The bolts must be snug-tightened as defined in Section J3 of AISC 360. The embedment and edge distance of the bracket into the concrete foundation must be as described in the approved plans and as indicated in Table 2 of this report.

The concrete foundation must be cast around the bracket in accordance with the approved construction documents.

4.3 Special Inspection: Continuous special inspection in accordance with 2015 and 2012 IBC Section 1705.9 (2009 IBC Section 1704.10 and 2006 IBC Section 1704.9) must be provided for the installation of the helical piles and foundation brackets. Where on-site welding is required, special inspection in accordance with 2015 and 2012 IBC Section 1705.12 (2009 and 2006 IBC Section 1704.3) is also required. Items to be recorded and confirmed by the special inspector must include, but are not necessarily limited to, the following:

1. Verification of product manufacturer and the manufacturer's certification of the installers.
2. Product configurations and identification (including catalog number) for lead sections, extensions, brackets, bolts, nuts, and washers, if applicable.
3. Installation equipment and written installation procedures.
4. Required target installation torque of piles and depth of helical foundation system.
5. Inclination and position of helical piles; top of pile extension in full contact with bracket; full-surface contact of foundation brackets with concrete; tightness of all bolts and threaded rods.
6. Verification that supported foundation is in a condition adequate to resist applied loads resulting from installation of repair bracket.
7. Compliance of installation with the approved construction documents and this evaluation report.

5.0 CONDITIONS OF USE

The Cantsink Helical Pile Foundation Systems described in this report comply with, or are suitable alternatives to what is specified in, those codes indicated in Section 1.0 of this report, subject to the following conditions:

- 5.1** The Cantsink Helical Pile Foundation Systems are manufactured, identified and installed in accordance with this report, the manufacturer's written installation instructions (which must be available at the jobsite at all times during installation), and the approved construction documents. In the event of a conflict, the most restrictive requirement governs.
- 5.2** The Cantsink Helical Pile Foundation Systems have been evaluated for support of structures assigned to Seismic Design Categories (SDCs) A, B and C in accordance with IBC Section 1613. Use of the systems to support structures assigned to SDC D, E, or F or that are located in Site Class E or F are outside the scope of this report, and are subject to the approval of the building official, based upon submission of a design in accordance with the code by a registered design professional.
- 5.3** Both the repair bracket and the new construction bracket must be used only to support structures that are laterally braced as defined in 2015, 2012 and 2009 IBC Section 1810.2.2 (2006 IBC Section 1808.2.5). Shaft couplings must be located within firm or soft soil as defined in Section 4.1.3.
- 5.4** Installation of the helical foundation systems is limited to regions of concrete members where analysis indicates no cracking will occur at service load levels.

- 5.5** The helical foundation systems must not be used in conditions that are indicative of potential pile deterioration or corrosion situations, as defined by the following: (1) soil resistivity less than 1,000 ohm-cm; (2) soil pH less than 5.5; (3) soils with high organic content; (4) soil sulfate concentrations greater than 1,000 ppm; (5) soils located in landfill; or (6) soil containing mine waste.
- 5.6** Zinc-coated steel and bare steel components must not be combined in the same system. All helical foundation components must be galvanically isolated from concrete reinforcing steel, building structural steel, or any other metal building components.
- 5.7** Special inspection is provided in accordance with Section 4.3 of this report.
- 5.8** The helical piles must be installed vertically into the ground with a maximum allowable angle of inclination of 1 degree from vertical. To comply with the requirements found in 2015, 2012 and 2009 IBC Section 1810.3.1.3 (2006 IBC Section 1808.2.8.8), the superstructure must be designed to resist the effects of helical pile eccentricity.
- 5.9** A geotechnical investigation report in accordance with Section 4.1.1 of this report must be submitted to the code official for approval.
- 5.10** The load combinations prescribed in Section 1605.3.2 of the IBC must be used to determine the applied loads. When using the alternative basic load combinations prescribed in Section 1605.3.2, the allowable stress increases permitted by material chapters of the IBC (Chapters 19 through 23, as applicable) or the referenced standards are prohibited.
- 5.11** Engineering calculations and drawings in accordance with recognized engineering principles as described in IBC Section 1604.4, and in compliance with Section 4.1 of this report, are prepared by a registered design professional and approved by the code official.
- 5.12** The applied loads must not exceed the allowable capacities described in Section 4.1 of this report.
- 5.13** The adequacy of the concrete structures that are connected to the brackets must be verified by a registered design professional in accordance with applicable code provisions, and is subject to the approval of the code official.
- 5.14** In order to avoid group efficiency effects, an analysis prepared by a registered design professional must be submitted where the center-to-center spacing of the helical piles is less than three times the diameter of the helical plate at the depth of bearing.
- 5.15** Compliance with 2015, 2012 and 2009 IBC Section 1810.3.11.1 (2006 IBC Section 1808.2.23.1.1) for buildings assigned to SDC C, and with 2012 and 2009 IBC Section 1810.3.6 (2006 IBC Section 1808.2.7) for all buildings, is outside the scope of this report. Such compliance must be addressed by a registered design professional for each site, and is subject to approval of the code official.
- 5.16** Settlement of the helical pile is outside the scope of this report and must be determined by a registered design professional, as required in 2015, 2012 and 2009 IBC Section 1810.2.3 (2006 IBC Section 1808.2.12).

5.17 The Cantsink Helical Pile Foundation Systems are manufactured at the Cantsink Manufacturing, Inc., facility located in Winder, Georgia, under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Helical Foundation Systems and Devices (AC358), dated June 2013 (editorially revised September 2014).

7.0 IDENTIFICATION

The Cantsink Helical Pile Foundation System components are identified by a tag or label bearing the name and address of Cantsink Manufacturing, the catalog number and the evaluation report number (ESR-1559).

TABLE 1—HELICAL PILE FOUNDATION SYSTEM COMPONENTS

PRODUCT DESCRIPTION	CATALOG NUMBER
5-foot lead with 8-inch helix	2.5-40L05-8
7-foot lead with 8-inch helix	2.5-40L07-8
10-foot lead with 8-inch helix	2.5-40L10-8
5-foot lead with 10-inch helix	2.5-40L05-10
7-foot lead with 10-inch helix	2.5-40L07-10
10-foot lead with 10-inch helix	2.5-40L10-10
5-foot lead with 12-inch helix	2.5-40L05-12
7-foot lead with 12-inch helix	2.5-40L07-12
10-foot lead with 12-inch helix	2.5-40L10-12
5-foot lead with 14-inch helix	2.5-40L05-14
7-foot lead with 14-inch helix	2.5-40L07-14
10-foot lead with 14-inch helix	2.5-40L10-14
5-foot lead with 8 and 10-inch helix	2.5-40L05-8-10
7-foot lead with 8 and 10-inch helix	2.5-40L07-8-10
10-foot lead with 8 and 10-inch helix	2.5-40L10-8-10
5-foot lead with 8 and 14-inch helix	2.5-40L05-8-14
7-foot lead with 8 and 14-inch helix	2.5-40L07-8-14
10-foot lead with 8 and 14-inch helix	2.5-40L10-8-14
5-foot lead with 10 and 12-inch helix	2.5-40L05-10-12
7-foot lead with 10 and 12-inch helix	2.5-40L07-10-12
10-foot lead with 10 and 12-inch helix	2.5-40L10-10-12
5-foot lead with 8, 10 and 12-inch helix	2.5-40L05-8-10-12
7-foot lead with 8, 10 and 12-inch helix	2.5-40L07-8-10-12
10-foot lead with 8, 10 and 12-inch helix	2.5-40L10-8-10-12
5-foot lead with 10, 12 and 14-inch helix	2.5-40L05-10-12-14
7-foot lead with 10, 12 and 14-inch helix	2.5-40L07-10-12-14
10-foot lead with 10, 12 and 14-inch helix	2.5-40L10-10-12-14
2-foot extension	2.5-40X02
3-foot extension	2.5-40X03
4-foot extension	2.5-40X04
5-foot extension	2.5-40X05
7-foot extension	2.5-40X07
10-foot extension	2.5-40X10
New Construction Bracket (compression only)	NCB-C
New Construction Bracket (compression and tension)	NCB-TC
Foundation Repair Bracket	UPB-D

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

TABLE 2—ALLOWABLE LOAD CAPACITY OF BRACKETS⁴

BRACKET TYPE	ALLOWABLE AXIAL COMPRESSIVE LOAD CAPACITY (kips)	ALLOWABLE AXIAL TENSILE LOAD CAPACITY (kips)
Repair Bracket	18 ¹	-
New Construction Bracket (NCB-C) bare steel	26 ²	-
New Construction Bracket (NCB-TC) bare steel	30 ²	21 ³
New Construction Bracket (NCB-TC) galvanized steel	30 ²	25.5 ³

For SI: 1 kip (1000 lbf)=4.48 kN.

¹Load capacity is based on full scale load tests per AC358 with an installed 5'-0 unbraced pile length having a maximum of one coupling per 2015, 2012 and 2009 IBC Section 1810.2.1 (2006 IBC Section 1808.2.9.2). Repair bracket must be concentrically loaded. Minimum specified compressive strength of concrete is 2500 psi.

²The allowable capacity is based on limit states associated with steel strength, concrete punching shear and concrete bearing strength. The bracket must be installed with a minimum of 8 inches of concrete cover measured from the top of the bracket plate to the top of concrete footing. The concrete footing must have a minimum width of 16 inches and a minimum depth of 12 inches, and must be normal-weight concrete having a minimum specified compressive strength of 2500 psi.

³The allowable capacity is based on limit states associated with steel strength, concrete punching shear and concrete bearing strength. The bracket must be installed with a minimum embedment of the bracket plate of 9 inches. The embedment of the bracket plate is measured from the bottom of the plate to the bottom of the concrete foundation. For compressive loads applications, the minimum concrete cover above the plate is 6 inches. The concrete footing must have a minimum width of 20 inches and a minimum depth of 20 inches, and must be normal-weight concrete having a minimum specified compressive strength of 2500 psi. Three (3) ¼-inch diameter bolts must be installed in accordance with Section 4.2.2.2 of this report.

⁴The capacities listed in Table 2 assume the pile foundation system is sidesway fully braced and complies with requirements described in Section 4.1.3 of this report.

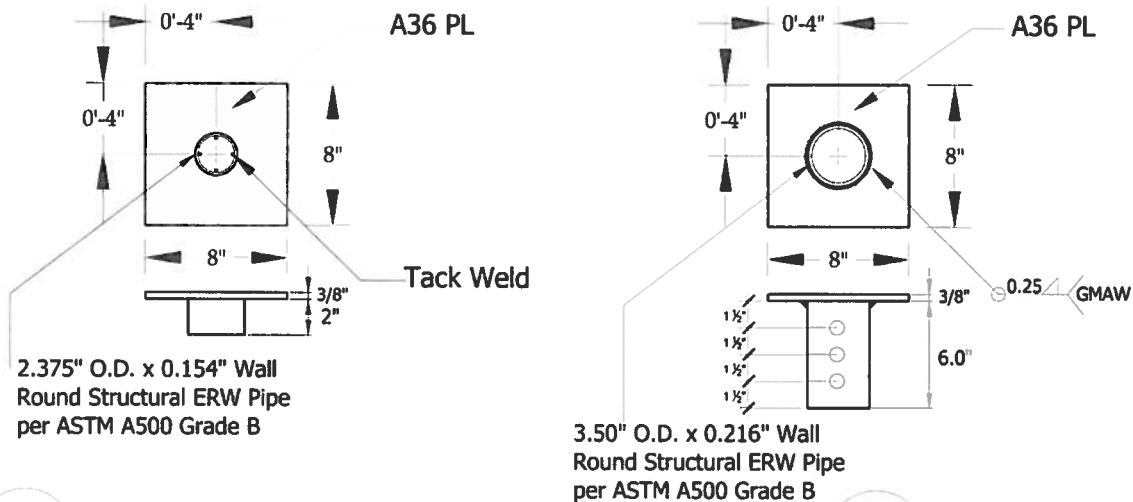
TABLE 3—MECHANICAL PROPERTIES AFTER CORROSION LOSS OF 2.875-INCH HELICAL PILE SHAFT AND EXTENSIONS

PARAMETER	VALUE	
	Bare Steel ¹	Galvanized Steel ²
Steel yield strength, F _y	50 ksi	
Steel tensile strength, F _u	65 ksi	
Modulus of Elasticity, E	29,000 ksi	
Design wall thickness	0.153 inch	0.181 inch
Outside diameter	2.839 inch	2.872 inch
Inside diameter	2.533 inch	2.510 inch
Cross-sectional area	1.291 inch ²	1.530 inch ²

For SI: 1 inch = 25.4; 1 ksi =6.89 MPa.

¹Dimensional properties are based on bare steel losing 0.036-inch steel thickness as indicated in Section 3.9 of AC358 for a 50-year service life.

²Dimensional properties are based on hot-dipped galvanized steel with a minimum coating thickness of 0.005 inch per side and losing 0.013-inch steel thickness as indicated in Section 3.9 of AC358 for a 50-year service life.



1 NCB-C

2 NCB-TC

FIGURE 1—NEW CONSTRUCTION BRACKETS

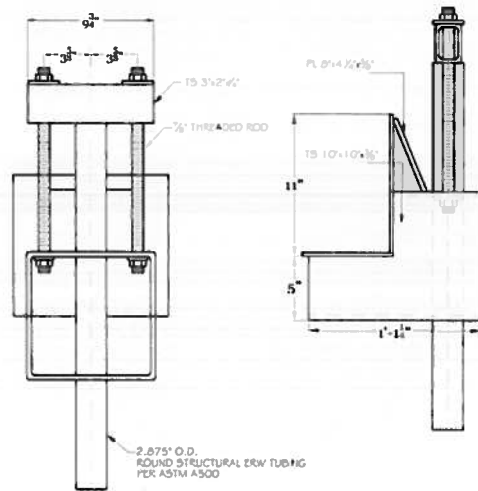


FIGURE 2—FOUNDATION REPAIR BRACKET

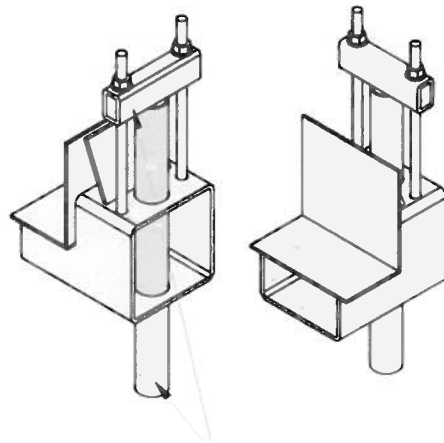


FIGURE 3—FOUNDATION REPAIR BRACKET

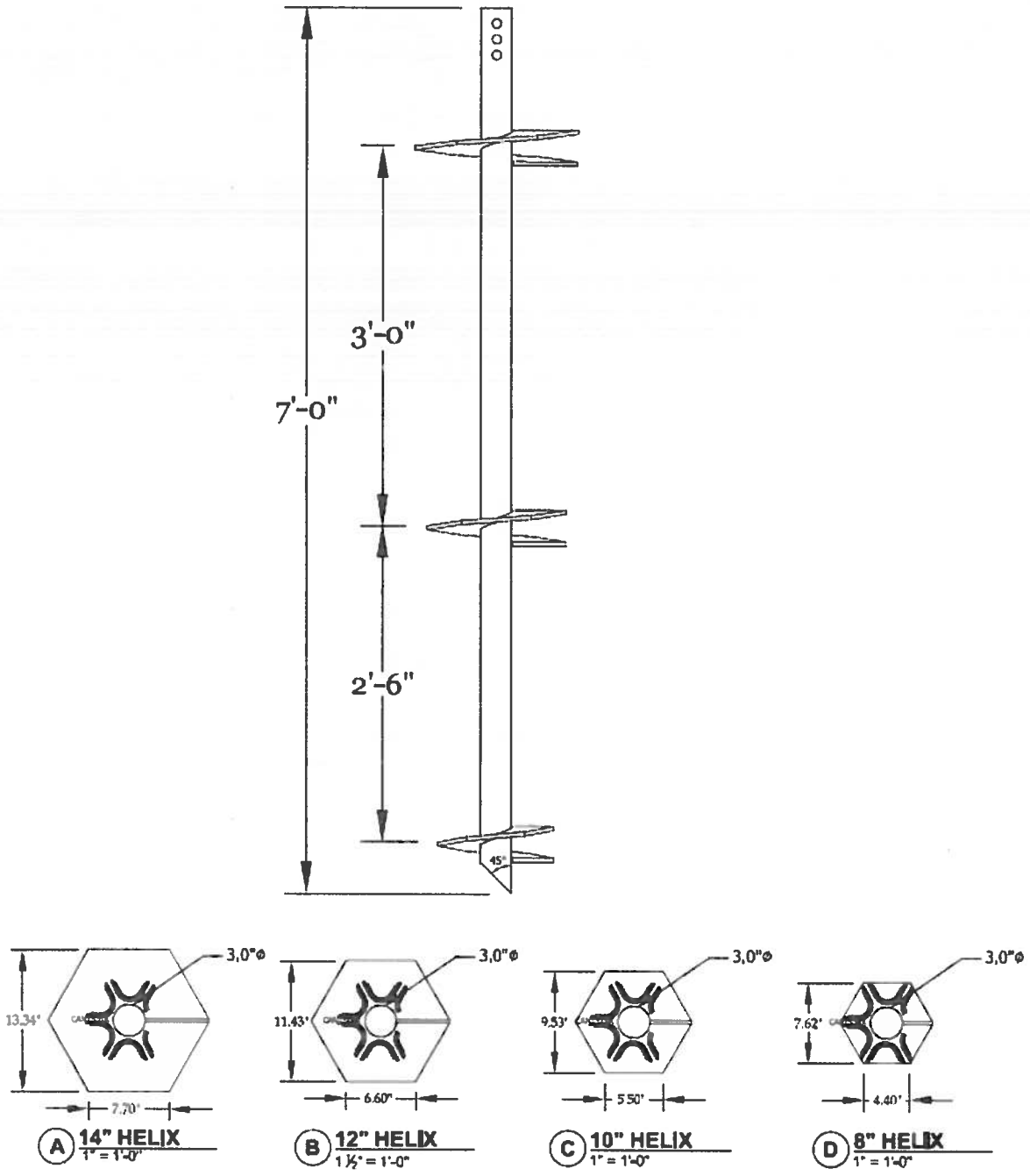


FIGURE 4—HELICALPILE LEAD SECTION AND HELICAL PLATES (TYPICAL)

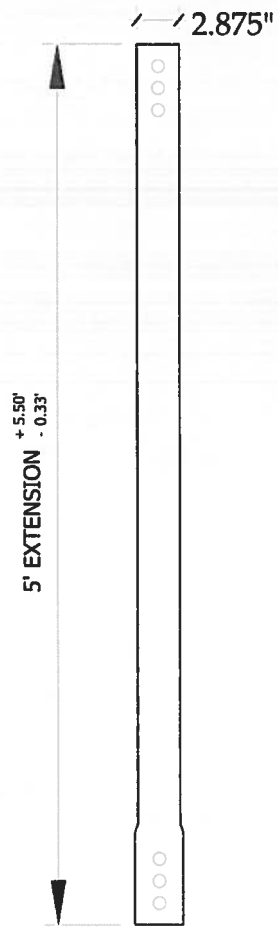


FIGURE 5—EXTENSION SECTION (TYPICAL)